

HANDBOOK OF THE BIRDS OF THE WORLD

Volume 13
Penduline-tits
to
Shrikes




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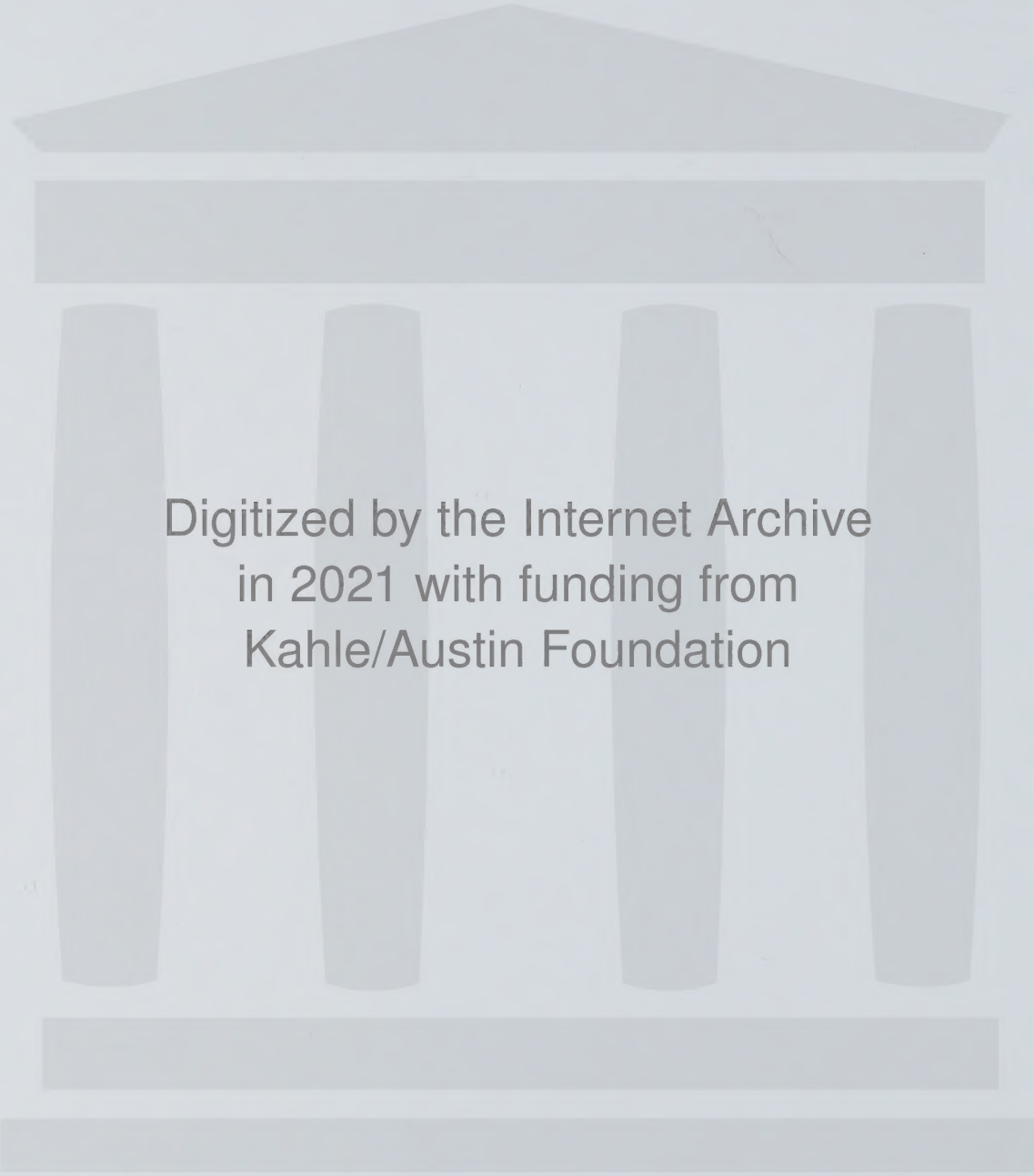
Edited by
Josep del Hoyo
Andrew Elliott
David Christie



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FOREST AND BIRD, NEW ZEALAND

Jacket illustration by CHRIS ROSE
Eurasian Penduline-tit (*Remiz pendulinus*)
Brown Shrike (*Lanius cristatus*)



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Penduline-tits *to* Shrikes



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Josep del Hoyo

Andrew Elliott

David Christie

Bas van Balen

Robert Cheke

Les Christidis

Brian Coates

Hugh Ford

Phil Gregory

Simon Harrap

Peter Higgins

Peter Jones

Robert Kennedy

Hans Löhrl

Steve Madge

Clive Mann

Hector Miranda

Ian Newton

Dawid de Swardt

Bruno Walther

Michael Wilson

John Woinarski

Reuven Yosef

International Shrike

Working Group

Colour Plates by

Norman Arlott

Hilary Burn

Ren Hathway

Ian Lewington

Douglas Pratt

Chris Rose

Brian Small

Jan Wilczur

Tim Worfolk

Consultant for Systematics
and Nomenclature

Walter J. Bock

Consultant for Status
and Conservation

Nigel J. Collar



Lynx Edicions

Barcelona

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ISBN: 978-84-96553-45-3

Authors of Volume 13

Dr S. van Balen

Honorary Researcher, Zoological Museum, University of Amsterdam, Amsterdam, The Netherlands.

Professor R. A. Cheke

Professor of Tropical Zoology, Natural Resources Institute, University of Greenwich at Medway, Kent, England.

Dr L. Christidis

Assistant Director and Head of Research and Collections, Australian Museum, Sydney, New South Wales, Australia.

B. J. Coates

Publisher and freelance ornithological consultant, Brisbane, Queensland, Australia.

Professor H. A. Ford

Division of Zoology, University of New England, Armidale, New South Wales, Australia.

P. A. Gregory

Professional bird guide and field ornithologist, Field Guides Inc. & Sicklebill Safaris, Kuranda, Queensland, Australia.

S. Harrap

Freelance ornithologist, naturalist and photographer, Norfolk, England.

P. J. Higgins

Consultant ornithologist and science editor, Sawtell, New South Wales, Australia; also, Senior Editor Handbook of Australian, New Zealand and Antarctic Birds (HANZAB).

Dr P. J. Jones

Institute of Evolutionary Biology, University of Edinburgh, Edinburgh, Scotland.

Dr R. S. Kennedy

Director of Natural Sciences, Maria Mitchell Association, Nantucket; also, Associate, Ornithology Department, Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA.

Dr H. Löhrl

Formerly Head of the Vogelwarte Radolfzell, Max Planck Institute for Behavioural Physiology, Radolfzell, Germany. Deceased.

S. C. Madge

Freelance wildlife consultant and writer; also, President, Cornwall Bird-watching & Preservation Society, Cornwall, England.

Dr C. F. Mann

Freelance ornithologist/biologist, London, England.

Dr H. C. Miranda

Assistant Professor, Department of Biology, Texas Southern University, Houston, Texas, USA.

Professor I. Newton

Emeritus Fellow, Centre for Ecology & Hydrology, Monks Wood Research Station, Huntingdon, England.

D. H. de Swardt

Head of Ornithology Department, National Museum, Bloemfontein, South Africa.

Dr B. A. Walther

Science Officer, DIVERSITAS, Muséum National d'Histoire Naturelle, Paris, France.

M. G. Wilson

*Honorary Research Associate, Edward Grey Institute, Department of Zoology, University of Oxford;
also, freelance translator and editor (ornithology), Oxford, England.*

Dr J. C. Z. Woinarski

*Principal Scientist, Biodiversity Conservation Division, Department of Natural Resources,
Environment and The Arts; also, Adjunct Professorial Fellow, School for Environmental Research,
Charles Darwin University, Northern Territory, Australia.*

Professor R. Yosef

Director, International Birding & Research Centre, Eilat, Israel.

International Shrike Working Group

Editorial Council

Ramón Mascort
(President)

Josep del Hoyo
Ramón Mascort Brugarolas
Carmen Pascual
Pilar Ruiz-Olalla
Jordi Sargatal



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José Luis Copete
Alan Elliott
Heather Elliott
Teresa Pardo

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Production

Xavier Ruiz

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Species Accounts of Laniidae

Numbers correspond to numbers of individual species accounts:

1 *MH*; 2 *MT*; 3 *DN*; 4 *AK*; 5 *MT*; 6 *MH*; 7 *MH*; 8 *JS* & *LR*; 9 *MH*; 10 *AK*;
11 *LR* & *JS*; 12 *MH*; 13 *AK*; 14 *SC*; 15 *PT*; 16 *AHL* & *OIC*; 17 *BPN*;
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International Shrike Working Group

SC — Susan Craig
CTD — Colleen T. Downs
DG — David Giralt
AHL — Ángel Hernández Lázaro
MH — Menno Hornman
OIC — Octavio Infante Casado
AK — Anton Krištín
JTK — Jan T. Kuper
DN — Dries van Nieuwenhuyse
MN — Marijn Nijssen
BPN — Boris P. Nikolov
LR — Luís Reino
JS — Joana Santana
SS — Shernice Soobramoney
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CONTENTS

Foreword	<i>I. Newton</i>	15
Introduction		48
Order PASSERIFORMES		
Family REMIZIDAE (PENDULINE-TITS)	<i>S. C. Madge</i>	52
Family AEGITHALIDAE (LONG-TAILED TITS)	<i>S. Harrap</i>	76
Family SITTIDAE (NUTHATCHES)	<i>S. Harrap</i>	102
Family TICHODROMIDAE (WALLCREEPER)	<i>H. Löhrl & M. G. Wilson</i>	146
Family CERTHIIDAE (TREECREEPERS)	<i>S. Harrap</i>	166
Family RHABDORNITHIDAE (RHABDORNIS)	<i>R. S. Kennedy & H. C. Miranda</i>	188
Family NECTARINIIDAE (SUNBIRDS)	<i>R. A. Cheke & C. F. Mann</i>	196
Family MELANOCHARITIDAE (BERRYPECKERS AND LONGBILLS)	<i>P. A. Gregory</i>	322
Family PARAMYTHIIDAE (PAINTED BERRYPECKERS)	<i>B. J. Coates</i>	340
Family DICAETIDAE (FLOWERPECKERS)	<i>R. A. Cheke & C. F. Mann</i>	350
Family PARDALOTIDAE (PARDALOTES)	<i>J. C. Z. Woinarski</i>	390
Family ZOSTEROPIDAE (WHITE-EYES)	<i>S. van Balen</i>	402
Family PROMEROPIDAE (SUGARBIRDS)	<i>D. H. de Swardt</i>	486
Family MELIPHAGIDAE (HONEYEATERS)	<i>P. J. Higgins, L. Christidis & H. A. Ford</i>	498
Family ORIOLIDAE (ORIOLES)	<i>B. A. Walther & P. J. Jones</i>	692
Family LANIIDAE (SHRIKES)	<i>R. Yosef</i>	732
Species accounts of Laniidae		
(for specific contributions, see facing page): <i>International Shrike Working Group</i>		
REFERENCES		
References of Scientific Descriptions		799
General List of References		807
INDEX		861

LIST OF PLATES

Plate 1	REMIZIDAE (<i>Remiz</i> , <i>Anthoscopus</i> , <i>Auriparus</i> , <i>Cephalopyrus</i> , <i>Pholidornis</i>)	N. Arlott	68
Plate 2	AEGITHALIDAE (<i>Aegithalos</i> , <i>Psaltiriparus</i> , <i>Psaltia</i> , <i>Leptopoeile</i>)	B. Small	94
Plate 3	SITTIDAE I (<i>Sitta</i>)	H. Burn	126
Plate 4	SITTIDAE II (<i>Sitta</i>)	H. Burn	138
Plate 5	TICHODROMIDAE (<i>Tichodroma</i>)	H. Burn	164
Plate 6	CERTHIIDAE (<i>Certhia</i> , <i>Salpornis</i>)	I. Lewington	180
Plate 7	RHABDORNITHIDAE (<i>Rhabdornis</i>)	T. Worfolk	194
Plate 8	NECTARINIIDAE I (<i>Chalcoparia</i> , <i>Deleornis</i> , <i>Anthreptes</i>)	H. Burn	244
Plate 9	NECTARINIIDAE II (<i>Anthreptes</i> , <i>Anthodiaeta</i>)	H. Burn	250
Plate 10	NECTARINIIDAE III (<i>Hypogramma</i> , <i>Anabathmis</i> , <i>Dreptes</i> , <i>Anthobaphes</i> , <i>Cyanomitra</i>)	H. Burn	256
Plate 11	NECTARINIIDAE IV (<i>Chalcomitra</i>)	H. Burn	262
Plate 12	NECTARINIIDAE V (<i>Leptocoma</i>)	H. Burn	266
Plate 13	NECTARINIIDAE VI (<i>Nectarinia</i> , <i>Drepanorhynchus</i> , <i>Cinnyris</i>)	H. Burn	270
Plate 14	NECTARINIIDAE VII (<i>Cinnyris</i>)	H. Burn	276
Plate 15	NECTARINIIDAE VIII (<i>Cinnyris</i>)	H. Burn	282
Plate 16	NECTARINIIDAE IX (<i>Cinnyris</i>)	H. Burn	288
Plate 17	NECTARINIIDAE X (<i>Cinnyris</i>)	H. Burn	294
Plate 18	NECTARINIIDAE XI (<i>Cinnyris</i>)	H. Burn	300
Plate 19	NECTARINIIDAE XII (<i>Aethopyga</i>)	H. Burn	304
Plate 20	NECTARINIIDAE XIII (<i>Aethopyga</i>)	H. Burn	308
Plate 21	NECTARINIIDAE XIV (<i>Aethopyga</i>)	H. Burn	312
Plate 22	NECTARINIIDAE XV (<i>Arachnothera</i>)	H. Burn	316
Plate 23	MELANOCHARITIDAE (<i>Melanocharis</i> , <i>Rhamphocharis</i> , <i>Oedistoma</i> , <i>Toxorhamphus</i>)	N. Arlott	334
Plate 24	PARAMYTHIIDAE (<i>Oreocharis</i> , <i>Paramythia</i>)	N. Arlott	348
Plate 25	DICAEIDAE I (<i>Prionochilus</i> , <i>Dicaeum</i>)	H. Burn	368
Plate 26	DICAEIDAE II (<i>Dicaeum</i>)	H. Burn	372
Plate 27	DICAEIDAE III (<i>Dicaeum</i>)	H. Burn	378
Plate 28	DICAEIDAE IV (<i>Dicaeum</i>)	H. Burn	382
Plate 29	DICAEIDAE V (<i>Dicaeum</i>)	H. Burn	386
Plate 30	PARDALOTIDAE (<i>Pardalotus</i>)	H. Burn	400
Plate 31	ZOSTEROPIDAE I (<i>Zosterops</i>)	D. Pratt	444
Plate 32	ZOSTEROPIDAE II (<i>Zosterops</i>)	D. Pratt	452
Plate 33	ZOSTEROPIDAE III (<i>Zosterops</i>)	D. Pratt	460
Plate 34	ZOSTEROPIDAE IV (<i>Zosterops</i>)	D. Pratt	466
Plate 35	ZOSTEROPIDAE V (<i>Zosterops</i>)	D. Pratt	472
Plate 36	ZOSTEROPIDAE VI (<i>Woodfordia</i> , <i>Rukia</i> , <i>Cleptornis</i> , <i>Apalopteron</i> , <i>Tephrozosterops</i> , <i>Madanga</i> , <i>Lophozosterops</i> , <i>Oculocincta</i> , <i>Heleia</i> , <i>Chlorocharis</i> , <i>Megazosterops</i> , <i>Speirops</i> , <i>Hypocryptadius</i>)	D. Pratt	478
Plate 37	PROMEROPIDAE (<i>Promerops</i>)	I. Lewington	496
Plate 38	MELIPHAGIDAE I (<i>Acanthorhynchus</i> , <i>Pycnopygius</i> , <i>Certhionyx</i>)	J. Wilczur	582
Plate 39	MELIPHAGIDAE II (<i>Prothemadera</i> , <i>Anthornis</i> , <i>Oreornis</i> , <i>Guadalcanaria</i> , <i>Meliphaga</i>)	J. Wilczur	586
Plate 40	MELIPHAGIDAE III (<i>Meliphaga</i> , <i>Lichenostomus</i>)	J. Wilczur	594
Plate 41	MELIPHAGIDAE IV (<i>Lichenostomus</i> , <i>Purnella</i>)	J. Wilczur	600

Plate 42	MELIPHAGIDAE V (<i>Melidectes</i> , <i>Meliarchus</i> , <i>Manorina</i> , <i>Acanthagenys</i>)	T. Worfolk	610
Plate 43	MELIPHAGIDAE VI (<i>Anthochaera</i>)	T. Worfolk	620
Plate 44	MELIPHAGIDAE VII (<i>Ramsayornis</i> , <i>Conopophila</i> , <i>Timeliopsis</i> , <i>Melilestes</i> , <i>Stresemannia</i> , <i>Glycifohia</i> , <i>Myza</i> , <i>Melipotes</i> , <i>Macgregoria</i>)	T. Worfolk	626
Plate 45	MELIPHAGIDAE VIII (<i>Sugomel</i> , <i>Myzomela</i>)	D. Pratt	636
Plate 46	MELIPHAGIDAE IX (<i>Myzomela</i>)	D. Pratt	640
Plate 47	MELIPHAGIDAE X (<i>Myzomela</i>)	D. Pratt	644
Plate 48	MELIPHAGIDAE XI (<i>Myzomela</i> , <i>Glycichaera</i>)	D. Pratt	648
Plate 49	MELIPHAGIDAE XII (<i>Ptiloprora</i> , <i>Gliciphila</i> , <i>Cissomela</i> , <i>Lichmera</i>)	T. Worfolk	656
Plate 50	MELIPHAGIDAE XIII (<i>Phylidonyris</i> , <i>Trichodere</i> , <i>Foulehaio</i> , <i>Gymnomyza</i>)	R. Hathway	666
Plate 51	MELIPHAGIDAE XIV (<i>Melithreptus</i> , <i>Entomyzon</i>)	N. Arlott	672
Plate 52	MELIPHAGIDAE XV (<i>Philemon</i> , <i>Melitograis</i>)	R. Hathway	678
Plate 53	MELIPHAGIDAE XVI (<i>Xanthotis</i> , <i>Plectorhyncha</i> , <i>Grantiella</i>)	T. Worfolk	688
Plate 54	ORIOLIDAE I (<i>Sphecotheres</i> , <i>Oriolus</i>)	H. Burn	714
Plate 55	ORIOLIDAE II (<i>Oriolus</i>)	H. Burn	720
Plate 56	ORIOLIDAE III (<i>Oriolus</i>)	H. Burn	726
Plate 57	LANIIDAE I (<i>Lanius</i>)	T. Worfolk	774
Plate 58	LANIIDAE II (<i>Lanius</i>)	T. Worfolk	780
Plate 59	LANIIDAE III (<i>Lanius</i>)	T. Worfolk	784
Plate 60	LANIIDAE IV (<i>Lanius</i> , <i>Corvinella</i> , <i>Eurocephalus</i>)	T. Worfolk	790



Foreword

Bird Migration

The term migration, as used by ornithologists, is usually understood as a regular, large-scale return movement of individual birds twice each year between restricted breeding and wintering areas. Non-migratory birds are usually described as sedentary or resident because they occupy the same areas year round, and their populations show no obvious seasonal shifts in distribution. However, closer examination of bird behaviour reveals a more complex and variable array of movement patterns, which for convenience can be divided into six main types (after Newton 2008):

- **Routine movements** centred on the place of residence. As part of everyday life, such movements occur in all birds, whether classed as resident or migratory. They include the flights from nesting or roosting sites to feeding sites, or from one feeding site to another. In most birds these movements are short and localised, restricted to a circumscribed home range, and extending over distances of metres or kilometres. But in other species (notably pelagic birds) regular foraging movements can extend over hundreds of kilometres out from the nesting colony.
- **One-way dispersal movements** also occur in both sedentary and migratory bird species. After becoming independent of their parents, young birds typically disperse in various directions from their natal sites. Individual young seem to have no specific inherent directional preferences, so within a population, dispersal movements occur randomly in all directions, unless constrained by local topography. In most bird species, dispersal distances can be measured in metres, kilometres or tens of kilometres, but in a few species (notably pelagic birds) such distances can be much greater. Post-fledging dispersal of this type does not usually involve a return journey (see below), but in any case most surviving young subsequently settle to breed at some distance from their hatch-sites (called natal dispersal). In addition, some adults may change their nesting locations from year to year (breeding dispersal), or their non-breeding locations from year to year (non-breeding or wintering dispersal). In general, dispersal movements cause no seasonal change in the centre of gravity of a population or in its overall geographical distribution.
- **Migration** in which individuals make regular return movements, at about the same dates each year, often to specific destinations. Compared with the above movements, migration usually involves a longer journey over tens, hundreds or thousands of kilometres and in much more restricted and fixed directions. Most birds spend their annual non-breeding period at lower latitudes than their breeding period. Such migration occurs primarily in association with seasonal changes in food availability, resulting from the alternation of warm and cold seasons at high latitudes, or of wet and dry seasons in the tropics. Overall, directional migration causes a massive movement of birds twice each year between regular breeding and wintering ranges, and a general shift of populations from higher to lower latitudes for the non-breeding season.
- **Dispersive migration** in which post-breeding movements can occur in any direction from the breeding site (like dispersal), but still involve a return journey (like other migration). Although these movements occur seasonally between breeding and non-breeding areas, they do not necessarily involve any change in the latitudinal distribution of the population, or any change in its centre of gravity. They are evident in some landbird species usually regarded as ‘resident’, but also include altitudinal movements in which montane birds shift in various directions from higher to lower ground for the non-breeding season. In addition, many seabirds can dis-

perse long distances in various directions from their nesting colonies to over-winter in distant areas rich in food, but returning to their colonies the following spring.

- **Irruptions (or invasions)** are like other seasonal migrations, except that the proportions of birds that leave the breeding range, and the distances they travel, vary greatly from year to year (the directions are roughly the same but often more variable between individuals than in regular migration). Such movements are usually towards lower latitudes, and occur in association with annual, as well as with seasonal, fluctuations in food supplies. In consequence, populations may concentrate in different parts of their non-breeding ranges in different years. Examples include some boreal finches that depend on sporadic tree-seed crops, and some owls that depend on cyclic rodent populations.
- **Nomadism** in which birds move from one area to another, residing for a time wherever food is temporarily plentiful, and breeding if possible. The areas successively occupied may lie in various directions from one another. No one area is necessarily used every year, and some areas may be used only at intervals of several years, but for months or years at a time, whenever conditions permit. The population may thus be concentrated in largely different places in different years. This kind of movement occurs among some rodent-eating owls and raptors of tundra and boreal regions, and among many birds that live in desert regions, where infrequent and sporadic rainfall leads to local changes in habitats and food supplies. Because these changes are unpredictable from year to year, individual birds do not necessarily return to areas they have used previously, and may breed in widely separated areas in different years.

These different kinds of bird movements intergrade, and all have variants, but in any bird population, one or two kinds usually prevail. Almost all bird species show post-fledging dispersal movements, in addition to any other types of movement shown at other times of year, and some species show both nomadic and irruptive movements. Through migration, irruption and nomadism, birds exploit the resources of mainly different regions at different times. The birds thereby maintain greater survival or reproductive success (and hence greater numbers) than if they remained permanently in the same place, and adopted a more sedentary lifestyle. In other words, because of their movements, populations probably persist at considerably larger size than they otherwise would.

The main variables in these different types of bird movements include: (1) the directions or spread of directions; (2) the distances or spread of distances; (3) the calendar dates or spread of dates; and (4) whether or not they involve a return journey. They also differ in whether they occur in direct response to prevailing conditions, or in an 'anticipatory' manner, in adaptation to conditions that can be expected to occur in the coming weeks, and leading birds to leave areas before their local survival would be compromised or arrive in other areas in time to breed when conditions there are suitable. Each of these aspects of bird movement behaviour can be independently influenced by natural selection, giving overall the great diversity of movement patterns found among birds, related to the different circumstances in which birds live. In the rest of this chapter, however, I shall be concerned primarily with regular seasonal migration—that large-scale seasonal shift in bird populations which has fascinated people throughout history, raising obvious questions such as why birds do it, where they come from or go, and how they find their way.

Migration as a product of natural selection

Migration might be expected to occur wherever individuals benefit more, in terms of survival or reproduction, if they move seasonally between different areas than if they remain in the same area year-round (Lack 1954). The usual reason why breeding areas become unsuitable during part of the year is lack of food. Such food shortages occur for many birds because plant growth stops for part of the year, and many kinds of invertebrates die or hibernate or become inaccessible under snow and ice. At high latitudes, daylengths also shorten in winter to such an extent that many diurnal birds would have too little time to get enough food, even if it were available. Hence, the purpose of the autumn exodus from high latitudes is fairly obvious.

The reason why birds leave their wintering areas to return in spring is sometimes less obvious, because many wintering areas seem able to support the birds during the rest of the year. But if no birds migrated to higher latitudes in spring, these latitudes would remain almost empty of many species, and a large seasonal surplus of food



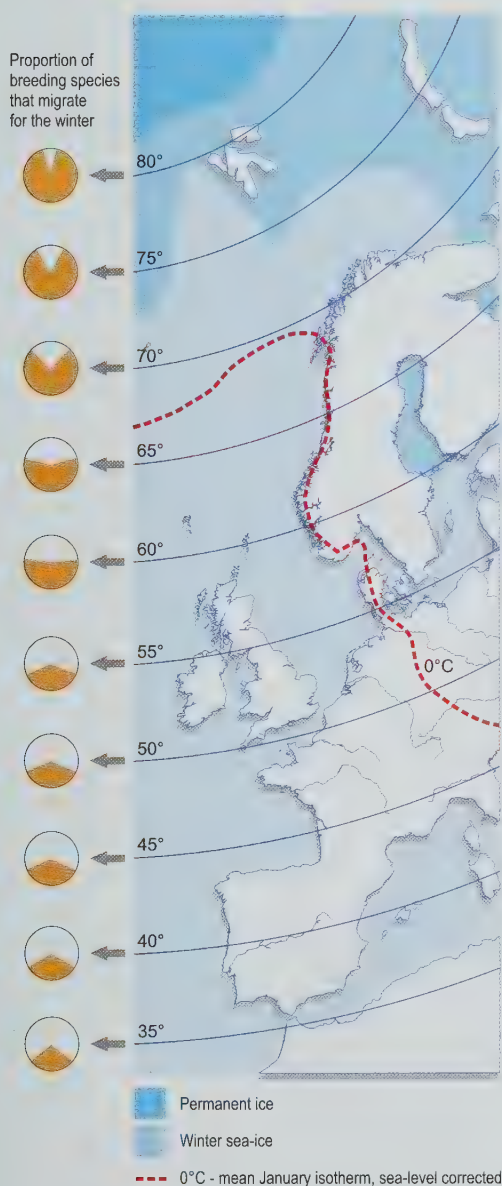
Snow Buntings (Plectrophenax nivalis).
Helsinki, Finland.
Markus Varesvuo.

would go largely unexploited. Under these circumstances, any individuals that moved to higher latitudes, with increasing food and long days, might raise more offspring than if they stayed at lower latitudes and competed with the birds resident there. So whereas the advantage of autumn migration can be seen as improved winter survival, dependent on better food supplies in winter quarters, the main advantage of spring migration can be seen as improved breeding success, dependent on better food supplies in summer quarters. Compared to survival, reproduction often has more stringent requirements in terms of specific food needs and predation avoidance.

In effect, migration reduces the seasonal fluctuations in food supplies to which a breeding population could otherwise be exposed. This does not rule out an influence of other factors, such as reduced predation, parasitism or competition, all of which have at one time or another been proposed as contributing to the evolution of migration, but on scant evidence. Whatever the main selective forces, however, the migratory habit ensures in the long term that species in seasonal environments adopt and maintain movement patterns that allow individuals to survive and breed better than if they remained in the same area year-round.

Global patterns

Figure 1
Map of western Europe showing the proportions of breeding bird species at different latitudes that migrate south for the winter.
From Newton & Dale (1996a).



Throughout the world, migration is most apparent wherever the contrast between summer and winter (or wet season and dry season) conditions is great. Migration thus allows individual birds to exploit different areas at different times of year, whether to benefit from seasonal flushes of food or to avoid seasonal shortages. In fact, some migratory birds occupy habitats over winter that they could not use for breeding, and then occupy breeding areas that would not support them in winter. This applies to all arctic nesting shorebirds which spend the winter on sea coasts where, due to tidal flooding, nesting would be impossible, and then migrate north to breed on the arctic tundra which is frozen and snow-covered for the rest of the year. Thus some bird species exist over much or all of their range only by exploiting widely separated habitats at different seasons.

Although most marked at high latitudes, migration also occurs in the tropics, especially in the savannahs and grasslands exposed to regular wet and dry seasons. In the northern tropics, for example, many species move south for the dry (non-breeding) season, some crossing the equator, while in the other half of the year many species of the southern hemisphere move north. In contrast, birds confined to lowland equatorial rainforest are probably the least migratory, especially the small insectivores of the understorey where conditions remain relatively stable and suitable year-round. This year-round consistency in the rainforest environment removes any advantage in moving, and many individuals may remain within the same few hectares throughout their adult lives. In the same forests, however, some nectar-eaters and fruit-eaters move within small latitudinal or altitudinal bands in response to flowering and fruiting patterns, while other birds from higher latitudes move in for their 'winter'.

In general, the proportions of species which are migratory increase from equatorial to polar regions, as the contrast between summer and winter conditions widens (Newton & Dale 1996a, 1996b). Progressing northward up the western seaboard of North Africa and Europe, for example, the proportion of breeding bird species which move out totally to winter further south increases from 29% of species at 30°N (North Africa) to 83% of species at 80°N (Svalbard), a mean increase of 1.3% of breeding species for every degree of latitude (Figure 1).

This relationship holds, it has been suggested, because at high latitudes the numbers of resident birds (species and individuals) are held at low level by winter severity. The flush of food in summer is greater than the small number of resident species can exploit, leaving a surplus available for summer migrants. The latter therefore increase in proportion with latitude, as the severity of the winters increase, and the numbers of year-round resident species decline. At lower latitudes, a large proportion of breeding species can remain year-round, leaving fewer openings for summer visitors (Herrera 1978, O'Connor 1985).

In the largely different avifauna of eastern North America, the proportion of migrants among breeding species also increases with distance northwards from 12% at 25°N to 87% at 80°N, a mean increase of 1.4% per degree of latitude (Figure 2; Newton & Dale 1996b). The difference between eastern North America and western Europe (Figure 2) reflects the climatic shift between east and west sides of the Atlantic: over most of the latitudinal range, at any given latitude winters are colder in eastern North America than in western Europe. Correspondingly, at any given latitude, a greater proportion (on average about 17% more) of breeding species leaves eastern North America for the winter than leaves western Europe. The slopes of the two linear

regression lines calculated from the data in Figure 2 do not differ significantly, but their positions do, reflecting this climatic difference.

On both continents, this northward trend in the prevalence of migration is easily understood in terms of winter conditions. In Europe, during much of the 20th century, mean January temperatures exceeded 10°C only in southern Spain and North Africa; they lay within the range 0–5°C in much of western Europe, but fell below freezing and as low as –15°C in most of Fennoscandia, plunging to –20°C in Novaya Zemlya in the far north. Minimum winter daylengths were around 11 hours at 35°N in southern Europe but decreased to zero at the Arctic Circle. The season of plant growth lasted 6–9 months at 35–50°N, but shrank to less than three months in Svalbard, a mean decline in growing season of about one month for every 11° of latitude. In continental western Europe, most fresh waters north of 55°N froze in winter, although they mostly remained open in Britain and Ireland. Much of the Baltic and Barents Seas also iced over during the course of the winter, closing these areas for seabirds. In North America, similar latitudinal trends occurred, but were more marked because the continent spans a wider range of latitude than Europe. Throughout much of these areas, winter temperatures are now rising, as part of ‘global warming’, and bird migration patterns are changing accordingly, but they still relate to gradients in prevailing conditions.

The few species that remain to winter in the far north include the Common Raven (*Corvus corax*), Rock Ptarmigan (*Lagopus mutus*), Gyrfalcon (*Falco rusticolus*) and Snowy Owl (*Nyctea scandiaca*) among landbirds, and the Northern Fulmar (*Fulmarus glacialis*), Ivory Gull (*Pagophila eburnea*) and Glaucous Gull (*Larus hyperboreus*) among seabirds. The most northerly seabirds depend in winter on the open water provided by polynyas, and some of the gulls also scavenge the remains of seals killed by Polar Bears (*Ursus maritimus*). However, some individuals of these species may move south to some extent in the darkest weeks of winter.

The relationship between the proportion of migrants and latitude, established above for Europe and North America, continues southwards towards the equator. There are insufficient data to examine the trend in detail, but by 8° latitude in Panama, only five (0.6%) out of 807 breeding species are wholly summer migrants (Ridgely & Gwynne 1989). This is consistent with the regression line between proportion of migrants and latitude derived from the data for North America in Figure 2. The five migratory species found at Panama are all insectivores which leave for the winter dry season and head further south, namely American Swallow-tailed Kite (*Elanoides forficatus*), Plumbeous Kite (*Ictinia plumbea*), Common Nighthawk (*Chordeiles minor*), Piratic Flycatcher (*Legatus leucophaius*), and Yellow-green Vireo (*Vireo flavoviridis*).

The proportions of all bird species that are migratory are correlated not only with latitude, but also with various climatic factors that vary with latitude, such as the temperatures of the hottest or coldest months or the temperature difference between the hottest and coldest months (Newton & Dale 1996a, 1996b). These various measures are of course interrelated, but what really matters is the degree of climatic difference between summer and winter. It is this difference that, for many birds, governs the difference in food supply between summer and winter at particular latitudes, and hence the difference in environmental carrying capacity between the two seasons.

The seasonal difference in carrying capacity may also vary from west to east, according to changes in climate (as between west and east sides of the Atlantic). From west to east across Europe, summer climates become warmer and drier, and winter climates become colder. In consequence, progressing eastward through Europe into Asia, increasing proportions of the local bird breeding species become migratory. This is especially obvious in comparing populations of coastal areas that live under mild oceanic climates with those further inland that live under more extreme continental climates. For example, Common Starlings (*Sturnus vulgaris*) live year-round on the Shetland Islands at 60°N, while at the same latitude in Russia (and for 10–15° south of it) Common Starlings are wholly migratory.

Superimposed on the overall latitudinal trend is another related to diet. Broadly speaking, those species that are resident year-round in a particular region exploit food sources that remain available there all year, whereas those that leave after breeding exploit foods that disappear about that time. In the northern coniferous forests, for example, residents include mainly species that feed directly from trees, on bark-dwelling arthropods (tits, treecreepers), fruits and seeds (some corvids, finches, tits), buds or other dormant vegetation (grouse), or that eat mammals and other birds (some corvids, raptors and owls). Almost the entire resident landbird fauna at high northern latitudes falls into one or other of these dietary categories. In contrast, species that depart for the winter include those which eat active leaf-dwelling or aerial insects (warblers, hirundines) or which eat foods that become inaccessible under snow or ice (ground feeding finches and thrushes, some raptors, waterfowl and waders). Towards the equa-

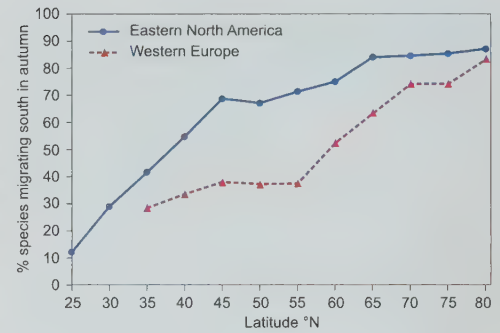


Figure 2

Proportions of breeding bird species (y-axis) at different latitudes (x-axis) in western Europe and eastern North America that migrate south for the winter. On regression analysis for western Europe: $y = 41.49 - 1.03x + 0.02x^2$, $r^2 = 0.97$, for eastern North America: $y = -75.05 + 4.33x - 0.3x^2$, $r^2 = 0.98$. The slopes of the regression lines from Europe and North America showed no significant difference, but the intercepts did differ ($F_{1,19} = 27.5$, $P < 0.001$), reflecting the climatic differences between west and east sides of the Atlantic. From Newton & Dale (1996b).

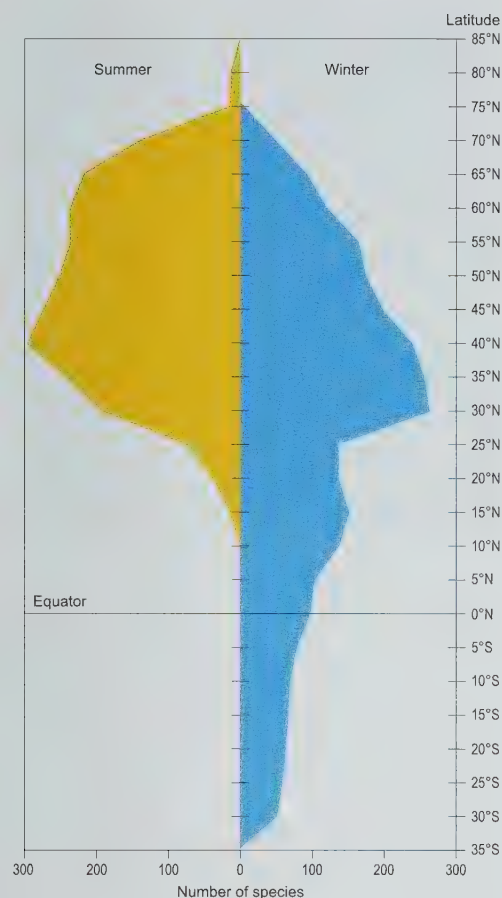


Figure 3
Latitudinal shift between summer and winter distributions of bird species that breed in western Europe. Includes wintering areas in Europe, Asia and Africa.
From Newton (1995).

tor, as winters become less severe, the range of bird dietary types that remain for the winter increases, as a wider range of food-types remains available year-round.

This relationship between migration and diet means that, in some mid-latitude areas, similar numbers of species may be present in summer and winter, but species composition changes somewhat between seasons, as some species from lower latitudes are present only in summer and other species from higher latitudes only in winter (Newton & Dale 1996a, 1996b). In southern England, for example, insectivorous swallows and warblers arrive from the tropics for the summer, whereas fruit-eating thrushes from further north arrive for the winter. Seasonal changes in bird communities in particular regions are thus tied to seasonal changes in the types of food available. This emphasises the point that migrants often exploit seasonal abundances in both their breeding and non-breeding areas. It is a strategy that, for obvious reasons, is much more developed in birds than in most other animals.

The overall effect of bird migration is to alter the latitudinal distribution of birds between summer and winter, so that species numbers in the northern hemisphere are at their greatest in the northern summer and in the southern hemisphere in the austral summer (northern winter). Take the west European migrants as an example. Some species move relatively short distances within Europe, but others move longer distances to Africa or southern Asia (Newton 1995). But the net result, each autumn and spring, is a huge latitudinal shift in avifaunal distribution (Figure 3). In summer, the whole European assemblage of breeding birds is (by definition) concentrated north of 25°N, but in winter the same assemblage extends southwards as far as the southern tip of Africa (35°S) and beyond. Forty-eight species of Palearctic birds reach the southern Cape of South Africa (Harrison *et al.* 1997), and some seabirds extend into the seas further south. When they are in their wintering areas, the migrants add to the local species, increasing the overall species numbers, especially in the tropics.

The above analyses (Figures 1-3) were based on the presence or absence of species at particular latitudes in winter. They were therefore based only on complete migrants, in which all individuals move out for the winter, while for purposes of analysis partial migrants (in which only a proportion of individuals leave for the winter) were counted as year-round residents. However, in many species that breed over wide areas, a greater proportion of individuals migrate from higher than from lower latitudes. Thus, some such species in the northern hemisphere are completely migratory in the north of their breeding range and completely sedentary in the south, while in intervening areas some individuals leave and others stay (partial migration). European examples include Common Blackbird (*Turdus merula*) and Peregrine Falcon (*Falco peregrinus*), and North American examples include American Robin (*Turdus migratorius*) and Red-tailed Hawk (*Buteo jamaicensis*). In general, therefore, the extent to which any population migrates for the winter broadly corresponds to the degree of seasonal reduction in food supplies. Taking account of partial as well as complete migrants, the latitudinal trends discussed above would be even more marked.

Altitudinal migration

By moving a few hundred metres down the sides of a mountain, birds can achieve as much climatic benefit as by moving several hundred kilometres to lower latitudes, but without the extra winter daylength. Mirroring the latitudinal trend, with rising altitude, increasing proportions of breeding species move out for the winter, but in contrast to latitudinal migration, altitudinal movements can be in any directions that reach lower ground. They occur on mountain ranges worldwide, from the Himalayas to the Andes, and can involve a large proportion of local montane species. Examples include the Citril Finch (*Serinus citrinella*) and Water Pipit (*Anthus spinoletta*) in Europe, and the Rosy Finch (*Leucosticte arctoa*) and White-tailed Ptarmigan (*Lagopus leucurus*) in western North America. Seasonal altitudinal movements occur even on relatively low mountains, such as the Great Dividing Range in southeast Australia, where several montane species appear in lowland towns and farms in winter.

Comparisons between hemispheres

Migration of landbirds from their breeding areas is a much more obvious phenomenon in the northern hemisphere than in the southern. This is partly because land covers three times the area in the northern hemisphere as in the southern hemisphere, and the difference is most marked at high latitudes (we can ignore Antarctica because it holds no landbirds). In North America, Greenland and Eurasia, some landbird habitat extends north of 80°N, but in the southern hemisphere, South America reaches

only to 55°S, Africa to 35°S, Australia to 43°S, and New Zealand to 47°S. The net result is that latitudes 30–80°N hold 15 times more land than do latitudes 30–80°S, and it is at these latitudes that winters are coldest, and migration is most developed (for discussion of area effects in South America see Chesser 1994, and in Australia see Chan 2001). The greater latitudinal spread of land in the northern hemisphere results not only in more marked migration, but also in generally longer journeys than are undertaken by southern hemisphere breeders, which are closer to the equator.

Another factor is temperature, which has a steeper downward gradient north of the equator than south of it. For example, in the New World the mean midwinter (January) temperature at the Tropic of Cancer is about 13°C, while at 50°N it is –15°C, a 28°C difference. In contrast, the mean midwinter (July) at the Tropic of Capricorn is 16°C, while at 50°S it is 0°C, a 16°C difference. Similar hemisphere differences are apparent in much of the Old World too. This difference in steepness of temperature gradient between hemispheres may explain why greater proportions of species leave from temperate latitudes in the northern hemisphere than in the southern. For example, about 29% of species leave completely for the winter from Morocco, but only 6% of species leave from equivalent latitudes around the Cape in South Africa (Harrison *et al.* 1997, Newton & Dale 1996a). It is presumably largely for both these land-related and temperature-related reasons that landbird migration is much more marked in the northern than in the southern hemisphere.

Regarding length of journeys, many landbird species that breed in the northern hemisphere migrate south of the tropics, yet no landbird species that breed in the southern hemisphere move north of the tropics. This may be because the much larger landbird populations of the northern hemisphere have to travel far to the south to find sufficient accommodation, while the smaller landbird populations of the southern hemisphere find sufficient accommodation by travelling relatively shorter distances to the north. This difference is another likely consequence of the imbalance in available land areas between the two hemispheres.

In extent of seasonal migration, pelagic seabirds provide a revealing contrast with landbirds. Associated with the reduced land areas in the southern hemisphere, the sea areas are correspondingly larger than in the northern hemisphere. Linked with these greater sea areas and larger numbers of scattered island breeding sites, pelagic seabirds breed much more numerous in the southern hemisphere than in the northern, both in terms of species and of individuals. Correspondingly, a greater proportion of southern than of northern hemisphere breeding seabird species make long migrations. Five (11%) of 47 species that breed north of the tropics extend to south of the tropics in the northern winter, whereas 14 (23%) of 61 species that breed south of the tropics extend to north of the tropics in the austral winter (calculated from maps in Harrison 1983). Some seabird species that breed in the southern hemisphere, such as Wilson's Storm-petrel (*Oceanites oceanicus*) and Sooty Shearwater (*Puffinus griseus*), are amongst the commonest seabirds in the North Atlantic and North Pacific in the northern summer (austral winter). The implication is again that the sheer numbers of individual birds, in relation to the habitat available, influence the distances moved and areas occupied outside the breeding season.

Species that migrate between the northern and the southern hemispheres gain the advantage of 'summer' conditions in both their breeding and non-breeding homes. The question then arises why the same individuals do not breed twice in one year, in both northern and southern quarters. One reason in many species is that individuals moult while in their non-breeding areas, a process that takes several weeks or months and could not be undertaken at the same time as breeding (the two processes being mutually exclusive in most birds). Another reason is that many migratory species do not remain for long in the same area in winter, but periodically move to other areas in response to changes in food supplies. This exploitation of temporary abundances is one way in which migrants in the southern hemisphere could avoid competing with the local birds which, breeding at that time, are tied to fixed nesting areas. Neither explanation applies to all trans-equatorial migratory species, however, and there are still some that are sedentary while they are in both breeding and non-breeding areas, and would seem able to breed in both, six months apart, but do not.

Sex and age differences

In many bird populations, sex and age differences occur in the proportions of individuals that migrate, in the timing of outward and return movements, and in the distances travelled. The latter give rise to geographical gradients in sex and age ratios from high to low latitudes across the wintering range. In many species, adult birds winter, on average, nearer to the breeding areas than first-year birds, and males,



Gulls and terns.
Khaluf, Oman.
Hanne & Jens Eriksen.

on average, nearer than females. Winter sex ratios have been studied in detail in the Common Pochard (*Aythya ferina*) in which the proportion of females in local flocks increases from north to south across the European wintering range (Carbone & Owen 1995).

Sex differences in migration within species can often be linked to the different roles of the sexes in breeding, and both sex and age differences partly to dominance and competition within populations, duration and timing of moult, and perhaps also to other (as yet unknown) factors. Thus, in many bird species, males are responsible for establishing nesting territories, and arrive in breeding areas before females. In addition, in species in which only one partner looks after the young, the other leaves breeding areas earlier (males in ducks, males in some shorebirds, females in other shorebirds). In Curlew Sandpipers (*Calidris ferruginea*), the males play no part in parental care, so depart early, leaving the females to raise the young. In Spotted Redshanks (*Tringa erythropus*), the opposite occurs, in that the females depart earlier, leaving the males to rear the young. In yet other waders, both partners help to the same stage with parental care, and the two sexes migrate at about the same time, as in the Northern Lapwing (*Vanellus vanellus*) and Black-tailed Godwit (*Limosa limosa*). Typically, in all these species, adults leave breeding areas earlier than young of the year.

Variants on a migratory theme

Several variants occur on the return two-way movement between regular breeding and wintering areas, associated with the ecology of the species concerned.

Moult migration

Moult migration is a regular movement which many waterbirds and others perform each summer, travelling long distances from their nesting areas to assemble at traditional sites that offer food and safety (Jehl 1990). Here they pass the flightless period, replacing all their large wing feathers simultaneously within the space of a few weeks. Geese migrate to moult mainly in latitudes higher than their nesting areas, but ducks migrate in any directions from their nesting areas. After moulting, depending largely on location, the birds may return to their nesting areas, move on to their wintering areas, or stay in their moulting areas all winter, returning to nesting areas in spring.

One of the best known moult migrations concerns Common Shelducks (*Tadorna tadorna*), in which individuals from large parts of Europe gather each summer on the vast tidal mudflats of the Grosser Knechtsand in the German Wadden Sea, where they feed on the abundant mud snail (*Hydrobia ulvae*). The birds converge on this site from all directions, travelling up to several hundred kilometres from their nesting areas. Their numbers peak at more than 200,000 individuals. Yearlings and young adults arrive first, followed by failed breeders, then successful adults which leave their well-grown young behind (Patterson 1982). After moult, the birds drift back to their breeding sites over a period of weeks or months or move on to wintering areas, depending on whether their particular breeding areas are habitable in winter. In some other duck species, individuals have been found by ringing to travel distances of more than 2000 km from breeding to moulting sites, and some of the biggest concentrations hold tens of thousands or hundreds of thousands of birds. In general, sea-ducks perform longer journeys than freshwater ducks. For example, King Eiders (*Somateria spectabilis*) from most of eastern Canada travel to coastal areas off mid-western Greenland to moult, travelling up to 2500 km, and forming a concentration of more than 100,000 birds (Salomonsen 1968). Moult migrations are also known among grebes, auks and other waterbirds.

Movements in the breeding season

Some multi-brooded bird species nest in more than one locality each year, migrating from one site to another during the course of the breeding season. Typically, individuals raise a brood in one locality, then migrate several hundred kilometres to another locality, and raise another brood. Such 'itinerant breeding' has been recorded in various seed-eaters, including the Red-billed Quelea (*Quelea quelea*) of the African savannas. Throughout the dry season, Red-billed Queleas subsist on dry grass seeds picked off the ground, but when the rains break, this seed suddenly germinates, thus removing the food supply. The birds then fly over the approaching rain front to areas

where rain fell about two months earlier and new grass seed has already formed. This new seed, together with insects associated with growing vegetation, enable the birds to breed. After raising their young, the birds move en masse, stopping again in an area where rain has recently fallen, and raise another brood (Jaeger *et al.* 1986, Ward 1971). Conditions suitable for rearing young do not last long in any one place, and despite a short breeding season of only five weeks, Red-billed Queleas cannot raise successive broods at the same place. Only by remaining within the slowly shifting zone of seedling grasses are individual Red-billed Queleas able to raise more than one brood per year, each time moving some hundreds of kilometres.

Itinerant breeding has also been suspected among Common Quails (*Coturnix coturnix*), as they breed first in North Africa and then in the northern Mediterranean region, and possibly a third time in temperate Europe, as spring begins progressively later with distance northward (Cramp 1980). It has also been suspected among Common Redpolls (*Carduelis flammea*) in northern Europe, as they breed first in the boreal forests as conifer seeds are shed from the opening cones, and then further north on the strength of birch and grass seeds (Peiponen 1967).

Movements in the non-breeding season

Many birds make long movements within the non-breeding season, usually to escape food shortages. Some such movements occur in response to depletion of fruit and seed crops, while others occur in response to cold and snow. For example, following the first heavy snow-fall in temperate latitudes, thousands of birds can be seen moving southwards, particularly ground-feeding species, such as plovers, larks, pipits and finches. Such escape movements vary from year to year, depending on the severity of the winter, and in years without serious snow, no such movements occur.

Nomadism

Apparent nomadic movements occur in species which exploit sporadic habitats and food supplies, concentrating temporarily wherever conditions permit. They are shown by some boreal finches which move around to exploit sporadic tree-seed crops, by certain owls which exploit the cyclic peaks of rodent populations, and by many desert bird species which move around in relation to irregular rainfall which generates their food supplies (Dean 2005, Newton 2008). Such species seem to show little year-to-year consistency in their movement patterns, but shift from one area to another, residing for a time in whichever parts of their range food is plentiful at the time.

Every few years, however, at times of widespread food-shortage, such species may move longer distances, and appear well outside their usual range. In the central Australian desert, the populations of many species increase greatly as a result of good breeding in occasional wet years, and then many individuals move outwards to the more humid peripheral districts in the following dry years (Nix 1976). Many birds probably die before they can return, but individuals of some species spend long periods in coastal localities and occasionally move inland to breed in vast numbers when rain creates suitable conditions. For example, Banded Stilts (*Cladorhynchus leucocephalus*) can live for years as non-breeders on scattered briny coastal lagoons. But within days of rain falling inland, they concentrate in tens of thousands on newly formed shallow lakes, feeding on the freshly-hatched swarms of brine shrimps (Burbidge & Fuller 1982, Robinson & Minton 1989). They breed while conditions last, making repeated nesting attempts, while the young form huge crèches. Water evaporates rapidly, however, and the land soon resorts to its usual parched state. The birds return to the coast, if necessary leaving the last eggs and young to die. Years may pass before they can breed again, but not necessarily in the same sites. A similar outward movement of desert species at times of widespread drought is illustrated in Eurasia by the westward movements of Rose-coloured Starlings (*Sturnus roseus*), Pallas's Sandgrouse (*Syrhaptes paradoxus*) and others from the steppes into western Europe.

One of the puzzles of nomadic birds, which seem to move in any direction from one breeding area to another, is how they find their way to suitable areas. One possibility is that they search at random, gradually settling wherever conditions are good, but this seems inefficient, and desert birds, in particular, may have other means of detecting areas where rain has fallen, responding perhaps to atmospheric pressure changes, cloud formations or changing odours. As yet, though, it remains a mystery how birds find widely separated patches of temporarily favourable habitat in the vastness of the desert.



White Storks (*Ciconia ciconia*).
Tarifa, Spain.
Markus Varesvuo.

Migratory flight

The reason that long-distance movements are so well developed in birds is that most species can fly. One of the main advantages of flight is its speed, which is much faster than the alternatives of walking, running or swimming. Flight requires more energy per unit time, but because of the greater distance covered, it is also the cheapest mode of transport overall. One type of flight, by soaring–gliding, is cheaper still, but is practised mainly by larger species, such as albatrosses, which can travel the Southern Ocean with little more energy expenditure than sitting still. Long-distance flight also allows birds to cross hostile areas that would otherwise act as barriers to their movements. Nevertheless, while most birds migrate by flying, penguins and some other seabirds migrate by swimming, and some landbirds by walking for part or all of their journeys.

The flight speeds of birds have often been measured using a car or airplane travelling alongside, or by using radar to track the movements of particular flocks or individuals (Bruderer & Boldt 2001). Measures taken from a vehicle or airplane cannot be corrected for wind effects, and are often of doubtful accuracy, so are of limited value. Radar measures can be obtained specifically for birds on migration and can be corrected to allow for wind speed, but do not always provide a reliable identification of species. Other values used for comparative purposes are the theoretical flight speeds calculated from aerodynamic principles on the basis of body mass, wingspan and wing area (Pennycuick 1969). The main findings to emerge from all these various sources of information are that, while individual birds can vary their flight speeds according to circumstance, larger birds generally fly faster than small ones, although body and wing structure also have a major influence.

Birds are assumed to migrate, whenever possible, either at their ‘minimum power speed’ (which minimises energy cost per unit time) or at their ‘maximum range speed’ (which minimises energy cost per unit distance). Both speeds are somewhat slower than the maximum speed of which the bird is capable. On average, 10 g birds have a theoretical maximum range speed in flapping flight of around 22 km per hour, 20 g birds of around 32 km per hour, 100 g birds of around 55 km per hour, 1000 g birds of around 85 km per hour and 10 kg birds of around 90 km per hour (Pennycuick 1969). As a rule of thumb, the theoretical maximum range speed of birds roughly doubles for every 100-fold increase in body mass up to around 15–20 kg, the approximate weight limit for flying birds. These are mean theoretical values, however, and species of similar weight would be expected to vary somewhat in their actual flight speeds, according to body and wing shape and other features, which differ from one type of bird to another. Hummingbirds, pigeons, ducks and auks fly faster than expected from their body weight, while terns, harriers and owls fly slower.

In steady flapping flight, a bird must generate the forces which support its weight against gravity and which at the same time provide the forward thrust necessary to overcome the friction and other forces that make up drag. The power for both the lift and forward thrust is supplied by the breast muscles, while directional control is provided mainly by the tail. Given sufficient fuel reserves, some birds that migrate by continuous flapping flight, such as passerines and waders, can travel for hours or days on end. They can cross water or other hostile terrain, and can fly by night as well as by day. In moving between their breeding and wintering places, therefore, such birds often travel directly, taking the shortest routes. As populations, they migrate mostly on a broad front, but concentrate to some extent through mountain passes or along coasts or other ‘leading-lines’ that deviate little from their main direction. Because flapping flight is expensive, however, such species must normally lay down substantial body reserves, especially for travelling over large areas of sea or other inhospitable substrate where they cannot feed. Sustained flapping also produces heat, which may enable birds to fly at high latitudes and altitudes without having to burn extra fuel to keep warm. In hot conditions, however, heat production can result in the need for evaporative cooling (panting), which increases water loss and dehydration risk.

The situation differs somewhat in birds that migrate mainly by soaring–gliding flight, notably the broad-winged raptors, storks and pelicans, which gain most of the energy they need for flight from the ambient atmosphere. Typically, these birds make use of updrafts created either by wind striking a cliff or slope being directed upwards, or by ‘thermals’, which are columns of rising air caused by uneven heating of the ground. Typically, soaring birds circle upwards in a thermal, then glide with loss of height to the next thermal and rise again; they repeat this process again and again along the migration route, and over long distances in ideal conditions they seldom need to flap their wings (Figure 4). Because the lift comes largely from rising air currents and the forward motion partly from gravity, this still-wing flight mode requires much less internally-generated energy than continuous flapping. Many soaring

Figure 4
Soaring–gliding bird migration, indicating soaring within thermals, gaining height, and gliding between thermals, losing height. Thermals are often topped with cumulus clouds.



species use a mix of gliding and powered flight, with intermediate costs, but seek to maximise the contribution from gliding, resorting increasingly to flapping as thermal conditions deteriorate. Flapping during a glide ('power gliding') can provide additional lift and speed, but at a cost in fuel use. The extreme soaring species thus depend for their movements mainly on a source of energy external to their own bodies, and unlike flapping birds, soaring species can continually correct for the effects of crosswinds without wasting energy.

Soaring-gliding flight has other consequences. Because of their dependence on updrafts, soaring landbird species must migrate mainly over land, favouring routes where appropriate conditions develop. They are also constrained to travel by day when the sun heats the land surface, creating rising air currents. Their migration typically reaches its peak, and moves most rapidly, in the middle part of each day when thermal activity is greatest. It is then that the birds achieve the greatest heights, and can make the longest and fastest glides across country (Spaar 1997, Spaar & Bruderer 1996). Soaring landbirds also tend to concentrate along narrow land bridges (such as Panama), or at narrow sea crossings (such as Gibraltar or the Bosphorus), and thereby avoid spending long periods over water where thermal soaring is seldom feasible. In this way, soaring landbirds often take long roundabout routes between breeding and wintering areas in order to make as much of their journey as possible over land, and minimise their use of expensive flapping flight. Despite the greater distances, their total energy consumption is thereby much reduced. Moreover, because their travel routes are determined by geography and topography, they tend to take the same traditional narrow-front 'corridor' routes year after year.

Soaring-gliding flight is not confined to landbirds. Many seabirds make use of up-currents formed either as the wind is deflected off waves (equivalent to slope soaring), or as a wave of 'swell' displaces air upwards as it moves over the sea surface. Some seabirds also use 'dynamic soaring', which depends partly on wind speed being slowed by the sea surface, an effect which is lessened with height up to about 16 m. The bird first climbs into the wind, then makes a high leeward turn, gaining distance by gliding with the wind whilst losing height. After making a low turn in the trough of a wave, it starts the cycle again. A bird could also make use of discontinuities in wind flow near the sea surface, as it flies first behind a wave crest and then emerges for a time into the unobstructed wind. At this moment, the bird tilts its body so that the temporary gust strikes its ventral surface, providing lift, enabling further onward gliding flight (Pennycuik 2002). Over most oceanic areas, soaring seabirds are normally constrained to fly low over the sea surface, where conditions are most favourable.

Migration mode

Some birds may benefit by migrating as rapidly as possible, thus minimising the time spent on travel (the 'time minimisation model' of Alerstam & Lindström 1990). Such birds would then gain the longest possible time on their breeding, wintering or moulting sites, but would require large fuel stores to permit long, non-stop flights. Other birds may have food available throughout their migration route, so that they can stop and feed almost anywhere. Because heavy fat loads mean greater transport costs, one way to save energy is to keep fuel loads small and fly only short distances at a time, refuelling as necessary (the 'energy minimisation' model). Moreover, because extra weight reduces flight performance (notably climb rate and agility), minimising fuel loads can also reduce predation risks (the 'predation minimisation' model). The second and third options may thus be combined as the 'load-minimising' strategy. The particular migration mode adopted by individuals in any population might be a compromise between any of these different options, depending partly on the type of terrain over which birds travel, the distribution of potential feeding sites, and the risks of predation. Moreover, any 'ideal strategy' that the bird might have is likely often to be compromised by external conditions, such as adverse weather or poor food supplies.

Difficult journeys

Landbirds that migrate over oceans provide some of the most extreme examples of endurance flight. They travel without opportunity to feed, drink or rest, over vast stretches of open water, where they cannot stop, as birds do overland, when the weather turns against them. Yet millions of landbirds regularly cross the Mediterranean Sea and the Gulf of Mexico at their widest points (about 1200 km), and smaller numbers regularly cross longer stretches, such as the western Atlantic between northeastern North America and northeastern South America (2400–3700 km), or the northern Pa-



Thick-billed Murres (Uria lomvia).
Norway.
Markus Varesvuo.



Above:
A Red-billed Tropicbird (*Phaethon aethereus*) with a
GPS transmitter.
Raso I, Cape Verde.
Jacob González-Solís and Elena Gómez Díaz.

Below:
A ringer removing a Common Chiffchaff
(*Phylloscopus collybita*) from a mist-net.
Osmaniye, Turkey.
Ferran López.

cific between Alaska and Hawaii and other central Pacific Islands (5000–6000 km). To judge from their normal flight speeds, landbirds would take more than 100 hours of non-stop flight in still air to accomplish the longer of their overwater journeys, but by taking advantage of favourable winds, they can shorten their flight times, sometimes by as much as one half. Participants include many passerines and shorebirds, but also waterfowl which, unlike the others, can (and do) rest on the sea if need be. However, the most impressive of all overwater migrations by a landbird is undertaken by Bar-tailed Godwits (*Limosa lapponica*) from eastern Siberia and Alaska, which in autumn apparently accomplish an astonishing 175-hour non-stop 10,400 km flight to New Zealand (Gill *et al.* 2005). These figures are minima, and recent satellite-based radio-tracking of godwits has shown that both non-stop flight times and distances can be even longer.

Some overland journeys are also difficult. Long desert crossings are made by the many species (including passerines) that travel between Eurasia and tropical Africa (Moreau 1961). Most west European species cross at least 1500 km of the Sahara Desert immediately after crossing the Mediterranean Sea. In autumn some species may make this Mediterranean–Saharan flight without a break, a total journey of 1500–2700 km, depending on the route taken. Other individuals on the same journey fly by night but stop and rest in the shade by day, but without feeding or drinking (Biebach 1990). Yet other birds from further east cross the central Asian deserts, and then another 1700 km of southern Arabia and its bordering gulfs, before reaching East Africa. In Australia, some shorebirds cross the central desert in moving between southeast and northwest coasts, a journey of more than 2000 km.

Yet other birds cross high mountain ranges, including the Himalayas and Tibetan plateau. One such species is the Bar-headed Goose (*Anser indicus*) which in the process can rise to more than 8 km above sea level, where the air is thin and very cold. Other species cross extensive areas of pack-ice that lie in spring between Siberia and Alaska or between Norway and Svalbard. A few species cross 2000 km of the 2-km-high Greenland ice cap on journeys between northeastern Canada and western Europe.

Seabirds migrating entirely over the sea would seem to have plenty of opportunity to pick up food en route. But this is not always the case. Many species breeding at high latitudes migrate over the equator, and tropical seas are notoriously poor in food. In any case, foods such as surface fish tend to be concentrated in particular nutrient-rich places, which may be few and far between. Evidence is accumulating that, like some landbirds, some seabirds refuel at widely-separated staging areas before continuing migration. For example, after breeding in western Europe, Black Terns (*Chlidonias niger*) assemble at one major feeding area, the IJsselmeer on the Dutch coast. Here they increase in body mass by 25–30% within 2–3 weeks, which would then enable a non-stop flight of more than 3600 km to West Africa. The birds ascend in the evening to more than 500 m and start migration at night. Although Black Terns are seen at localities en route, no important stopover site is known between the IJsselmeer and West Africa (van der Winden 2002). In Namibia, a similar increase in the body mass of Black Terns was noticed prior to spring migration.

Duration and speed of migration

It is not so much the speed of flight that determines the speed of migration, but the time spent on stopovers where fuel reserves are replenished. Migration speed is a function of both flight times and stopover times. From knowledge of the average fuelling rates and flight costs of small passerines, it has been calculated that, for every hour spent in flight, about seven hours would need to be spent on the ground, feeding and resting (Hedenström & Ålerstam 1998). Such a ratio has been borne out by field observations. In larger birds which refuel at a slower rate, the proportion of stopover time is two to three times greater than in passerines (Newton 2008).

Actual migration speeds have been measured mainly by use of ring recoveries of birds identified at different points on their migration routes, or in recent years from the satellite tracking of radio-marked individuals or other electronic means. Such studies have revealed that the times spent on migration by different bird populations are enormously variable, depending partly on features of the birds themselves (such as body size, wing shape and flight speed), but largely on the distances travelled and the conditions encountered en route. At one extreme, some birds can complete their migration in less than one day (such as a radio-tagged Bald Eagle (*Haliaeetus leucocephalus*) that flew 435 km between its wintering site in Michigan and its nesting place in Ontario, Grubb *et al.* 1994). At the other extreme, some landbirds take at least four months to reach their distant winter quarters, and at least two months to return, so that more than half of every year is spent on migration. Long journey times are also shown by some

marine species, including shearwaters and petrels, which have a fixed base only during the breeding season, and are effectively on migration for the rest of the year, pausing to feed at places where food is available en route. Whatever the advantages in migrating as quickly as possible, external conditions provide severe constraints, notably the rate at which food can be obtained and converted into body reserves to fuel the flights, and also the weather at the time, which could speed or slow the journeys. Rain or snow, cold or ice, or unfavourable winds can delay migration for days or weeks at a time.

We should not be misled by birds that make their whole over-sea migration in one flight. In favourable winds, wild geese have been found to fly 5000 km over water within 60 hours, giving mean speeds of around 2000 km per 24-hour day, or around 80 km per hour. Bar-tailed Godwits travelling from Alaska to New Zealand covered more than 10,400 km non-stop in seven days, around 1500 km per day, or 60 km per hour (Gill *et al.* 2005). However, these estimates exclude the initial fuelling period, which could extend to several weeks, considering the large fuel reserves necessary to power such long over-water flights. Strictly speaking, fuelling times are part of migration, and should be added to flight times. These record speeds would then not seem so unusual.

Weather effects on migration

Weather has obvious effects on bird migration. It influences the times when birds can travel, the energy costs and risks of the journey, and the visibility of any celestial or ground-based cues that birds might use for navigation. Yet assessing the effects of weather on the volume of bird migration is not straightforward. This is partly because migration depends less on the prevailing weather than on the intrinsic migratory state of the birds themselves. The numbers of individuals migrating on particular days depend not just on the prevailing weather, but on the weather over preceding days, the date in the season, and the proportion ready to leave at the time. Towards the end of the migration season few birds may be left to migrate, however good the weather. The association between the volume of migration on particular days and the prevailing weather is therefore not constant, which complicates analysis. In addition, because species differ in body size, flight mode and other aspects, they are affected by adverse weather to different extents, some species being able to travel in conditions that would ground others (Alerstam 1978, Lack 1960).

Another problem is that different weather factors tend to be associated with one another, with some occurring under cyclonic and others under anticyclonic conditions (Lack 1960, Richardson, W.J. 1990). Even with the help of multivariate statistics, it is often hard to tell which factors are critical to migration and which are coincidental. Almost certainly, migrants do not react to the general weather situation as such, but to one or more components of it, such as wind and rain. Nevertheless, for the human observer, the synoptic weather situation of fronts and pressure systems gives a good indication of how much migration is likely to occur at different places on particular days.

Visual records from ground-based observers armed only with binoculars may miss birds flying too high to be seen by day, and provide little or no information on nocturnal migration. Yet radar has revealed that most migration of birds that fly by flapping flight occurs above binocular range. In fact, the proportion of birds flying within sight, and the proportion that come to ground, tend to be greatest in conditions that are unfavourable for flight (Lack 1960). Thus, migrants tend to fly low in opposing rather than following winds, and to settle whenever they encounter strong opposing winds, mist or rain, or reach coastlines or islands. The observer equipped only with binoculars might conclude that these were the very conditions that favoured migration, a once firmly held view but the opposite to reality. Birds also tend to fly low along coasts in these conditions, reluctant to strike out over water. It is therefore important to distinguish the influence of weather in promoting migration from its influence in making migration conspicuous (Alerstam 1978, Lack 1960).

The advent of radar greatly clarified the situation, because it enabled migrants to be detected at almost all heights (missing only those below the radar horizon), day and night, and in all weathers. From radar-based studies, consensus has now emerged that, within the appropriate seasons, migration is favoured by fine anticyclonic conditions with favourable tailwinds, and also by rising temperatures in spring and by falling temperatures in autumn. In effect, at both seasons the birds prefer to migrate under clear skies with following or light winds. Clear skies assist navigation, especially at night, by making celestial cues more visible, while following winds reduce the time and energy spent on the journey, and the risk of being blown off course. In contrast, birds seldom take off to migrate in strong opposing winds, dense cloud, mist and rain. Opposing winds make progress difficult or impossible, cloud hampers navigation, while mist or rain can soak many kinds of birds and force them down.

While temperature is important to migration, the basis of this relationship is less clear. In spring, warmth occurs in association with other conditions favourable to flight, as does cold in autumn. But temperature may have direct effects through influencing the energy balance of the birds, and more importantly through influencing their food supplies, because all vegetative growth, insect activity, and ice melt are temperature-dependent. It is therefore of obvious advantage for migrants to adjust their migratory schedules to year-to-year variations in temperature, and they are clearly deterred in spring by extreme cold and snow.

If migrating birds meet low cloud and unfavourable wind en route, they may be forced low and, if over land, they can settle and wait for conditions to improve. Over the sea, as radar has revealed, landbird migrants that enter cloud or mist banks often become disorientated, milling in all directions and gradually drifting downwind, or actively flying downwind which gives a good chance of reaching clearer weather (Lack 1960, Richardson, W.J. 1990). If cloud persists, migrants over the sea are sometimes attracted in large numbers to lighted ships or oilrigs (Bourne 1979). Although heavy overcast appears inimical for migration, some birds seem to maintain more or less straight courses with complete cloud cover. Below the cloud they can see the ground, and above it the sun or stars (although flying above the cloud seems infrequent).

Importance of wind

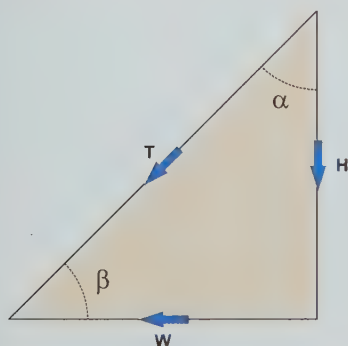
In general, wind speeds are stronger at mid-day than at night or early morning, and increase from the ground, where friction slows the flow, up to several thousand metres. In addition, the air mass in which birds migrate is continually changing in speed and direction, and birds must continually adjust their behaviour if they are to migrate to a predetermined destination in the most energy-efficient way. That birds respond to wind is shown by the frequent observations that: (1) they tend to depart only in favourable (following) winds; (2) they often select flight altitudes where winds are favourable; and (3) they compensate for wind drift, at least to some extent, providing that they can see the ground below.

Wind assistance is like food or fat reserves: it is a resource that fuels migration. If a bird with a given flying speed was blessed with a tailwind of the same direction and speed, it could in theory fly twice as far on the same fuel and in the same time, or the same distance on half the fuel and in half the time. Yet a bird flying into a headwind of the same speed could make little or no progress, however great its fuel reserve. In practice, it seems from radar studies that birds flying overland do not behave in quite this way, but fly slower than usual with a tailwind, and faster than usual against a headwind (Alerstam & Gudmundsson 1999, Hedenström *et al.* 2005, Liechti 2006). It is as though they conserve energy when conditions allow, and expend more than usual when necessary. The net effect is that birds make slower progress than expected in a tailwind, and faster progress than expected in a headwind, but further study is needed to find how widespread this behaviour is. In any case, following winds reduce the energy cost of migration, which is important to many migrants.

If the wind blows from the side, the bird can in theory correct for this by adjusting its heading so as to remain on track with respect to the ground (Figure 5). Birds do not then progress in the direction they are heading, but at some angle to it, which is closer to the intended track. The greater the crosswind component for a given flight speed, the greater this compensating angle must be (aircraft pilots refer to the angle between heading and track as the drift angle, *alpha*). This angle can be reduced if the bird flies faster. The point at which a bird is no longer able to compensate for lateral drift is thus a function of wind speed and direction, as well as the maximum flight speed that the bird itself is able to maintain (called the threshold for drift, Evans 1966).

Radar observations have been used to explore not only the extent to which migrating birds can compensate for drift by crosswinds, but also how much the prevailing circumstances (wind strength, visibility, day or night, over land or over sea, and cloud cover) affect the response. Patterns of compensation, full lateral drift, partial drift and downwind drift have all been observed, depending on conditions. Birds can presumably 'know' they are being drifted off course only when they have reference to some stable feature, such as the ground below; for drift would have to be substantial before it could be detected from celestial or magnetic cues. These considerations may explain why compensation seems usual in low-altitude (<1 km) diurnal migrants, but is much less frequent or complete at high altitudes, and why it is more frequent in light winds (up to 5 m per second) than in stronger ones (Bruderer & Jenni 1990). In any case, it is rarely complete in nocturnal migrants and over large water bodies (Richardson, W.J. 1990). Drift by crosswinds is, of course, one of the commonest ways in which migrants turn up as vagrants in places off their normal routes.

Figure 5
Diagram showing relationships between heading (H , the direction the bird faces), wind direction (W), and track (T , direction the bird travels on a journey). The track vector (T) is the sum of the heading (H) and wind (W) vectors. The angle α between track and heading depicts the amount of drift with constant heading, while the angle β shows the wind direction in relation to the track direction.



With respect to wind, soaring birds provide a partial exception to the usual patterns. Updrafts strongly reduce the energy cost of migration for such birds, which often fly in side-winds or light opposing winds if updrafts are present. Thermals develop in calm or light wind conditions, but not in strong winds, which suppresses soaring bird migration in some regions, regardless of wind direction. Soaring birds also show no particular tendency to migrate on cold days in autumn, as do many other birds, probably because the necessary thermals develop best on warm days (Alerstam 1978, Kerlinger 1989).

Flight altitudes

As revealed mainly by radar studies, the altitude of migratory flight is related to prevailing atmospheric conditions, especially wind speed and direction, but also cloud thickness and height, topography and other factors, as well as features of the birds themselves. Over low land, most migration takes place within 1.5 km of the ground, with decreasing numbers of birds at higher altitudes up to 3 km or more (Bruderer 1999). When birds need to cross high mountains or find favourable airstreams, they sometimes fly much higher, occasionally reaching more than 7 km.

Several species migrate regularly over the Himalayas, and as mentioned above, at least one species, the Bar-headed Goose, has been recorded at more than 8 km above sea level. Some birds can thus achieve feats of high altitude performance unmatched by other animals, and can do so without needing time to acclimatise. Clearly, they must be pre-equipped physiologically to avoid altitude sickness (hypoxia). Not all birds have such flexibility in their flight altitudes and, whatever the advantages of high-altitude flight, some species (such as swans) seem confined to migrate at low elevations, presumably for physiological or energy-based reasons (one published high altitude estimate for swans probably being erroneous).

Soaring birds are limited in flight altitude by the height reached by thermals, which is greatest around noon over land, and in most conditions seldom exceeds 1.5 km. During their migrations, soaring birds are continually rising and falling, as they climb in successive thermals and lose height between them (Leshem & Yom-Tov 1996b, Spaar & Bruderer 1996). Unlike many other birds, therefore, soaring species cannot maintain constant altitude over long distances.

Diurnal and nocturnal migration

As indicated already, some birds migrate mainly by day and others mainly by night. Nocturnal species such as owls and nightjars, or optional diurnal–nocturnal species such as shorebirds, might be expected to migrate under cover of darkness. Surprisingly, however, many normally diurnal species also prefer to travel at night. To judge from their eye structure, diurnal birds may have no better vision at night than do humans, but this would still enable them to fly safely through the open skies, and recognise star patterns and landscape features that might help them find their way.

Apart from soaring landbirds, which depend on daytime thermals, it is not immediately obvious why particular species migrate at one time rather than another. Among passerines: crows, finches, pipits, larks, wagtails, tits, swallows and others migrate primarily by day; while warblers, flycatchers, thrushes, chats and others migrate primarily by night. Among non-passerines: pigeons, raptors, cranes, herons and egrets migrate by day; while cuckoos, shorebirds, rails, and grebes migrate mainly by night. Comparing different families, there is no obvious and consistent connection between migration times and difficulty of journey, habitat, diet or other aspects of ecology. Among closely-related families, some striking differences occur, as in the passerines just mentioned, and also among waders, in which plovers (*Charadriidae*) migrate more by day than sandpipers (*Scolopacidae*). Although most species within a family seem consistent in their migratory behaviour, occasional revealing exceptions occur, with the tendency to nocturnal migration increasing with migration distance (Dorka 1966). For example, most species of *Emberiza* buntings in western Europe migrate by day over short distances, but the Ortolan Bunting (*E. hortulana*) migrates by night over long distances, being the only species that winters in Africa south of the Sahara. Similarly, most pigeons migrate by day over short distances within Europe, but the European Turtle-dove (*Streptopelia turtur*) migrates partly by night over long distances to Africa. In addition, Tree Pipits (*Anthus trivialis*) are more nocturnal than Meadow Pipits (*A. pratensis*), Willow Warblers (*Phylloscopus trochilus*) than Common Chiffchaffs (*P. collybita*), and Common Redstarts (*Phoenicurus phoenicurus*) than Black Redstarts (*P. ochrurus*). In all these species pairs, the first mentioned migrates

Common Woodpigeons (*Columba palumbus*).
Hanko, Finland.
Markus Varesvuo.





Black Scoters (Melanitta nigra).
Porvoo, Söderskär, Finland.
Markus Varesvuo.

further than the second. Nevertheless, there are still some puzzling exceptions: for example, European Robins (*Erithaca rubecula*) and Common Firecrests (*Regulus ignicapilla*) are short-distance migrants, but still travel mainly at night.

The division between day and night migrants is most obvious from take-off times, with diurnal migrants leaving mainly in the morning and nocturnal ones mainly in the evening. However, whether day or night, landbirds of both groups must continue flying if they find themselves over water, as must waders and waterfowl over dry land.

The main supposed advantages of nocturnal migration are that: (1) more time is left for feeding during the day, the only time that most birds can feed, so the entire journey can be accomplished more quickly; (2) temperatures are lower at night than in the day which could help to prevent over-heating and dehydration in warm regions; (3) humidities are usually higher at night and early morning, which could further reduce dehydration risk; (4) energy demands are lower, because it costs less to fly in cooler denser night air than in warmer daytime air; (5) wind speeds are generally lower at night, thus reducing the effects of headwinds or crosswinds, and vertical turbulence is less, further reducing the total energy costs of flight; (6) the use of stars for navigating is possible; and (7) the likelihood of predation during flight is much reduced. The main threat to flying migrants is from falcons or eagles during the daytime (plus gulls over water), but a wide range of other raptors take migrants when they are on the ground. Owls do not normally fly high enough to encounter migrants and in any case seldom catch prey on the wing. Given these advantages, it is surprising that any birds (apart from thermal-dependent soaring species) migrate by day.

Control of migration

In considering the timing of migration, it is helpful to separate the ultimate from the proximate causal factors. The ultimate factors, notably seasonal changes in food supplies, are those that act through the survival and reproduction of individuals, favouring those genotypes which migrate in spring in time to take advantage of optimal conditions for breeding, but leave in autumn before their continual survival in breeding areas would become precarious. The proximate factors are those, such as changing daylengths, which act to trigger migration at appropriate dates each year. The birds may thus be said to migrate in spring because they can then take advantage of a developing food supply in breeding areas (the ultimate cause) or because they are stimulated to do so by increasing daylengths and other prevailing conditions (the proximate cause).

As every bird-watcher can see for himself, many long-distance bird migrants arrive at their nesting or wintering places every year at around the same dates. This implies the existence in the birds of precise timing mechanisms that, in response to external stimuli, trigger migration at about the same dates each year and maintain it for long enough to allow the bird to cover the distance required. The relatively small differences in timing that occur from year to year are mainly associated with variations in prevailing weather or food supplies.

In the scientific literature dealing with the timing of bird migration, German words are often used, even in texts written in English or other languages. This custom persists from a time when Germany led the world in migration research, mainly in the first few decades of the 20th century, when many of the basic concepts and paradigms were laid down. Anyone who reads widely in this subject area can thus expect to come across words like *Zugdisposition* (readiness to migrate), *Zugunruhe* (migratory restlessness), and *Zeitgeber* (time keeper).

The migratory state

Migratory condition (*Zugdisposition*) in birds is marked by a sudden weight increase, due largely to the deposition of additional fat which serves as the main fuel during the journey. In captive birds, it is also marked by the development of so-called 'migratory restlessness' (*Zugunruhe*). This is a distinct form of behaviour in which birds hop and flutter round their cages, and undertake long periods of 'wing-whirring' in a perched position (perhaps equivalent to migration in a cage). Typical diurnal migrants show this behaviour by day, and nocturnal ones by night. It gives a useful indication of migratory condition in captive birds because it can be quantified automatically. From studies of body weight and restlessness in caged birds, much has been learned about the proximate control of migration. Under natural daylengths, caged birds from migratory populations develop fat reserves and migratory restlessness at appropriate dates in autumn and spring, at about the same times as their wild counterparts (Berthold 1996, Gwinner 1986).

Endogenous rhythms

While the ultimate extrinsic factor controlling the annual cycles of birds is the seasonality of the environment, the primary intrinsic proximate factor is apparently an endogenous rhythm within the bird. This self-sustaining rhythm tends to ensure that the major processes of migration, breeding and moult occur in the correct sequence each year, and at roughly the right times. The evidence for the existence of an internal rhythm has come largely from studies on captive birds kept for up to several years under rather specific but constant daylengths (Berthold 1996, Berthold & Terrill 1991, Gwinner 1968, 1986, 1996, Gwinner & Helm 2003). Such birds have no clue from the outside world as to what the date might be. Yet they usually moult and reach breeding and migratory condition in the correct sequence, and at roughly appropriate intervals, with corresponding cycles in body weights, gonad sizes and hormone levels. This finding is taken to imply the existence of some underlying 'endogenous' controlling system. However, in conditions of constant daylength, the cycles do not stick strictly to a year, but tend to drift, getting either shorter (rarely) or longer, hence the term 'circannual' cycles, which typically last 9–13 months.

The existence of internal circannual rhythms, underlying the natural yearly cycles, and persisting for at least two cycles, has now been shown experimentally in more than 20 different bird species, including resident and migratory, temperate and tropical, passerines and non-passerines, as well as in other animals and plants (Berthold & Terrill 1991, Gwinner 1981, 1986, 1996). Circannual rhythms evidently underlie the control of seasonal activities in a great variety of organisms. Among birds, circannual cycles may be reflected in gonad condition alone, in moult alone, in migratory condition alone, or in any combination of these activities. The cycles can thus be viewed as consisting of separate but integrated components involving the different activities (Wingfield 2005). Which of these components are expressed in captive birds depends largely on the constant photoperiod to which the birds are exposed, and perhaps also on the time of year (= internal physiological state of the birds) when the experiment starts.

Spontaneous endogenous rhythms are most apparent in long-distance migrants, which are normally exposed to varying photoperiodic regimes on migration, and in which the need for some form of endogenous control is greatest. They are also apparent in some resident species of equatorial regions, where daylengths are constant year-round. For example, equatorial Common Stonechats (*Saxicola torquata axillaris*) kept caged in Germany under constant 11.8 hours of light alternating with 11.2 hours of dark went through up to 12 reproductive-moult cycles in a 10-year period (Gwinner 1996). However, in temperate zone residents and short-distance migrants caged in constant conditions, the cycles tend to continue for less long, and are more variable among individuals; they seldom proceed for more than one year, and the different events tend to become increasingly out of phase with one another. They are thus less rigid and persistent, as found in some Blackcap (*Sylvia atricapilla*) populations (Berthold *et al.* 1972) and in Common Stonechats (*S. t. rubicola*) from Europe, as opposed to Africa (Gwinner 1996).

The role of daylength

Under natural conditions, the endogenous cycles of many birds are kept in phase by seasonal daylength changes, and in experimental conditions particular events can be advanced or retarded by appropriate use of an electric light (Farner & Follett 1966, Lofts & Murton 1968). For example, if migratory birds of some species are exposed in late winter to photoperiods longer than natural days, their gonads begin to grow earlier than usual, and they show migratory and reproductive behaviour prematurely (King 1972, Lofts *et al.* 1963, Rowan 1925, Wolfson 1959). Similarly, if they are exposed in late summer to shorter days than usual, they moult and reach migratory condition earlier than usual.

The importance of daylength as a time-keeper (*Zeitgeber*) derives from its reliability. Its seasonal changes are consistent between years, making it the most obvious environmental feature that, at most latitudes, gives a reliable cue to date. The synchronisation of the internal annual cycle to photoperiod has been shown most convincingly in experiments in which birds were exposed to seasonal photoperiodic cycles with periods deviating from 12 months (e.g. six month cycles). As a rule, the birds' biological rhythms then conformed to the altered photoperiodic regime (Gwinner 1986, 1990b). For example, when the normal annual cycle of daylength was shortened to six months without altering its amplitude, Garden Warblers (*Sylvia borin*) went through four instead of two moult periods within one calendar year, two instead of one gonad

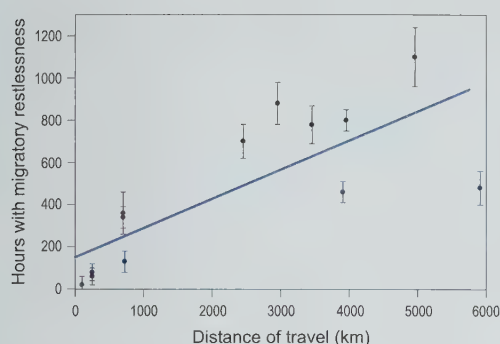


Figure 6
Relationship between the usual distance migrated and the number of nights that captive juveniles showed migratory restlessness for different populations of *Sylvia* warblers. The longer the journey undertaken by wild birds, the more nights of migratory restlessness were shown by captive birds from the same population. From Berthold (1973).

cycle, and four instead of two periods of migratory restlessness (Berthold 1996). The same occurred in Sardinian Warblers (*Sylvia melanocephala*), in which the usual one annual moult occurred twice within one calendar year (six months apart). It also occurred in Common Stonechats which underwent two gonad and moult cycles in one calendar year (Gwinner & Helm 2003). More remarkably, Dark-eyed Juncos (*Junco hyemalis*), which were exposed to four periods of short (9-hour) days and five periods of long (20-hour) days in one year, showed in this time five periods of gonadal activity, five of fat deposition and two of moult (Wolfson 1954).

Time and distance programmes

In general, the longer the distance between breeding and wintering areas, the greater is the duration and intensity of migratory restlessness (*Zugunruhe*) shown by caged birds. Different *Sylvia* warblers that breed in Europe migrate average distances varying from a few hundred to nearly six thousand kilometres, and show corresponding average periods of restlessness varying from less than twenty to more than 1000 hours (Figure 6). This implies that periods of restlessness in these different populations are endogenously (genetically) determined. In addition, the amount of fat accumulated by captive birds at migration times is related to the types of journeys they make in the wild. Birds that migrate by long flights, as from Europe to sub-Saharan Africa, typically accumulate more fat in captivity than do birds that migrate short distances within Europe (Berthold 1973, 1984). This contrast is evident in comparisons between related species, such as Willow Warbler and Common Chiffchaff (Gwinner 1972), and between different populations of the same species which migrate different distances, as in the Blackcap (Berthold & Querner 1981). Hybrids between short-distance and long-distance populations of the Blackcap show intermediate patterns of restlessness and fattening (Berthold & Querner 1981).

Directions

The timing and duration of migratory restlessness, and patterns of fattening, are not the only features under endogenous control, as the same applies to directions. Birds from populations that take different directions in the wild show the same directional preferences when tested in captivity in special 'orientation cages'. These circular test cages have a wire top, so the bird can see the sky, and some system of automatic recording which indicates the directional preference adopted by the bird during periods of restlessness.

Blackcaps in western Europe mostly migrate southwest in autumn, while those from eastern Europe migrate southeast, the two types separated by a distinct 'migratory divide'. Birds from the two types, reared together in captivity and then tested in orientation cages, showed appropriate directional preferences, either southwest or southeast, depending on their region of origin (Helbig 1991). Moreover, hybrids between the two types showed intermediate directional preferences, more or less due south. These and other findings provide strong evidence that directional preferences are inherent, and endogenously controlled.

Some wild migrants in spring retrace their path from the previous autumn, but others take different routes at the two seasons (so-called loop migrants). When tested for directional preferences in orientation cages, hand-reared Garden Warblers kept in constant (12Light:12Dark) conditions changed their mean heading from southwest to southeast part way through their autumn migration period. This corresponded with a change they would normally make part way through their journey between central Europe and Africa (Gwinner & Wiltshko 1978). They made no such change in spring, when they return by a more direct northerly route, requiring no change in direction during the journey. This gave another indication that directional preferences were endogenously controlled, and that spring directions were not simply the reverse of autumn ones.

Integration of time-distance and direction programmes

The combination of inherent time-distance programmes and directional preferences could explain how juvenile birds migrating on their own can reach wintering areas unknown to them but specific to their population. On this basis, naïve autumn migrants would fly in the right direction for an appropriate period, and would not need to experience the particular conditions of their wintering areas before they stopped mi-

grating. After an appropriate time, caged birds from both European and North American breeding areas lost their autumn restlessness and fat reserves, even though they had moved no further than the confines of their cages. Moreover, when captive juveniles were experimentally transported to their species-specific wintering areas, or even beyond their normal wintering range, the migratory activity they showed in cages persisted as long as that of individuals kept in the breeding area (for experiments on young Garden Warblers, Lesser Whitethroats (*Sylvia curruca*) and European Pied Flycatchers (*Ficedula hypoleuca*) see Gwinner 1971, Rabøl 1993). Similarly, juvenile Common Starlings and other species that were trapped on migration, flown by airplane and released immediately in the usual wintering areas for their population, or at some other locality off the normal route, resumed migration. Ring recoveries revealed that these transported juveniles moved in the same direction and covered about the same additional distance that they would have travelled had they not been displaced (Figure 7; Perdeck 1964, 1967). These experiments again suggested control of timing and direction by an endogenous programme, rather than by location. This type of migration is often called 'clock-and-compass' or 'vector' migration.

The role of experience

On current thinking, then, the urge to migrate in autumn and spring is genetically controlled. It is reflected in an autonomous rhythm of physiology and behaviour, which is kept on schedule by daylength changes (Berthold 1996, Gwinner 1972, 1986). This inherent system controls both fattening and migratory restlessness, as well as the general direction and time-course of migration. However, most of the experimental work which gave rise to these ideas was based on naïve juvenile birds that had no previous knowledge of the wintering range of their population. The situation differs somewhat in experienced birds migrating to a known site. This was first shown in experiments with Common Starlings and others, in which adults birds displaced off their normal route did not stick to their inherent direction, like the juveniles described above, but corrected for their displacement, changed direction and headed back to their previous wintering areas (Figure 7). These birds revealed more than one-directional orientation; they had a map sense, as they knew where they ought to be, and headed towards their goal (Perdeck 1958). On return migration to breeding areas, both juveniles and adults proved able to return to the region of their birth, but in this case both age-groups had previous experience of the area (Perdeck 1958).

Later experiments on Dark-eyed Juncos showed that individuals that were held captive on their wintering areas all summer did not show the usual autumn restlessness and fattening. Many of those that were released in autumn in wintering areas stayed nearby, often within the same home range they occupied the previous winter (Ketterson & Nolan 1986). They acted as though they knew where they ought to be at that time of year, and remained there without migrating. However, they disappeared from the area in the following spring and some reappeared in the next autumn, so they were assumed to have spent the summer as normal on more northern breeding areas.

Comparable findings emerged from an experiment in which migratory Indigo Buntings (*Passerina cyanea*) were held in their breeding areas through the winter, and released there in spring (Ketterson & Nolan 1990, Sniegowski *et al.* 1988). Seven out of 20 males released in spring in their nesting territories remained, while eight out of 20 that were transported and released 1000 km to the south returned to their nesting localities. The remaining birds were unaccounted for, but it seemed that when migrants were exposed in spring to their previous nesting place, they did not migrate. These findings gave a further indication that the inherent template of migration, so important to the first migration of juveniles, could be modified by experience.

Other factors influencing the timing of migration

Within the migration season, migratory flights may be influenced by prevailing weather, as discussed earlier, and also by food supply. The role of feeding conditions in affecting autumn fattening rates, body condition and departure dates has been established in the field for a number of species ranging from the Sedge Warbler (*Acrocephalus schoenobaenus*), studied by Bibby & Green (1981), to the Greylag Goose (*Anser anser*), studied by van Eerden *et al.* (1991).

When they reach an appropriate weight, migrants normally leave immediately if weather permits. This would be expected because, once acquired, fat reserves are dangerous and expensive to maintain, conferring increased vulnerability to predation. For example, when captive Blackcaps were exposed to simulated predator at-

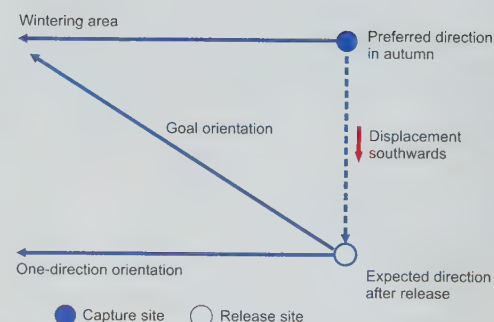


Figure 7

Displacement experiment performed on Common Starlings which were caught while on migration through the Netherlands, and then displaced to the south and released. Juveniles migrated in the same direction and for the same distance as they normally would, following a route parallel to their usual route, while adults corrected for their displacement, and headed northwest towards their normal wintering area. The juveniles had never previously experienced the normal wintering area, whereas adults 'homed' to the area they had experienced in previous years. From Perdeck (1958).

tacks, individuals carrying a fuel load equivalent to 60% of lean body mass (the maximum recorded in this species) were calculated to suffer reduction of 32% in angle of ascent and 17% in velocity, compared to lean Blackcaps (Kullberg *et al.* 1996). This degree of difference could put fat birds at substantially greater risk. Research on captive birds, or on wild ones caught during migration, has confirmed that the motivation to proceed with migration is related to fat reserves, as is the strength of directional preference. In general, individuals with the greatest body reserves at any one time showed the greatest migratory restlessness and the strongest directional preferences (Bairlein 1992, Berthold 1996, Dolnik & Blyumental 1967, Sandberg *et al.* 2002, Yong & Moore 1993).

Autumn migration

Migrants normally leave their breeding areas when conditions deteriorate, but before their continued survival there would become precarious. From any one area, however, departure dates also differ widely between species, between late summer and late autumn, depending largely on their type of food and when it becomes scarce. For example, species that depend on insects from fresh leaves, such as warblers, normally leave before those that depend on fruit or seeds, such as thrushes and finches. Moreover, in association with the earlier onset of winter at high latitudes, many species withdraw from high-latitude parts of their breeding range first, and from lower latitude parts later. The assumption is that, in order to prepare for autumn migration, populations have evolved responses to different daylength regimes, appropriate to the latitude at which they breed.

Obligate and facultative modes

In considering the proximate control of autumn migration, a useful distinction can be drawn between obligate migrants (formerly called 'instinct' or 'calendar' migrants), and facultative migrants (formerly called 'weather' migrants). In obligate migrants, all main aspects are viewed as under firm internal (genetic) control, mediated by daylength changes, which gives a high degree of annual consistency in the timing, directions and distances of movements. For the most part, each individual behaves in the same way year after year, migrating at similar dates and for similar distances. Obligate migrants often leave their breeding areas well before food supplies collapse, and while they still have ample opportunity to accumulate body reserves for the journey. They tend to migrate long distances, often to the tropics or beyond. Examples include swallows and warblers.

In contrast, facultative migration is viewed as a direct response to prevailing conditions, especially food supplies, and the same individual may migrate in some years but not in others. Within a population, the proportions of individuals that leave the breeding range, the dates they leave and the distances they travel, can vary greatly from year to year, as can the rate of progress on migration, all depending on conditions at the time (e.g. Moore *et al.* 2003, Newton 2006, Svårdson 1957, Terrill 1990). In consequence, facultative migrants have been seen on migration at almost any date in the non-breeding season (at least into January in the northern hemisphere), and their winter distributions can vary greatly from year to year. Extreme examples include irruptive seed-eaters, such as Common Redpoll, Eurasian Siskin (*Carduelis spinus*) and Bohemian Waxwing (*Bombicilla garrulus*). Although in such facultative migrants, the timing and distance of autumn movements may vary with individual circumstances, other aspects must presumably be under firmer genetic control, notably the directional preferences and the tendency to return at appropriate dates in spring.

Compared with obligate migrants, facultative migrants tend to migrate shorter distances, although many exceptions occur. The two types of migrants thus have different distribution patterns in mid winter. Whereas obligate migrants are concentrated in a distinct wintering area, usually at long distance from the breeding area, facultative migrants are typically found over the whole migration route from breeding to wintering areas, usually tailing off with increasing distance from breeding area, but with marked annual variations.

In general, it seems that obligate migration occurs in populations whose food supplies in breeding areas are predictably absent in winter, whereas facultative migration occurs in populations whose food supplies in breeding areas vary greatly from one winter to another, according to weather or other variables. The distinction between the two types is thought to reflect the degree to which individual behaviour is sensitive to prevailing external conditions, and hence varies from year to year. However, obligate

and facultative migrants are best regarded, not as distinct categories, but as opposite ends of a continuum, with predominantly internal control (= rigidity) at one end and predominantly external control (= flexibility) at the other.

Another reason for not drawing a sharp distinction between the two categories is that many birds seem to change from obligate to facultative mode during the course of their journeys, as the endogenous drive to migrate wanes with time and distance, and the stimulus to continue becomes more directly dependent on prevailing local conditions (Helms 1963, Terrill 1990, Terrill & Ohmart 1984). Theoretically, the initial obligate phase of any journey might take the migrant across regions where the probability of overwinter survival is practically zero: where any individuals that attempted to winter there in the past were eliminated by natural selection. As migration continues into more benign areas, and survival probability increases, the bird switches to a facultative mode, in which it benefits by responding to local conditions, stopping where food is abundant. The obligate phase would therefore be expected to be undertaken much more rapidly, on average, than the facultative phase, which involves longer and more variable stops. Such a two-phase migration, with obligate and facultative stages, would also ensure that, in any particular year, the bird migrated no further than necessary. In some species only the tail end of the migration may be facultative, in others the entire journey. Most irruptive migrants are near the latter end of the spectrum.

Arctic-nesting geese provide circumstantial evidence for a two-phase migration, in which the first part is obligatory and the second part facultative. Geese need to leave the arctic every year before survival there becomes impossible, and they tend to depart en masse on about the same dates every year. But once they reach suitable wintering areas, their movements become much more variable in timing and extent, depending on local food availability. They appear to change from a primarily endogenous migratory phase (obligate migration) to a stage when the stimulus for further migration is primarily environmental. In effect, as birds travel south in autumn, the drive to continue becomes increasingly dependent on food and other local conditions.

Role of dominance in facultative migrants

Because birds compete for food, and vary in dominance or feeding efficiency, some individuals could survive in conditions where others would die unless they moved out. In facultative migrants, the subordinate sex and age groups typically migrate in greater proportions, at earlier dates, or extend further from the breeding areas, than the dominants. Thus, in many bird species, adult females are more migratory than adult males, juveniles more than adults, and late-hatched young more than early-hatched ones (Gauthreaux 1982, Smith & Nilsson 1987). Such differences have led to the notion that, in facultative migrants, competition (or its effect on body condition) is involved as a proximate mechanism stimulating migration in those individuals least able to survive in local conditions (Gauthreaux 1982).

Timing of autumn migration

In obligate migrants, where all individuals leave the breeding range each autumn, the dates of migration are in general fairly consistent from year to year. This is apparent not only in the dates that birds leave their breeding areas, but also in the dates they pass particular places on their migration routes and arrive in wintering areas. For example, among raptors migrating through Israel en route to Africa, the timing and duration of passage varied greatly between species, but within species the autumn passage dates were remarkably similar between years (as were spring dates). Over nine years, the confidence intervals of the mean autumn dates ranged between 1.5 and 3.4 days (versus 2.1–5.5 days for spring dates), depending on species (Leshem & Yom-Tov 1996a).

In facultative migrants the situation differs. Such populations generally moult after breeding and, in contrast to obligate migrants, individuals do not necessarily depart immediately after finishing moult. If conditions are favourable, they may linger longer in the breeding or stopover areas, leaving only when food supplies dwindle or are shut off by snow and ice. Mean autumn migration dates may therefore vary greatly from year to year, depending on local food supplies, as may rates of travel. This situation is exemplified by most short-distance migrants, especially irruptive seed-eaters, and by waterfowl and others affected by frost. For example, the peak date for passage of Eurasian Siskins through Falsterbo Bird Observatory in south Sweden during 1949–1988 varied from 15 August (in 1988) to 17 November (in 1958), the last date the station was manned that year (Roos 1991). At another site, Eurasian Siskins passed in

Steppe Buzzards (*Buteo buteo vulpinus*).
Eilat, Israel.
Klaus Bjerre.



largest numbers, and at the earliest dates, in years when birch seeds (the main autumn food) were scarce (Svårdson 1957). Likewise, the date on which the last Whooper Swans (*Cygnus cygnus*) left Lake Chuna on the Kola Peninsula each year during 1931–1999 varied between about 20 September and 9 November, depending on when the lake froze over (Gilyazov & Sparks 2002). These observations illustrate the point that some migrants depart only when deteriorating conditions encourage them to leave. Together with variable conditions on migration routes, this facultative response gives wide variation in the dates that particular species arrive in their various wintering areas, the more distant of which may be reached only in occasional years.

Split migrations

Although autumn migration is usually considered as a single event, consisting of alternating periods of flight and fattening, some species break their autumn journeys for periods of several weeks, much longer than is needed for refuelling. Some even moult during this break in migration. This behaviour is shown by many Eurasian migrants to Africa, such as the Marsh Warbler (*Acrocephalus palustris*) and Garden Warbler, which remain in the northern tropics for several weeks, and only later move on to the southern tropics (Jones 1995). In this way, they get the best from both regions, remaining in the northern tropics until conditions deteriorate, and arriving in the southern tropics at the optimal time, after fresh rains have promoted vegetation growth. Interrupted migrations are also evident in various irruptive and other facultative migrants that break their journeys to exploit food supplies they encounter en route, and travel much further from their breeding areas in some years than in others (Newton 2006, 2008, Svårdson 1957). One consequence of split migration is that the outward journey (including the break) takes more than four months in some species, whereas the return journey in spring can take only 1–2 months.

Spring migration

Birds normally leave their wintering areas so as to reach their nesting areas in time to breed at the most favourable season. Many migrants winter so far from their breeding areas that they could not judge conditions there from their position in wintering areas. They can only leave their wintering areas at a time that natural selection has decreed is appropriate, using an internal timer combined with local conditions as a cue. Among species wintering in the temperate zone, the main known environmental stimulus for spring migration (perhaps superimposed on an endogenous rhythm) is increasing daylength which promotes extra feeding, fattening and migratory restlessness at appropriate dates for the population concerned (King 1972, Lofts *et al.* 1963, Rowan 1925). In species that undergo a spring moult, this is also initiated by increasing daylengths, as is gonad growth, each of these processes occurring in appropriate overlapping sequence through the season. The role of daylength has been shown repeatedly in experiments on captive birds, in which longer-than-natural photoperiods advance all spring-occurring processes, whether gonad growth, pre-nuptial moult or migration.

As in autumn, however, the effects of daylength may be modified by both temperatures and food supplies. Every bird watcher outside the tropics can see that summer migrants arrive later in cold springs than warm ones, and that migrants can be held up for many days during a cold snap. This situation has been duplicated experimentally. For example, captive White-crowned Sparrows (*Zonotrichia leucophrys*) exposed to air temperatures increasing from 5°C to 26°C advanced the time of migratory restlessness compared with control birds (Eyster 1954, Lewis & Farnier 1973). However, it is hard to tell whether temperature acts directly on the birds, or through its effect on their energy needs and the food available for fuelling.

Different populations of a species wintering in the same area

Different species wintering in the same area, and hence subject to the same daylength regime, may start their migrations at different dates, weeks or sometimes months apart, depending on the distance they have to travel and the dates their breeding areas become fit for occupation (for shorebirds see Piersma *et al.* 1990). Such differences are also found in different races (or populations) of the same species wintering in the same area, as shown for White-crowned Sparrows in California (Blanchard 1941) and for Yellow Wagtails (*Motacilla flava*) in tropical Africa (Curry-Lindahl 1958, 1963). Although exposed to the same winter conditions, the members of the various races

differ in the dates at which their gonads develop, and at which they accumulate fat and depart for breeding areas (Blanchard 1941, Curry-Lindahl 1963, Fry *et al.* 1972). In general, in these northern hemisphere species, races that breed furthest south are first to leave their wintering areas, and those that breed furthest north are last to leave. Thus, in the Yellow Wagtail, the first to leave in spring is the southern race *M. f. feldegg*, then *M. f. lutea*, followed by *M. f. flava* and *M. f. flavissima*, and finally *M. f. thunbergi*. These various races arrive in their breeding areas in the same sequence, spanning the period March–June, from south to north. Inherent differences in endogenous rhythms could explain such population differences, as could inherent differences in the threshold daylengths required to trigger departure. Either mechanism could account for how birds of different races can leave their shared wintering area in appropriate sequence and reach their respective breeding areas (at different latitudes) at appropriate dates. However, the Yellow Wagtails are the more remarkable because several races winter together on the equator, where daylength is constant year round. In these birds, endogenous control seems essential, with different races responding differently, according to where they breed, and setting their ‘internal clocks’ before they reach the equator, so as to leave at appropriate dates some weeks or months later.

Return migration from variable wintering areas

In many bird species, the migrants from particular breeding areas can winter over a wide span of latitude and daylength regimes. For example, Eurasian Siskins breeding in the northern boreal forest of western Europe may winter anywhere between mid Sweden and Morocco, a latitudinal span of about 30 degrees, and the same individuals may winter at widely separated places in different years (Newton 2006). The general pattern in such species is that return migration begins earliest from the most distant (most southern) parts of the wintering range, and latest from the most northern parts. This sequential withdrawal from lower to higher latitudes can be spread over many weeks. It has been examined in detail in White-crowned Sparrows wintering in western North America. In these birds, the date of onset of pre-migratory fattening varied linearly with latitude (and hence with solstitial daylength), averaging 3.3 days later for each degree of latitude northward. The start of withdrawal was thus spread over seven weeks from the 14 degrees of latitude involved (King & Mewaldt 1981). Mean rates of fattening were the same in all areas, regardless of latitude.

Deferred return to breeding areas

In some long-lived bird species with deferred maturity, individual migrants leave their natal areas towards the end of their first summer, and do not return in the next spring, but only in a later one, when they are two or more years old. Other individuals may return part way towards breeding areas, or may visit breeding areas only for a short time each year, leaving wintering areas later and returning earlier than breeding adults. They perform both migrations in less hurry than the breeding adults, and in more favourable conditions. Such patterns are shown by various raptors, seabirds, shorebirds and others in which individuals do not breed until they are several years old.

Most of the first-year shorebirds that stay in ‘wintering areas’ show no sign of pre-migratory fat deposition or spring moult into breeding plumage, but remain light in weight and in well-worn winter plumage until the next ‘post-breeding’ moult in late summer into new winter plumage. In other individuals, ‘pre-breeding’ moult and fattening are much delayed, sometimes into July, too late for the birds to breed that year (McNeil *et al.* 1994). Lack of both weight gain and pre-breeding moult was apparent among juvenile Curlew Sandpipers in South Africa, among Ruddy Turnstones (*Arenaria interpres*) in Scotland, and among Western Sandpipers (*Calidris mauri*) in Panama, while adults wintering in the same places began moult, accumulated body fat and left in spring in the usual manner (Elliott *et al.* 1976, Metcalfe & Furness 1984, O’Hara *et al.* 2002).

Although the birds that stay year-round in wintering areas do not always undergo the pre-breeding moult into summer plumage, their late summer post-breeding moult can occur up to several weeks earlier than in adults returning from breeding areas. Ruddy Turnstones over-summering in England moulted seven weeks earlier than adults returning from their arctic nesting grounds (Branson *et al.* 1979), and Western Sandpipers over-summering in Panama moulted 3–4 weeks earlier than returning adults (O’Hara *et al.* 2002). They provide an example of birds moulting at a more genial time of year when not constrained by breeding to a less favourable time later in the year. More study is needed before we can hope to understand the mechanisms



Above:
Common Redshanks (*Tringa totanus*).
Barr Al Hikman, Oman.
Hanne & Jens Eriksen.

Below:
Sanderlings (*Calidris alba*).
Oman.
Markus Varesvuo.

that control the occurrence and timing of migration in such species during their early years of life.

Recent changes in migration patterns

Mainly in association with climate warming, many birds have changed their migratory behaviour in recent decades, arriving earlier in spring on their breeding areas, and often also departing later in summer or autumn (Newton 2008). In some once wholly-migratory species, some individuals are now remaining in breeding areas year-round, while other individuals are migrating less far than before. In general, such changes are most obvious in regions with the greatest climate change, and are more marked in short-distance than in long-distance migrants. Other species have extended their breeding areas into higher latitudes, where they have become more migratory. Not all these changes are necessarily linked with climate warming, however, as some major changes in food-supplies were human induced. An example is the increased feeding of garden birds in winter, which has enabled some formerly migratory species to remain at higher latitudes in winter, almost entirely dependent on these handouts. The important point is that migratory behaviour has proved flexible, changing rapidly in response to altered conditions. Some of these behavioural changes may have a genetic basis, resulting from the action of natural selection, whereas others may represent facultative responses to environmental changes. Whatever the basis, it is this facility for rapid modification of migratory behaviour which presumably enabled birds to respond to the great glacial changes of the past, and will enable them to adapt to future changes.

Migratory fuelling

At times of migration, as mentioned above, many birds put on extra body fat and other reserves for use as fuel during the journey. Typically, they divide their migration into periods of flight, during which reserves are depleted, and stopovers, when reserves can be replenished by feeding. Species that travel over favourable terrain tend to migrate in short flights, each lasting up to several hours, broken by periods of rest and foraging, when they can replace the relatively small amounts of fuel used on each flight. Given suitable weather, migratory flight can, in theory, occur for part of every day until the journey is completed. However, birds that migrate over seas and other large inhospitable areas have to sustain much longer fasts during flights of up to several days. These flights are preceded by days or weeks of feeding when much larger body reserves are accumulated. Passerines and shorebirds typically take 1–3 weeks to accumulate the fuel reserves necessary for such long journeys, and before departure some may have doubled their normal weights.

Energy needs and body composition

Per unit of weight, fat provides much more energy than any other storable biochemical fuel available. The use of 1 g of fat will yield around 9.2 kilocalories (or 38 kilojoules) of energy, compared with only about 1.3 kcal (5.3 kJ) from 1 g of protein or 1.0 kcal (4.0 kJ) from 1 g of carbohydrate (Table 1). Weight for weight, therefore, fat contains 7–9 times more energy than alternative fuels, providing the maximum energy storage for the minimum weight gain. Fat is an even more efficient fuel than high-octane vehicle fuel, and has the additional advantage that its oxidation yields an equal weight of water, thus contributing to another of the bird's needs during long-distance flight. Moreover, unlike any other potential bio-fuel, fat can be stored without water or protein, and can also be digested efficiently with less loss of heat and no effect on body glucose. The main recognised drawback of fat is that its metabolism requires the breakdown of small amounts of protein to provide enzymes for the chemical processes involved (the citric acid cycle).

Fat is laid down as adipose tissue in various parts of the bird's body, especially under the skin, and in well-defined deposits within the wishbone (tracheal pit) and around the gut. Just before departure, the subcutaneous fat layer in some long-distance passerine migrants covers most of the body, only the central part of the breast muscle remaining uncovered.

Pre-migratory weight increase involves not only the deposition of fat, but also of body protein. Fuel should therefore be regarded as a combination of the two, but not necessarily in consistent proportions. In the most extreme species, protein contents increase prior to migration by less than two-fold, whereas fat contents may increase

Table 1
Energy and water yield of the three main fuel types in birds.
Modified from Jenni & Jenni-Eiermann (1998).

	Lipids in adipose tissue	Protein in skeletal muscle or digestive organs	Glycogen
Energy density (kJ g ⁻¹) in dry mass	39.6	17.8	17.5
Energy density (kJ g ⁻¹) in wet mass	37.6	5.3	3.5–4.4
Water content (%)	5	70	75–80
Metabolic water production (g water g ⁻¹ dry matter)	1.05	0.39	0.56
Total water production (g water g ⁻¹ wet tissue)	1.10	0.82	0.89–0.91
Water produced (g water kJ ⁻¹ expended from wet mass)	0.03	0.16	0.21–0.25

Note. One kilojoule (kJ) is equivalent to 0.239 kilocalories, and a kilocalorie is popularly called a 'calorie' in human dieting.

by more than 10-fold. Nevertheless, the protein and fat levels usually increase in step with one another during migratory fuelling, so appear to be closely correlated. Some species, such as Sandhill Crane (*Grus canadensis*), add protein and fat at migration times in the approximate ratio of 1:10 (Krapu *et al.* 1985), whereas other migratory birds lay down roughly equal weights of protein and fat in the ratio of 1:1 (see later). This difference may result simply from differences in the diets of different species, or in their metabolism, but it may also represent an adaptation to the different types of journey they undertake or their needs after arrival.

Some species alter the ratio of stored protein to fat between seasons. For example, the 40–50 g mass gain by 200 g Eurasian Golden Plovers (*Pluvialis apricaria*) during autumn stopovers consists almost entirely of fat, but a similar mass gain in spring consists chiefly of protein tissue (mainly muscle). This difference may be because Eurasian Golden Plovers face energy deficits on autumn migration and in winter when they eat mainly protein-rich earthworms, but in spring they risk protein deficits, when after arrival in arctic breeding areas they eat mainly berries but must soon produce eggs (Piersma & Jukema 2002). Another indication that birds can adjust their body reserves to oncoming needs derives from King Penguins (*Aptenodytes patagonicus*), which double their body mass before long fasts on land, but with reserves consisting of about 14% protein before incubation, and 29% protein before feather moult (Cherel 1995).

Compared to fat and protein, carbohydrate is of relatively minor importance as an energy source for migratory birds. It is present in the form of glycogen in the liver and muscle tissue. The highest glycogen values reported from birds amount to no more than about 3.0% of liver mass and about 0.5% of total body mass (Blem 1990).

The bodies of resident bird species, or of migrants outside the migration seasons, typically contain fuel amounting to 3–5% of their lean body mass. Some migrants apparently travel with reserves no greater than this. However, most regular passerine migrants depart with fuel loads amounting to 10–30% of their usual body mass, and those making especially long flights accumulate fuel loads between 40 and 70% of their usual mass, approaching 100% in a few species (Blem 1990, Fry *et al.* 1970, Lindström 1991, Moreau & Dolp 1970). Similarly, some shorebirds attain very large fuel loads, as high as 50–90% of lean body mass, but with a maximum of around 100% in those embarking on the longest non-stop flights. They may then lose up to half their body mass during their flights over the next few days.

In addition to fuel deposition, preparation for migration in many birds involves enlargement of the breast muscles, heart and blood vessels, and shrinkage of other organs less important in migratory flight (see below). It also involves the activation of enzyme systems for the storage and rapid mobilisation of fat, an increase in the erythrocyte (haematocrit) content of the blood to enhance oxygen transport during long flights (Jenni-Eiermann & Jenni 1991), and the modification of various aspects of behaviour, including the diurnal rhythm of activity to permit nocturnal flights in some otherwise diurnal species. All these changes vary between species, according to the types of journeys they undertake.

Mechanisms of fuel deposition

To deposit body fuel, a bird must increase its rate of food intake. This may be achieved in various ways, such as feeding more rapidly or for longer than usual each day, or by selecting from potential foods the most calorific and easily digestible items. This is shown by some warblers and other insectivores, which switch to mainly fruit at migration times, the sugars therein being easily converted to fats. A bird might also increase the size of its digestive tract, so as to increase the throughput and processing of food, as again shown in many species of passerines. Some waterfowl and shorebirds can feed both by day and by night, and can thus achieve higher rates of food intake than other birds, and correspondingly higher rates of fuel deposition. But the most obvious way in which a diurnal bird can conserve feeding time is to migrate at night. While this may not increase feeding time over what is usually available, it at least prevents potential feeding time being reduced by flight time.

Not only are birds able rapidly to store and metabolise large amounts of fat, they also undergo many other physiological changes, affecting skeletal muscles and various internal organs (Battley *et al.* 2000, Piersma 1998). Before departure on long journeys, exercise organs (pectoral muscle and heart) tend to enlarge and nutritional organs (stomach, intestine and liver) tend to shrink. This makes sense on long flights where weight reduction is at a premium. Prior reductions in nutritional organs appear most pronounced in populations about to over-fly oceans that offer few or no opportunities for emergency landings, let alone feeding. In other species, the digestive tract is apparently reduced during the flight itself, rather than beforehand, contributing to the



Above:
Brent Geese (*Branta bernicla*).
Porvoo, Söderskär, Finland.
Markus Varesvuo.

Below:
Greater White-fronted Geese (*Anser albifrons*).
Estonia.
Markus Varesvuo.

fuel and water needs of the migrant on its journey. Digestive organs are rebuilt after arrival at a staging or wintering site. Hence, a bird refuelling for long-distance migration is not like a plane landing, refuelling and taking off again. Unlike the plane, the bodies of long-distance migrant birds have to be partly reconstructed at each stopover and modified again before take-off (Piersma 1998). This is much less true of species that migrate by short flights.

In some waterfowl, notably geese, reserves accumulated before arrival in breeding areas, and especially at the last stopover site, help in egg formation and survival through incubation (Drent *et al.* 2003, Ebbinge & Spaans 1995, Newton 1977). Such geese often arrive before vegetation growth has begun in their breeding areas, when little food is available. They are described as 'capital breeders', because they reproduce largely on the strength of existing body reserves, and contrast with 'income breeders' which breed on the strength of food eaten at the time. In different goose populations, weight gains of 25–53% have been recorded before the birds set off on spring migration (McLandress & Raveling 1981). This is a lot for birds of this size. Females accumulate more weight than males, in association with the needs of egg production and incubation (in which males do not participate, except in nest guarding).

At least some species of high arctic geese, such as the Lesser Snow Goose (*Anser c. caerulescens*), Ross's Goose (*A. rossii*) and Brent Goose (*Branta bernicla*), can start egg-laying 2–5 days after arriving in breeding areas, before plant growth has begun. They seem to rely entirely on body reserves. Others feed and regain some weight after arrival, but still depend partly on body reserves accumulated further south (Bromley & Jarvis 1993). In Lesser Snow Geese, the relationship between body reserves and reproductive output was studied in females shot at various stages of breeding in the Northwest Territories of Canada (Ankney & MacInnes 1978). The potential clutch size of pre-laying females was found from the number of large vascularised follicles in the ovary, and it emerged that females with larger body reserves had, on average, larger potential clutches. In other females collected after laying, body reserves had been partly used, but the mean weights of remaining reserves from females that laid clutches of different sizes were not then significantly different. Apparently, clutch size in Lesser Snow Geese was determined by the size of nutrient reserves: females with the largest body reserves produced the most eggs. Breeding females used most of their remaining fat and protein reserves during incubation (85% and 24% respectively). Late in incubation when females had depleted their body reserves, some left their nests to feed, while others were found dead on their nests from starvation. Hence, to reproduce successfully in this area, female Lesser Snow Geese had to accumulate beforehand enough reserves to support the last stage of migration, egg production and maintenance during the four weeks of incubation. Only after hatch were females able to feed intensively again, and build up body condition for the return migration to wintering areas.

Navigation

One of the most amazing aspects of migration is how birds find their way over long distances, often through unknown terrain. Many species are capable of migrating year after year between exactly the same breeding and wintering places, located up to thousands of kilometres apart. Some pelagic seabirds wander widely over the oceans, yet each year return unerringly to their own particular nesting islands. Great Shearwaters (*Puffinus gravis*), for example, nest on the isolated Tristan da Cunha Islands, lying at 40°S in the South Atlantic and more than 2000 km from Africa, the nearest continent. In the non-breeding season these birds migrate northward in their millions, ranging over large parts of the North Atlantic. But they return each year with pinpoint accuracy to their tiny breeding islands, which are spread over only 45 km of ocean. Individuals occupy the same nest burrows from year to year, often lying within a metre of those of other individuals. These and other seabirds that migrate long over-water distances to small oceanic islands must surely be among the greatest of animal navigators. But how do birds achieve these remarkable feats of orientation and navigation over such huge distances?

It is not just a question of finding the way. Birds must know where in their journeys they need to do particular things, such as change direction or accumulate extra body reserves in preparation for a long non-stop flight. The fact that they can respond appropriately at specific places on their route again implies that they possess some geographical sense — an ability to detect and respond in an appropriate manner to conditions at particular locations.

The most obvious way in which birds and other animals could find their way around on a day-to-day basis is by use of landmarks. But such features are useful only in familiar areas. When moving over longer distances into unknown terrain, a reliable

geographical reference system is needed by which to navigate. At least two types of factors can provide this reference—celestial and geomagnetic—and both are used by birds as directional aids (for reviews see Able 1980, Åkesson 2003, Emlen 1975, Wiltschko, R. & Wiltschko 1995, Wiltschko, W. & Wiltschko 2003). In migratory birds, compasses based on the sun, various sunset cues, stars, and magnetic information have been studied in detail, but a prior requirement for using any compass is that the bird should ‘know’ beforehand—either by inherent preference or experience—in what direction it needs to head.

Moreover, one feature of celestial cues, such as the sun and stars, is that they appear to change in position through each 24-hour cycle, as the earth spins on its axis. In the northern hemisphere, the sun lies in the south and moves during the day from east to west, and at night the stars rotate anticlockwise around the geographical north. In the southern hemisphere the sun lies in the north and moves from east to west, while the stars rotate clockwise around the geographical south. In using the sun and related factors in direction finding, therefore, birds in both hemispheres must allow for time of day. The same is not necessarily true for star patterns if they are used solely to indicate geographical north or south, determined by the centre of rotation of the night sky. Time-keeping depends on the internal clock, kept to time by the regular day–night cycle of light and dark.

The sun compass

The height of the sun’s arc in the sky varies with latitude and season, but it is always symmetrical with respect to true north or south. Its highest point in the sky at mid-day indicates due south in the northern hemisphere and due north in the southern hemisphere. The use of the sun as a compass by birds has been known for more than 50 years. Under a sunny sky, Common Starlings kept in circular wire cages during the migration period oriented in the same direction as free-living birds. They varied the angle they took to the sun according to the time of day. If the sky became overcast, their directional preference disappeared. When their view of the sun’s direction was changed using mirrors, the birds oriented at the same angle to the apparent sun as they would to the real sun (Kramer 1952, 1957). These experiments confirmed that starlings made use of a sun compass, which gave accurate information only if used in association with an internal clock, allowing adjustment of directional preference as the sun moved across the sky. Additional experiments in which Common Starlings were kept under artificial cycles of day and night of the same duration as natural time, but out of phase, revealed clearly that, in order to orientate, the birds used both the sun’s position on the azimuth (direction from the observer) and the time of day. Given a simulated stationary sun, a caged migrant orientated at different angles to it according to the time of day. The use of a sun-azimuth compass has now been confirmed experimentally in several species, and may be commonly used by diurnal migrants.

If homing pigeons and other species known to use the sun in orientation are transported to the southern hemisphere, they orientate themselves incorrectly, interpreting the sun as if they were in the northern hemisphere, indicating south rather than north. Regular trans-equatorial migrants must presumably be able to make the necessary adjustment, but how they do so is still unknown.

Skylight polarisation patterns

The ability of birds to detect sky polarisation patterns, which change with respect to the sun’s position (being particularly striking around the time of sunset), has also been demonstrated by experiment (Able 1993). Several species of normally nocturnal migrants have been shown to respond to manipulations of polarised skylight, especially around the time of sunset. The birds were tested individually outdoors in otherwise normal conditions in cages covered by sheet polaroids (Able 1982, 1989, Helbig & Wiltschko 1989, Moore & Phillips 1988, Phillips & Moore 1992). In each case, the birds changed orientation as predicted by alterations in the alignment of the polaroids. The experimental birds were clearly responding to polarised light as such, rather than to other sunset features.

The star compass

Providing that enough of the night sky is visible, nocturnal migrants proved able to use the stars as a guide. When tested in orientation cages, they could orientate cor-



Common Starlings (*Sturnus vulgaris*).
Denmark.
Hanne & Jens Eriksen.

rectly on clear starry nights, but became inactive or disoriented under overcast skies. They also became confused if star patterns were varied experimentally in a planetarium (Emlen 1967a, 1967b, Sauer 1957). When Indigo Buntings were tested under a natural starry sky during autumn migration, they preferred southerly directions. They maintained this southerly preference under an artificial star pattern imitating the natural sky in a planetarium. But when the artificial star pattern was changed by 180° , the birds changed their directional preference to the north. Under a static night sky, no obvious migratory restlessness occurred. The development of a star compass evidently involved learning, with celestial rotation as a directional reference, and captive Indigo Buntings without early experience of the night sky failed to orientate correctly in a planetarium (Emlen 1967b, 1975). Similar results were later obtained with Garden Warblers (Wiltschko *et al.* 1987).

In experimental conditions, some birds learnt to respond to a simplified and reduced star pattern, with some constellations blocked out, so long as this pattern rotated about a single conspicuous star. Nestling Indigo Buntings raised under an artificial sky with the star Betelgeuse (in the constellation Orion) as the point of rotation treated Betelgeuse as the Pole Star when subsequently tested. Detecting the rotation of the night sky probably takes considerable time—it could not be determined at a glance. Not surprisingly, therefore, the birds did not depend on the axis of rotation *per se*, but rather learned star patterns that indicated the axis, and thereafter they relied on those patterns. As with the sun compass, however, the ability and tendency to acquire this knowledge was apparently innate.

The use of a star compass has now been demonstrated experimentally in at least six different bird species, and may be general in nocturnal migrants. If the birds use the rotating star pattern only to define the position of the poles, then no correction for time of day is necessary. They may, however, gain further information from star patterns: as long-distance migrants proceed on their journeys over several weeks, stars that were once visible disappear below the horizon behind them, while others appear above the horizon in front, another indication that birds are unlikely to rely throughout on particular star patterns.

Celestial cues and time shifts

In using celestial cues, long east–west migrations present greater navigational problems than north–south flights because they involve time shifts, as the birds pass through successive time zones. If long-distance migrants using celestial cues to navigate did not allow for time shifts when travelling east–west (or west–east), they would make ever greater directional errors, and veer progressively further off course. The problem created by time shift is greatest at the highest latitudes, where the longitude lines are closest together, requiring more rapid adjustment. Hence, a second presumed function of an internal clock is to measure the changes in timing of sunrise and sunset, as the bird flies long distances west or east. High-latitude east–west or west–east flights are fairly common, being performed every year, for example, by the many waterfowl and seabirds that migrate along the northern coasts of Eurasia and North America to reach the Atlantic or Pacific Oceans on either side.

The magnetic compass

The second major system of bird orientation makes use of the earth's magnetic field, which has both horizontal and vertical components. Imagine the earth as a hugely powerful magnet, whose north magnetic pole is situated fairly close to the geographic North Pole, and whose south magnetic pole is similarly close to the geographic South Pole. Running through the atmosphere between the two magnetic poles are invisible longitudinal lines of magnetic force, which circle the globe rather like the segments of an orange. At the equator, the magnetic force lines run horizontal to the earth's surface, but toward higher latitudes they dip more and more strongly into the earth, becoming vertically downward at the magnetic poles. The inclination of the field lines thus varies within each hemisphere according to latitude. Hence, for any creature that can measure the inclination of the force lines, the earth's magnetic field can give a cue to latitude and direction (toward the equator or pole) within each hemisphere. However, it cannot give a reliable cue to longitude, so it cannot provide a firm basis for 'bi-coordinate navigation' (although this may be possible in some regions because of irregularities in the field). In contrast to celestial cues, however, the magnetic field can give consistent information in all weather conditions, both day and night, and unlike the sun compass, it needs no correction for time of day.

As revealed by radar studies, nocturnal migrants can occasionally orientate correctly even under completely overcast conditions, as can caged birds with no view of the sky. Caged birds lost this ability when isolated from both the sky and the earth's magnetic field behind metal-reinforced walls. Moreover, when the magnetic field experienced by caged European Robins was rotated using a powerful electromagnetic coil so that, for example, magnetic north was shifted to the east while the field's total intensity and inclination, as well as other potential directional cues, were kept unchanged, the birds altered their orientation accordingly (Wiltschko 1968). This crucial experiment showed conclusively that birds can respond appropriately to the earth's magnetic field. Since then, the use of a magnetic compass has been demonstrated experimentally in about 20 bird species, and its use may be widespread, but mainly in association with other information. Although the method of its perception is still unclear, birds are sensitive to both inclination and intensity, but apparently not to polarity (Wiltschko & Wiltschko 1972).

Use of multiple orientation cues

Experiments thus indicate that birds can use a number of different compasses for orientation during long-distance migration, based on information from the sun and related pattern of skylight polarisation, from star patterns and from the earth's magnetic field. Birds can learn and modify their use of all these compasses during their early lives or later. These different cues would normally give the same directional message. However, they might vary in reliability between regions, seasons and local conditions, so that for instance the sun compass cannot be used if the sky is totally overcast, the star compass might not be visible during the round-the-clock daylight in high-latitude summers, and a magnetic compass based on the angle of inclination is of little use around the geomagnetic poles and the geomagnetic equator (Åkesson *et al.* 2001). In practice, individual birds probably use information from more than one compass mechanism, with emphasis on whatever cues are most reliable in the conditions prevailing, switching from one type of cue to another during the course of a journey, depending on location, weather and light values (Muheim *et al.* 2006, Wiltschko, Weindler & Wiltschko 1998).

Which of several potential compasses is most important to a bird at a given time has been investigated in so-called 'cue-conflict' experiments. These involve presenting a bird with two (or more) orientation cues at once, manipulating one of them while leaving others unchanged, and monitoring the response of the bird (Able 1993). A typical experiment might involve placing an orientation cage surrounded by electric coils outdoors under a clear night sky. In this situation, the bird would have access to two known orientation cues, the stars and the magnetic field. The coils can be used to shift the direction of magnetic north so that magnetic compass directions differ from star-based ones. If, as compared to control birds tested in an unaltered magnetic field, the birds experiencing the cue-conflict changed direction in line with the magnetic field shift, one would conclude that in this situation magnetic information took precedence over stellar information.

Just such an experiment was conducted on three species of *Sylvia* warblers and European Robins captured on migration (Wiltschko & Wiltschko 1975a, 1975b). When the directions of stellar and magnetic north were at variance, the birds seemed to orient preferentially with respect to magnetic cues. The warblers changed direction during the first test in the conflict situation, but the robins did not shift until tested in cue-conflict for several consecutive nights (a finding later replicated on the same species elsewhere, Bingman 1987). Robins apparently needed longer to work out the changed relationship between stellar and magnetic cues.

Cue-conflict experiments have proved especially useful in assessing the cues used around sunset, a time when many birds set off on migratory flights. Orientation based on visual cues between the time of sunset and the appearance of the first stars could be based on the sun itself (e.g. the azimuth of sunset) or on patterns of polarised skylight as mentioned above. Both could provide the same reliable directional information. However, in cue-conflict experiments involving several different species, polarised light appeared to be the predominant influence on directional preference when placed in conflict with the sun's position or magnetic directions (Able 1993).

So far, we have considered only compass directions, but experienced birds can practice bi-coordinate navigation to re-find places they have previously visited. Such navigation could be provided by any two non-parallel gradients, and in theory the different gradients could be provided by different types of cues, for example one coordinate being based on a celestial cue and another on a magnetic cue. Whereas latitude can be fixed by both celestial and magnetic cues, longitude seems much more difficult



Black Storks (*Ciconia nigra*) and Steppe Buzzards (*Buteo buteo vulpinus*).
Eilat, Israel.
Klaus Bjerre.

to determine. Displacement experiments with White-crowned Sparrows in arctic North America indicated that a combination of geomagnetic and celestial information might be used to define longitude, but the precise mechanism remains unclear (Åkesson *et al.* 2005).

Another way in which different types of cues are not necessarily independent of one another is that a bird may calibrate one compass cue against another. Thus, while the rotation of the earth relative to the sky provides a stable reference for defining geographic north and south, changing geomagnetic declination (waviness in the force lines) renders the earth's magnetic field less reliable in this respect. Accordingly, young birds were found able to use celestial information to calibrate a migratory orientation response to the earth's magnetic field (Weindler *et al.* 1996). The combined experience of the night sky and the natural geomagnetic field seemed crucial for songbirds at high latitudes to find the appropriate migration direction to a population-specific wintering area (Weindler *et al.* 1996). Experienced adult Savannah Sparrows (*Passerculus sandwichensis*) also used celestial cues to recalibrate their migratory orientation to an experimentally shifted magnetic field (Able & Able 1995). Subsequent experiments revealed that Savannah Sparrows used polarised light cues from the region of sky near the horizon to calibrate the magnetic compass at both sunrise and sunset (Muheim *et al.* 2006).

In another study, *Catharus* thrushes caught on migration were exposed to an experimentally deflected magnetic field during twilight, and then released and radio-tracked on their subsequent night flights (Cochran *et al.* 2004). Their tracks indicated that the thrushes recalibrated their magnetic compass in relation to twilight cues, and then relied on their (miscalibrated) magnetic compass for their nocturnal flight, apparently ignoring stellar cues. The experimental birds changed to normal orientation again on succeeding nights, apparently having recalibrated their magnetic compass (correctly) back to north. Daily recalibration of the magnetic compass could explain how birds cope with changes in magnetic declination during the route, as well as various local magnetic anomalies; it could also explain how birds operating with a magnetic inclination compass can cross the equator (where the force lines are horizontal) without becoming disoriented.

Response to specific areas

Experiments using an artificial magnetic field implied that some birds use magnetic information to indicate regions where they must stop migrating, change direction or accumulate large fat reserves before crossing a barrier. For example, young migratory European Pied Flycatchers from western Europe showed a distinct change in compass heading when exposed in captivity to values of the magnetic field normally encountered in southern Europe, where the normal migratory route shifts from southwest to south. However, the altered magnetic field was followed by the shift in orientation only when applied at the appropriate time during the migratory period (Beck & Wiltschko 1988). In European Pied Flycatchers, therefore, the magnetic conditions of the location where the change is to occur and the time programme evidently interact to produce an appropriate response in an appropriate region.

In another experiment, some juvenile Thrush Nightingales (*Luscinia luscinia*) were caught in autumn in Sweden and exposed there to the geomagnetic conditions they would normally experience in northern Egypt. These birds promptly accumulated high fat levels appropriate to the subsequent desert crossing. They contrasted with control birds, exposed to local geomagnetic conditions, which accumulated much smaller fat reserves typical for south Sweden (Kullberg *et al.* 2003). However, birds trapped late in the onset period of autumn migration accumulated a high fat load irrespective of magnetic treatment. It seemed that the relative importance of endogenous and environmental factors in individual birds was affected by time of season, as well as by geographical location.

These experiments suggest that inexperienced birds on their first migration can detect and make use of the geomagnetic field, at least to indicate when major changes are needed during their journeys. The implication is that such birds have an inborn response to external geographic cues (especially geomagnetic cues) that are characteristic of certain latitudes or regions, and that they can use particular conditions to trigger a change in direction or fattening regime (Beck & Wiltschko 1988, Fransson *et al.* 2001). At least two mechanisms seem to be involved. The first is an endogenous time programme which switches particular activities on and off at appropriate times in the migration cycle (see above). The second is a response to particular latitudes or more specific regions, at least partly through regional magnetic or other conditions, which can similarly trigger appropriate changes in migratory behaviour. How much

these separate mechanisms act independently or in conjunction with one another is an open question, but different species would not necessarily be expected to respond to particular experiments in the same way.

Birds that have experienced a wintering area may use the magnetic conditions there to halt migration on subsequent journeys. Adult Tasmanian Silvereyes (*Zosterops lateralis*) were tested near the mid-point of their south–north migration in southeast Australia. Birds exposed in captivity to artificially generated magnetic field values of inclination and intensity normally experienced near the start of their migration, oriented correctly toward north-northeast. In contrast, birds exposed to magnetic field values that they would experience near the end of their migration ceased to show any significant directional preference; in this respect, they acted as though they had arrived in wintering areas (Fischer *et al.* 2003). In contrast, no effects of changing the artificial magnetic field were noted in inexperienced young birds caught prior to their first migration, and which had therefore never visited the wintering area. The implication is that birds can learn the magnetic conditions of areas important to them, and use these conditions to indicate when to stop migrating.

Rhumblines and great circle routes

An unresolved question in migration research is whether long-distance migrants travel on straight ‘rhumblines’ routes (also called loxodromes) or on great circle routes (also called orthodromes). Navigationally, rhumblines are the most straightforward, because the bird could set off in the appropriate direction and maintain the same compass heading throughout its journey. If the route ran directly north–south, it would also be the shortest route between two points on the earth’s surface and would not involve a time-shift. However, if the journey had an easterly or westerly component, so that it involved crossing lines of longitude (as most routes do), a constant heading would still be the simplest but not the shortest route. The great circle route covers the shortest distance between two longitudinally separated points on the globe, but requires continual change in heading during the journey. Great circle routes are thus more demanding in their navigational needs. They can be accomplished by aeroplanes, with sophisticated navigation equipment, but whether by birds remains uncertain. Moreover, on any journey that involves longitudinal displacement, whether on rhumblines or great circle routes, the bird is also subject to time-shifts, as mentioned above. These time-shift problems are greatest at high latitudes where the longitude lines are closest together, but it is also at high latitudes where the distance savings on great circle routes are greatest.

The tracking of individual birds on their journeys has shown that many take a straight, constant-direction rhumblines route, even when they would save much time and distance by taking a great circle route. This held, for example, in Brent Geese migrating between the Wadden Sea and the Taimyr Peninsula in Siberia. However, it was not clear whether these geese took a rhumblines route because they were not capable of navigating the shorter (over-water) route, or in order to stay near the coast with its feeding areas. The shortest (great circle) route was about 4300 km, compared to the rhumblines of about 4700 km. Although the birds that were tracked kept closer to a rhumblines than a great circle, they also made continual minor deviations, bringing their average flight distance to 5000 km, at least 700 km (16%) further than the shortest possible route (Green *et al.* 2002). Similarly, Brent Geese travelling from Iceland to the Queen Elizabeth Islands in northeast Canada tended to migrate along fairly straight rhumblines routes to their breeding areas, and Red Knots (*Calidris canutus*) performed likewise (Gudmundsson *et al.* 1991). Again these routes took the birds mostly over land, where they could come to ground in inclement weather. Many other birds that have been studied have followed rhumblines routes.

In contrast, evidence that any birds take great circle routes (other than north–south) is as yet rather slender. Use of radar on the coast of northern Siberia revealed the occurrence of an east-northeast post-breeding migration, indicating direct flights between Siberia and North America, 1800–3000 km across the Arctic Ocean (Alerstam & Gudmundsson 1999). If the migrants gradually changed their orientation to the right during these flights, they would travel towards Alaska and neighbouring parts of Canada along the shortest possible great circle route to South America. The commonest species involved were the Pectoral Sandpiper (*Calidris melanotos*) and Red Phalarope (*Phalaropus fulicaria*), which winter on and near South American coastlines, respectively. This is one piece of evidence indicating that some long-distance migrants might travel along approximate great circle routes, but it will remain inconclusive until birds have been followed along more of the route. Ring recoveries from these or other candidate species are also insufficient to confirm travel by great circle

routes. Only when not influenced by topographic features, important feeding sites or weather patterns, would migrants be expected to follow either straightforward rhumbline or great circle routes, and this situation may be quite rare.

As a further point, among the known orientation mechanisms, only a sun compass with no compensation for changes in local time could lead birds along a track similar to a great circle route. If birds did compensate for the time shift, using the sun compass they would follow a route similar to a rhumbline route. Hence, either type of route would appear possible using the sun as a compass. However, routes based on use of the stars or the earth's magnetic field would invariably run closer to a rhumbline than a great circle route. One way in which birds could follow an approximate great circle route would be to divide the journey into stages with one or more appropriately positioned stopover sites, flying straight from one to another, but making a directional change at each one. Many landbirds are known to take roundabout routes in order to avoid long water crossings or high mountains, or to make use of re-fuelling sites that are off the most direct route. The journey is thus divided into successive legs with different main orientations. For example, most of the migrants that travel in autumn from western Europe to West Africa travel southwestward into southern Iberia, and then take a more southerly course into Africa. If they continued heading southwestward, they would end up far over the Atlantic Ocean.

Overall, straight rhumbline routes based on constant compass headings appear more likely in many bird populations, and are consistent with the routes frequently recorded by ringing and radio-tracking. They also fit the experimental evidence (based mainly on passerines) of a genetically fixed directional preference that steers inexperienced juveniles towards their wintering areas (although they may change directions at specific points on their journeys). Clearly, more research is needed on the precise routes taken by long-distance migrants before their navigation systems can be more thoroughly assessed.

Route-finding

In conclusion, the navigational tools available to migrating birds include: (a) a celestial compass based on sun, skylight polarisation and star patterns; (b) a magnetic compass based on the earth's magnetic field; (c) an internal clock, recording diurnal (circadian) and longer-term time changes; and (d) an inherited mean migratory direction and time programme, which together ensure that the bird flies in an appropriate direction for an appropriate time. Some, if not all, birds also have a map sense used for homing to a previously experienced place. Moreover, the fact that birds can re-find places they have already visited implies a good spatial memory.

Various other navigational methods may also be used by migrating birds, including the use of ultra-sound and odours. Tube-nosed seabirds, in particular, have a well developed olfaction sense which may be used for locating food and nest burrows, but may also be used in longer-distance navigation, although this idea is conjectural only.

Equipped with these navigation aids, a bird could use at least four different route-finding strategies:

1. In guiding or 'follow-the-leader', some birds might complete their migration by following others which know the way, thereby learning the route. Providing the leaders were experienced, they could pass on knowledge of travel routes to younger individuals by cultural transmission, assuming the youngsters could record and memorise their journey in some way. This strategy is used by swans, geese and cranes, in which young migrate with their parents. Any birds using this method would benefit from a back-up mechanism (such as clock-and-compass) in case they were left to migrate on their own. This method cannot be used by many other bird species, however, because the young migrate independently of the adults, and sometimes at a somewhat different time of year. One example is the Common Cuckoo (*Cuculus canorus*) in which the adults leave their breeding areas a month before their latest young, reared by various host species, have even left the nest.
2. In clock-and-compass (vector) navigation, birds aim to head in a constant migratory direction (which may change once or more times during a journey) for an innately determined amount of time controlled by an internal clock. By this mechanism birds could reach previously unknown but appropriate wintering areas. Theoretically, birds of all ages could use this orientation strategy, which has been demonstrated experimentally in young passerines and others. On this mechanism alone, birds are unable to determine their position and are therefore unable to correct for wind drift, directional mistakes, over-flight, or experimental displace-

Eurasian Cranes (*Grus grus*).
Finland.
Markus Varesvuo.



ment. Also, adults would be unlikely to return to the same precise localities in successive years, which many are known to do.

3. In bi-coordinate navigation, birds can sense at least two global coordinates forming a reliable grid through which they can determine their geographical position. Bi-coordinate navigation could provide continual positional feedback, enabling birds to correct for drift or directional mistakes. Theoretically, birds of all ages could use this strategy, but experimental evidence from several species suggests that it is used primarily by experienced birds returning to a known area.
4. In piloting, a migration route is retraced by using a sequence of learnt landmarks. This method would require birds to build a landmark-based map during a previous migratory journey which is retraced during each subsequent migration. Such landmarks could be visual, auditory, magnetic or olfactory. This method could not be used by inexperienced migrants on a first-time journey, but could help birds returning to a known area.

While we still have much to learn about this fascinating subject, migratory birds clearly have a number of orientation and navigation mechanisms available to them, and are not restricted to just one. They also have an inherent ability to learn to make use of the more important navigational cues, re-assessing them and if necessary cross-checking them at points along the route. By these various means, they can find their way each year between widely-separated localities, to the continuing amazement of mankind.

Birds as colonisers

Like other terrestrial organisms, land-birds that have the opportunity readily expand their geographical ranges across land areas, occupying all suitable habitats. A spectacular example is the Eurasian Collared-dove (*Streptopelia decaocto*) which in the mid-twentieth century colonised much of Europe from breeding areas further east. It is now a common village bird in areas where a century ago it was totally unknown. In addition, however, powers of sustained flight enable land-birds to cross extensive sea areas, and thereby to colonise distant lands in a way that most other animals cannot. As a result, land-birds of one sort or another are found on almost every oceanic island in the world, where other animal groups are poorly represented or altogether lacking.

Every bird-watcher delights in seeing occasional individuals of certain bird species, which normally live far away but periodically turn up as rarities. There can be no doubt that individual birds continually reach localities hundreds of kilometres beyond their normal range boundaries. Bird vagrancy is a familiar phenomenon, especially in well-watched places such as the British Isles, where more than half the species recorded in the last 200 years are classed as vagrants. Some appear in small numbers every year, but others only singly at intervals of many years.

In both Europe and elsewhere, vagrancy is especially evident on off-shore islands. Although the variety of species is somewhat restricted, and most vagrants are drawn from migratory populations, bird movement is clearly not the major obstacle to range extension. The main problem is the difficulty in establishment. Migrants blown off-course are usually programmed to re-fatten and move on, reducing the chance that they will stay in a new area. Unless they are adapted to the journey, birds that have crossed an ocean are likely to arrive so exhausted and low on body reserves that they have poor survival prospects, even in favourable environments; and even if individuals recover from the journey, remain and survive long enough to breed, their low numbers may render them vulnerable for several years.

Despite the difficulties, some remarkable trans-oceanic range extensions have occurred among birds in recent times. One remarkable example is the Cattle Egret (*Bubulcus ibis*) which around 1880 is thought to have crossed the Atlantic from Africa unaided, reaching Surinam in South America. From there it gradually spread to occupy grassland habitats through much of the New World, including Caribbean Islands. In the opposite direction, the same species spread from Asia via New Guinea to Western Australia, and then on to New Zealand. It has doubtlessly been helped by forest clearance, and the proliferation of cattle ranching, as it naturally associates with large grazing mammals to feed on the insects they disturb. Moreover, in the relatively short time since it arrived in these new areas, the Cattle Egret has established new migrations, including one between New Zealand and Australia.

Since the occupation of New Zealand by European people, and the resulting habitat transformation, several bird species have crossed the 1600 km of sea and colonised the country from Australia (Baker 1991, Bell 1991). Besides the Cattle Egret which



Greater Flamingos (*Phoenicopterus ruber roseus*).
Khawr Ghawi, Oman.
Hanne & Jens Eriksen.

arrived around 1958, new colonists include: the Silvereye (*Zosterops l. lateralis*), since 1855; Grey Teal (*Anas gibberifrons gracilis*), re-established since 1916; Welcome Swallow (*Hirundo neoxena*), 1920s; Spur-winged Lapwing (*Vanellus spinosus*), since about 1932; Masked Lapwing (*Vanellus miles*), since 1940; White-faced Heron (*Egretta novaehollandiae*), since 1940; Royal Spoonbill (*Platalea regia*), since 1950, still rare; Common Coot (*Fulica atra*), since 1954; and Black-fronted Dotterel (*Elseyornis melanops*), since 1954. Such species may have reached New Zealand in earlier times, but did not persist, possibly because suitable habitat was lacking then. They contrast with many other animals which have reached New Zealand only with more direct human help.

Concluding remarks

From time immemorial, the seasonal movements of birds have fascinated people. They have continually raised questions about where particular species come from, where they go, how they time their journeys, and how they find their way. After more than a century of scientific research, we have come a considerable way towards answering these questions in broad terms, at least for northern hemisphere species. But substantial gaps in our understanding still remain, notably on important aspects of navigation, fuel accumulation and use on journeys, and the control of migratory timing. In addition, for obvious reasons, we still have only skimpy knowledge of the movement patterns of pelagic birds which spend most of their lives on the open sea. As time goes by, research is likely to extend to a wider range of species, and to other parts of the globe, while developments in technology will make more things possible. In the foreseeable future, smaller and more sophisticated radio-transmitters are likely to become available, enabling us to follow much smaller birds, such as swallows, day by day on their journeys, recording the heights at which they fly, the precise routes they take, and when and where they stop to rest and feed. No doubt future discoveries, like previous ones, will generate excitement and awe in scientists and lay people alike, as we continue to be amazed at what migrating birds can do.

Ian Newton

Bibliography

The full references to the citations included herein can be found towards the back of the volume, in the General List of References.

Introduction to Volume 13

Readers are invited to consult the Introductions to previous volumes for explanations of the aims and norms of the HBW series. We do not wish to abuse the patience of regular readers by repeating these same details too often!

Volume 13 covers the creeper and nectarivore groups of traditional classifications, and makes a start on the shrike block. Australasia is again very well represented in this volume, in no small measure due to the large and diverse honeyeater family, Meliphagidae.

The foreword that graces the current volume is on another of the subjects most frequently requested by readers—migration. We have been particularly fortunate that Professor Ian Newton accepted authorship of this essay, covering surely one of the most fascinating subjects in ornithology, and indeed in the natural world. We are quite sure readers will agree that this fine contribution makes an excellent addition to the HBW foreword collection.

We are also delighted and extremely grateful that Lars Jonsson very kindly allowed us to use his splendid plate for the frontispiece.

Sadly for us, with this volume we have to say goodbye to Teresa Pardo, who has decided to follow her calling and become a teacher. Tere started with HBW in 1994, when she took over the Bibliography. As each volume has gone by, she has become more and more important until she has become effectively a fourth Editor. We wish her all the very best in her new job, and hope she will drop in often to keep tabs on us! In the meantime, we are very pleased to report that she has maintained her link with HBW by compiling the Index of the present volume, as well as running a check on the final publishing proofs—among other things.

We have been most fortunate in having ideal cover already available within the team. Both Frank Steinheimer and Amy Chernasky have considerably diversified their hugely important and time-consuming roles to fill the gap left by Tere. Both have been most worthy Assistant Editors on the current volume.

Issues of nomenclature have at times risen to the forefront, as in other volumes, and there are two particular cases that probably merit brief explanation. The family of the Wallcreeper (*Tichodroma muraria*) has for some years been given by various authors in two different versions, Tichodromidae and Tichodromadidae. Until the present volume HBW had adopted the latter spelling, as used, for example, by the Peters *Check-List*. However, closer examination of the case led us to the clear conclusion that, in accordance with Article 29 of the International Code of Zoological Nomenclature, the correct name is Tichodromidae (Art. 29.3.2), as indeed already indicated in Bock's (1994) monograph on the *History and Nomenclature of Avian Family-group Names*.

The other case in question required the formal establishing of priority between two genus names in the family Nectariniidae. In a recent paper in *Zootaxa* Frank Steinheimer has given *Leptocoma* Cabanis, 1851 priority over *Chalcostetha* Cabanis, 1851 (Nectariniidae) on the Principle of the First Reviser (see Steinheimer 2008b).

Acknowledgements

We are grateful for the kind assistance received from museums and their helpful staff, and we would like to give special thanks to the British Museum of Natural History at

Tring (Robert Prys-Jones, Mark Adams, Katrina Cook, Alison Harding), the American Museum of Natural History in New York (Paul Sweet, Peg Hart, Mary LeCroy), the Smithsonian Institution, National Museum of Natural History in Washington (James Dean), the Royal Museum for Central Africa in Tervuren (Michel Louette), the Peabody Museum at Yale University (Kristof Zyskowski), the Natuurhistorisch Museum at Leiden (Hein van Grouw), the Muséum National d'Histoire Naturelle in Paris (Eric Pasquet), the Australian Museum in Sydney (Walter Boles, Jaynia Tarnawski), the Field Museum in Chicago (David Willard, Mary Hennen), the Bernice P. Bishop Museum in Honolulu (Carla Kishinami) and the Zoological Museum at the University of Copenhagen (Jon Fjeldså, Geert Brovad).

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We have been very fortunate to receive help from many individuals in a variety of ways, including refereeing texts, answering queries, providing access to unpublished information and literature, and proof-reading foreign-language references. We warmly thank Vasil Ananian, Óscar Arribas, Norbert Bahr, Rüdiger Becker, Ulf Beichle, Hans-Martin Berg, Walter Bock, Christiane Boehm, Jenny Bounds, Rauri Bowie, Carol Boyse, Axel Bräunlich, Katja Bräunlich, Stuart Butchart, Robert Cheke, Nigel Collar, Paul Cooper, Normand David, Edward Dickinson, Colleen T. Downs, Bob Dowsett, Françoise Dowsett-Lemaire, Guy Dutson, Jon Fjeldså, Christian Hogrefe, Michael P. S. Irwin, Hans Jakober, Martin Jones, Mikhail Kalyakin, Ragnar Kinzelbach, Guy Kirwan, Theo Kleefisch, Albrecht Manegold, Stuart Marsden, Tiffany Mason, Lionel Maumary, Gerald Mayr, Alan Peterson, Douglas Pratt, Christiane Quaiser, Hans-Ulrich Raake, Pam Rasmussen, Martina Rissberger, Gerard Rocamora, Peter Ryan, Svenja Sammler, Richard Schodde, Christian Sturmbauer, Lars Svensson, Jean-Claude Thibault, Kathleen M. C. Tjørve, Colin Trainor, Magnus Ullman, Laurent Vallotton and Mike Wilson. Particular thanks go to Svenja Sammler for her help in the editing of references, literature searches and the checking of original descriptions, and to Axel Bräunlich for his assistance with proof-reading. We are greatly indebted to Normand David for his generous assistance over several months in checking all the genus- and species-level taxa for gender agreement, correct spelling and other details. We also thank him and Edward Dickinson for being on hand for numerous consultations related to scientific names, their original descriptions and accurate dates. As ever, we would like to show our grateful appreciation to Guy Tudor and Michelle le Marchant for continuing to make available to us a wide array of photographs, which is invaluable for the plate preparation.

The French, German and Spanish names for the volume have been provided by Normand David, Peter H. Barthel, Einhard Bezzel, Renate van den Elzen, Frank D. Steinheimer and Eduardo de Juana, together with their respective associates. We thank them all for this important contribution.

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As a special note, Reuven Yosef would like dedicate his contribution in this volume to the memory of his prematurely departed colleagues Tony Harris (South Africa) and Andreas Helbig (Germany).

For their continued support and assistance, we are grateful to M^a Josep de Andrés, Dolores Buxó, Juan Antonio Cantí, Cam Christie, Marc Duquet, Marta Fenollar, Fortunato Frías, Rosa Llinàs, Albert Martínez-Vilalta, Jordi Martínez-Vilalta, Isabel Martínez, Rafael Martínez, Anna Motis, Mary and Jim Ramsay, Olga Rius, Jamer Rivera, Iván Teba, Virginia Toledo and Aurea Vilalta.

As mentioned above, we are extremely grateful to Lars Jonsson for his most generously supplying the frontispiece to this volume. We also warmly thank Toni Llobet for another of his signature back-cover illustrations.

Finally, we should like to pay a special tribute to Dr Hans Löhrl, who died in June 2001. Dr Löhrl's huge contribution to the study of European birds is well known and much appreciated. When we originally approached him with a view to writing the family Tichodromidae, he was slightly reluctant to take on authorship, due to failing health. However, he did agree, but insisted on writing the text right away, years in advance of his deadline, to make sure that he was able to deliver. We are extremely grateful to him for this contribution, and to his widow, Frau Hildegard Löhrl, for assisting Mike Wilson in various aspects of the updating of the text.

PASSERIFORMES

— Eurylaimi

- Eurylaimidae (Broadbills)
- Philepittidae (Asities)
- Pittidae (Pittas)

— Furnarii

- Furnariidae (Ovenbirds)
- Dendrocolaptidae (Woodcreepers)
- Thamnophilidae (Typical Antbirds)
- Formicariidae (Ground-antbirds)
- Conopophagidae (Gnateaters)
- Rhinocryptidae (Tapaculos)

— Tyranni

- Cotingidae (Cotingas)
- Pipridae (Manakins)
- Tyrannidae (Tyrant-flycatchers)

— Acanthisittae

- Acanthisittidae (New Zealand Wrens)

— Menurae

- Atrichornithidae (Scrub-birds)
- Menuridae (Lyrebirds)

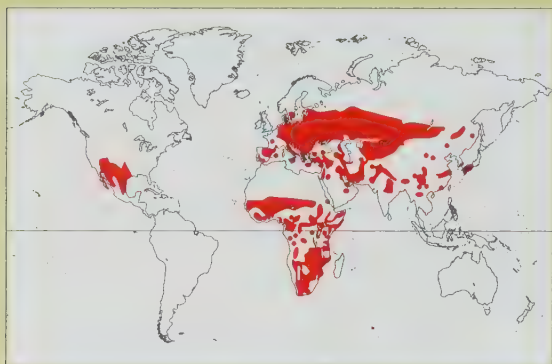
— Oscines

- Alaudidae (Larks)
- Hirundinidae (Swallows)
- Motacillidae (Pipits and Wagtails)
- Campephagidae (Cuckoo-shrikes)
- Pycnonotidae (Bulbuls)
- Chloropseidae (Leafbirds)
- Irenidae (Fairy-bluebirds)
- Aegithinidae (Ioras)
- Ptilonotidae (Silky-flycatchers)
- Bombycillidae (Waxwings)
- Hypocoliidae (Hypocolius)
- Dulidae (Palmchat)
- Cinclidae (Dippers)
- Troglodytidae (Wrens)
- Mimidae (Mockingbirds and Thrashers)
- Prunellidae (Accentors)
- Turdidae (Thrushes)
- Muscicapidae (Old World Flycatchers)
- Platysteiridae (Batises and Wattle-eyes)
- Rhipiduridae (Fantails)
- Monarchidae (Monarch-flycatchers)
- Regulidae (Kinglets and Firecrests)
- Polioptilidae (Gnatcatchers)
- Cisticolidae (Cisticolas and allies)
- Sylviidae (Old World Warblers)
- Picathartidae (Picathartes)
- Timaliidae (Babblers)
- Paradoxornithidae (Parrotbills)
- Pomatostomidae (Australasian Babblers)
- Orthonychidae (Logrunners)
- Eupetidae (Jewel-babblers and allies)
- ...

— ...

- Pachycephalidae (Whistlers)
- Petroicidae (Australasian Robins)
- Maluridae (Fairy-wrens)
- Dasyornithidae (Bristlebirds)
- Acanthizidae (Thornbills)
- Epthianuridae (Australian Chats)
- Neosittidae (Sittellas)
- Climacteridae (Australasian Treecreepers)
- Paridae (Tits and Chickadees)
- Remizidae (Penduline-tits)
- Aegithalidae (Long-tailed Tits)
- Sittidae (Nuthatches)
- Tichodromidae (Wallcreeper)
- Certhiidae (Treecreepers)
- Rhabdornithidae (Rhabdornis)
- Nectariniidae (Sunbirds)
- Melanocharitidae (Berrypeckers and Longbills)
- Paramythiidae (Painted Berrypeckers)
- Dicaeidae (Flowerpeckers)
- Pardalotidae (Pardalotes)
- Zosteropidae (White-eyes)
- Promeropidae (Sugarbirds)
- Meliphagidae (Honeyeaters)
- Oriolidae (Orioles)
- Laniidae (Shrikes)
- Malaconotidae (Bush-shrikes)
- Prionopidae (Helmet-shrikes)
- Vangidae (Vangas)
- Dicuridae (Drongos)
- Callaeidae (Wattlebirds)
- Notiomystidae (Stitchbird)
- Grallinidae (Magpie-larks)
- Corcoracidae (White-winged Chough and Apostlebird)
- Artamidae (Woodswallows)
- Pityriaseidae (Bornean Bristlehead)
- Cracticidae (Butcherbirds)
- Paradisaeidae (Birds-of-paradise)
- Ptilonorhynchidae (Bowerbirds)
- Corvidae (Crows)
- Buphagidae (Oxpeckers)
- Sturnidae (Starlings)
- Passeridae (Old World Sparrows)
- Ploceidae (Weavers)
- Estrildidae (Waxbills)
- Viduidae (Indigobirds)
- Vireonidae (Vireos)
- Fringillidae (Finches)
- Drepanididae (Hawaiian Honeycreepers)
- Parulidae (New World Warblers)
- Cardinalidae (Cardinals)
- Thraupidae (Tanagers)
- Emberizidae (Buntings and New World Sparrows)
- Icteridae (New World Blackbirds)

Class AVES
Order PASSERIFORMES
Suborder OSCINES
Family REMIZIDAE (PENDULINE-TITS)



- Small to very small birds with sharply pointed conical bill, short to medium-length tail and relatively strong toes; plumage rather nondescript, but four species have bold head patterns and males of two others have colourful heads.
- 7.5–11 cm.



- Africa, Europe and Asia, and one species in southern North America.
- Open forest, waterside trees, reedbeds, desert with scattered vegetation, and montane forest.
- 5 genera, 13 species, 45 taxa.
- No species threatened; none extinct since 1600.

Systematics

Formerly treated as a subfamily, Remizinae, within the family of tits and chickadees (Paridae), the penduline-tits were recognized as being worthy of family status by C. Vaurie, in his 1959 review of Palearctic bird species. This decision was supported by K. H. Voous in 1977, in his taxonomic review of Holarctic birds. A decade or so thereafter, C. G. Sibley and J. E. Ahlquist produced a complete revision of the classification system of birds, following the results of their researches into avian phylogeny based on techniques of DNA–DNA hybridization. These authors revived the subfamily Remizinae, which they housed within an enlarged family Certhiidae. Nevertheless, the majority of authors have followed Vaurie and Voous in regarding the penduline-tits as representing a full family. One notable exception is in the 1996 monograph on the tits, nuthatches (Sittidae) and treecreepers (Certhiidae) by S. Harrap and D. Quinn, who continued to treat the penduline-tits and their allies as a subfamily of Paridae.

Of the five genera currently included within Remizidae, three are monotypic, and are quite different both from one another and from the rest of the family. The placement of these species in the present family remains controversial. In particular, these three species, namely the Verdin (*Auriparus flaviceps*), the Tit-hylia (*Pholidornis rushiae*) and the Fire-capped Tit (*Cephalopyrus flammiceps*), differ markedly from the two basic genera of penduline-tits, *Remiz* and *Anthoscopus*, although they do share certain anatomical features, notably the sharply pointed conical bill.

Sibley and Ahlquist, in 1990, moved the Verdin from their subfamily Remizinae and placed it with the gnatcatchers and gnatwrens (Poliophtilidae) in a subfamily, Poliophtilinae, of their very much expanded family Certhiidae. This move was not followed by F. H. Sheldon and F. B. Gill in their 1996 review of songbird phylogeny, which gave emphasis on the tits and their close relatives; these authors returned the species to the Remizidae, which is where it has remained. More recently, E. C. Dickinson, in the third edition of the *The Howard and Moore Complete Checklist of the Birds of the World*, published in 2003, retained the Verdin with the penduline-tits, as also did K. A. Jonsson and J. Fjeldså in their 2006 review and “supertree” of passerine birds. Nevertheless, it does seem extraordinary that such a small Old World group as the penduline-tits should have an aberrant relative living in the deserts of the southern USA

and Mexico; indeed, it may not be long before the Verdin is moved on again, but in the meanwhile it is housed with the penduline-tits.

The tiny Tit-hylia, alone in the genus *Pholidornis*, is the smallest African passerine, and it has had a remarkable taxonomic history. It was originally described, by J. Cassin in 1855, as a flowerpecker (Dicaeidae), but its similarity to these equally tiny, short-tailed canopy feeders of the Oriental and Australasian Regions is likely to be coincidental, having arisen through parallel



The placement and membership of the family Remizidae have had a fairly complex history. On occasion, the penduline-tits have been demoted to a subfamily, Remizinae, included within the treecreepers (Certhiidae) or tits and chickadees (Paridae). It is now generally considered a family in its own right, although the family limits still remain a matter of considerable debate. In addition to these matters, the number of species that should be recognized in the genus Remiz is the main subject of controversy. Some authorities consider there to be a single polymorphic species. However, structural, habitat and plumage differences suggest that there are actually four species, one being the Chinese Penduline-tit.

[*Remiz consobrinus*,
Arasaki, Kyushu, Japan.
Photo: Pete Morris]

evolution, rather than being genetic. It has since been placed variously with the sunbirds (Nectariniidae), the waxbills (Estrildidae), the Old World warblers (Sylviidae), and the tits and chickadees, and alongside the unrelated Green Hylia (*Hylia prasina*) in a new family Hylidae, as well as with the Australasian honeyeaters (Meliphagidae). In 1975, C. J. Vernon and W. R. J. Dean proposed that the Tit-hylia was closest to the penduline-tits, and the two do, admittedly, share similarities in nest construction and roosting habits and in vocalizations, while aspects of their feeding behaviour and basic appearance bear reasonable comparison. On the other hand, *Pholidornis* has bright yellow legs and its upper mandible curves down to the tip, whereas all of the other members of the Remizidae have dark legs and a straight culmen. Until molecular-genetic research sheds light on its true affinities, however, it seems best to keep the Tit-hylia in the Remizidae.

Cephalopyrus, the third and final monotypic genus in the family, is a small bird of Himalayan oak (*Quercus*) forests. In its size and its general plumage coloration, the Fire-capped Tit is reminiscent of a *Phylloscopus* leaf-warbler. With its olive and yellowish plumage and the male's red crown and throat, it is perhaps not surprising that this species was formerly considered to be a firecrest or kinglet (Regulidae), but the final allocation of a family to this little Himalayan-forest oddity seems to be the Remizidae. This is not, however, entirely satisfactory, as *Cephalopyrus*, in contrast to the other species in the penduline-tit family, nests in tree holes, in which habit it resembles the true tits of the family Paridae; moreover, and in common with the Verdin, it lays blue, not white, eggs. Nevertheless, the Fire-capped Tit's song is very like those typical of the genus *Remiz*, as is its small cone-shaped bill, and it is considered best to retain the species in the Remizidae, pending further research. In this connection, it is of interest that the Fire-capped Tit employs a number of feeding actions and other movements which are typical of the penduline-tits, but do not appear in the true tits. In the 1960s, H. Löhr pointed out that *Cephalopyrus*, while feeding, will insert the closed bill into an object to prise it open; it also holds down a food item by grasping this with its foot, and it will reach forwards and, using its foot, pull leaves or food towards itself. All

of these mannerisms are shared with penduline-tits and are not exhibited by the parid tits.

The remaining two genera are the "true" penduline-tits, currently consisting of ten species. *Anthoscopus* contains six species, often termed "kapok tits", which B. P. Hall and R. E. Moreau considered to form a superspecies covering most of sub-Saharan Africa. The Forest Penduline-tit (*Anthoscopus flavifrons*), however, is markedly different from the other five, and C. H. Fry and colleagues, in volume VI of *The Birds of Africa*, considered this inhabitant of West and Central African lowland rainforest to be an independent species and best excluded from the superspecies. The most difficult member of this group to summarize clearly is the Grey Penduline-tit (*Anthoscopus caroli*), which has no fewer than eleven subspecies, these falling into five groups. Within this complex are what could well be two further species, represented by taxa which appear to overlap in range with other subspecies of *A. caroli* but without interbreeding, or which are separated from them by altitude or habitat type. In south Kenya and north Tanzania, the subspecies *sylviella* may be worthy of treatment as a separate species, for which the vernacular name of "Rungwe Penduline-tit" or "Buff-bellied Penduline-tit" has been proposed, with subspecies *sharpei* as a race. Indeed, this was the treatment accorded to these subspecies by Sibley and B. L. Monroe in 1990, but this has not been followed by more recent authorities. Farther south, in north-east Zimbabwe, the very poorly known subspecies *rankinei* may likewise merit elevation to species rank, and the name of "Zambezi Penduline-tit" has been suggested. Unfortunately, so little is known about this taxon that it is impossible to do other than highlight the possibility of its being a separate species, in the hope that researchers will turn to studying its relationships in the field. In this respect, the race *sharpei* is not very well known, either, and how close it really is to *sylviella* remains to be determined.

The final genus, *Remiz*, is no less controversial in the number of species that it contains. Most authors have opted for one polymorphic species, but as long ago as 1940 A. Ivanov pointed out that in the vicinity of the Syr Darya and the lower Waksh of western Tajikistan the breeding ranges of three forms met. He encountered White-crowned Penduline-tits (*Remiz coronatus*) in

All members of Remizidae are small or very small passerines. Even the largest birds, in the genus *Remiz*, do not exceed 11 cm in length.

Morphologically, the five genera have little in common other than a sharp, cone-shaped bill with a straightish culmen.

The Eurasian Penduline-tit has relatively sturdy legs, well suited to a life spent largely in the thick of reedbeds, whereas the more arboreal *Remiz* species have slighter tarsi.

Adults of this genus are relatively colourful and strikingly patterned birds, three species wearing a black facial mask, and the other a full black hood.

Females are duller than males.

[*Remiz pendulinus*
pendulinus,
Santofia, Spain.

Photo: Joseba del Villar]





deciduous forest of willow (*Salix*) and birch (*Betula*), whilst Black-headed (*Remiz macronyx*) and Eurasian Penduline-tits (*Remiz pendulinus*) only inhabited *Phragmites* reedbeds. In Tajikistan clearly these three penduline-tits were behaving as three species, with no evidence of interbreeding. Black-headed and Eurasian Penduline-tits do, however, hybridize in two areas of the lowlands flanking the Caspian Sea, namely the delta of the River Ural in the north and, in the south-west, the region between Lenkoran and the River Kura. The variable hybrid population at the mouth of the Ural has been given the name *bostanjogli*,

and those in the zone of variable hybrids in the south-west Caspian lowlands have been named as, respectively, *loudoni* and *altaicus*; the last-mentioned is sometimes recognized as a valid subspecies. On the other hand, the Black-headed Penduline-tit overlaps widely with the White-crowned Penduline-tit without interbreeding, a situation which has created a difference in habitat preferences, the former species favouring reedbeds while the White-crowned is more at home in open woodland or bushy hill-sides. Opinions on the speciation of *Remiz* held by Russian taxonomists and scientists tend to differ from those of most of their European counterparts, although one may suppose that the position of the Chinese Penduline-tit (*Remiz consobrinus*) has not yet been considered by the Russian taxonomists, for it has only very recently been found in the Russian Far East. Earlier, in 1955, L. A. Portenko treated *Remiz* as consisting of one variable species, whereas I. A. Dolgushin, 17 years later, accepted three species, namely the Eurasian, Black-headed and White-crowned Penduline-tits. In 1990, L. S. Stepanyan took a different view, by "lumping" the Eurasian and White-crowned Penduline-tits but treating the Black-headed Penduline-tit as a full species.

For so small a family as Remizidae, there are a surprising number of taxonomic riddles still to be solved. This, combined with the fact that all except one of the species construct an extremely elaborate oval nest of felted materials (see Breeding), helps to make the penduline-tits a most interesting and alluring family.

Morphological Aspects

The 13 members in this family of small arboreal birds range in size from the minute, stump-tailed Tit-hylia, which, with a total length of just 7.5 cm, is Africa's smallest passerine, to the moderately longer-tailed Eurasian penduline-tits, up to 11 cm in length. The tail of most of the species is shallowly notched, and the wings are relatively short and rounded, the outermost of the ten primaries being very short and narrow. Despite their short wings, the two northernmost species, the Eurasian and Chinese Penduline-tits, are long-distance diurnal migrants (see Movements).

Members of the Remizidae are a weakly united group of genera, the single unifying feature being a sharply pointed conical

The genus *Anthoscopus* contains six species, often called "kapok tits". Five of the six are thought to form a superspecies, with a distribution that extends over much of sub-Saharan Africa. As the **Mouse-coloured Penduline-tit** amply demonstrates, the plumage of *Anthoscopus* tends to be rather duller than that of *Remiz*. The six species range through uniform dull olive, grey or brown upperparts and whitish or yellow underparts.

[*Anthoscopus musculus*, Negele, Ethiopia.
Photo: Ketil Knudsen]



It may seem strange that an otherwise entirely Old World family should have a single member in the New World. Such a relationship is not borne out by the results of DNA-DNA analysis, which suggest that the **Verdin** is more closely linked to the gnatcatchers (Polioptilidae). Nevertheless, most taxonomists currently treat the Verdin as a monotypic genus within Remizidae. This distinctive, tit-like bird inhabits the deserts of the southern USA and Mexico. The predominantly grey-brown plumage of the adult is offset by a shocking golden-yellow head, and, to a lesser extent, by the bright chestnut lesser upperwing-coverts.

[*Auriparus flaviceps ornatus*, Saguaro National Park, Tucson, Arizona, USA.
Photo: Dave Maslowski/
Maslowski Productions]

bill, which has a more or less straight culmen, although the culmen of the Tit-hylia is slightly decurved and that of the Forest Penduline-tit is almost imperceptibly so. As with the tits and chickadees of the family Paridae, the nostrils are hidden by the feathers at the base of the upper mandible. The legs and feet of the majority of the remizid species are strong, but they vary among similar species and even among some subspecies. In the genus *Remiz*, for example, the strongest bill and legs are possessed by those species which prefer reedbeds, the Black-headed Penduline-tit being a particularly good example, whereas those species which prefer bushes, such as the White-crowned Penduline-tit, have markedly more slender legs.

Little external sexual dimorphism is apparent in this family. In all 13 species the sexes are basically similar to each other, but females are on average a little smaller than males. The greatest sexual difference in plumage is found among the Eurasian group of penduline-tits in the genus *Remiz*, but even here the sexes are often difficult to determine. Complications arise because first-year males can resemble females, and also because of the effects of plumage wear on the general appearance of the individual bird. The feathers of the head and breast have dark chestnut bases, but in fresh plumage these feathers have wide buffy or pale tips, concealing the chestnut colour; when the tips are abraded, the chestnut becomes visible as mottling on the sides of the breast and on the crown. This can confuse the unwary observer, especially in view of the plumage complexity of the different subspecies of the Eurasian and Black-headed Penduline-tits, as well as the additional plumages presented in the two zones of hybridization between these two species in the Caspian lowlands.

Whereas adult *Remiz* penduline-tits have a distinctively patterned plumage, with a usually prominent dark facial mask, the Afrotropical genus *Anthoscopus* consists of nondescript species, rather uniformly dull olive, greyish or brownish above and whitish or yellow below, with few distinguishing features. Juveniles of the Eurasian genus *Remiz* are distinct from the adults, being duller in plumage and having a plainer head lacking the bold pattern of the adult. In contrast, juveniles of the Afrotropical penduline-tits are very similar to the adults, but very slightly duller.

The aberrant Fire-capped Tit of Sino-Himalayan distribution and the Verdin of Middle American deserts are distinctive members of the family and bear little resemblance to the others. As already mentioned (see Systematics), the Fire-capped Tit is not unlike a *Phylloscopus* leaf-warbler in size and general olive and yellowish plumage coloration, and in some respects it is reminiscent also of *Anthoscopus*, but the male's red crown and throat in breeding plumage are highly distinctive. The female and the non-breeding male lack the red, although some females in spring display a hint of orange or reddish feathering on the forehead and chin. Juvenile Fire-capped Tits are virtually identical to the non-breeding adults. The Verdin is a small tit-like passerine, the adults' dull grey-brown and whitish plumage coloration relieved only by the dull mustard-yellow head and reddish-chestnut lesser upperwing-coverts. The female is similar to the male, except that her lesser coverts are browner and less bright, but this part of the plumage is generally concealed when the bird is at rest. Juveniles of this species are distinctive; they lack yellow altogether and appear grey, with a paler underside, and with the colour of the lesser coverts greatly subdued.

Finally, the tiny Tit-hylia differs from all other members of the Remizidae in its streaked head, throat and breast, its bright yellow to golden rump and belly and, not least, its bright yellow legs. The sexes are more or less identical, and the juvenile is relatively distinct, being somewhat darker above and having the throat and breast less clearly streaked.

Not surprisingly, all members of the family for which the relevant information is available have a complete post-breeding moult. In this, the primaries are replaced descendantly, from the innermost outwards. A post-juvenile moult is undertaken by the penduline-tits in the genera *Remiz* and *Anthoscopus*, although that of most of the *Anthoscopus* species is poorly known. The Verdin, too, has an incomplete post-juvenile moult. Apparently, southern populations of the Eurasian Penduline-tit sometimes have a complete post-juvenile moult. Moreover, observations suggest that some adult Eurasian Penduline-tits occasionally un-

dergo a partial pre-breeding moult, in the late winter or early spring, although further study is required in order to determine how widespread this phenomenon may be.

Habitat

In combination, the 13 species of the Remizidae inhabit virtually all major forest types. This is particularly so in Africa, where the six species of *Anthoscopus* hardly overlap at all in geographical range. The northernmost of these six, the Sennar Penduline-tit (*Anthoscopus punctifrons*), extends across a narrow belt of the deserts of the Sahel zone and the soudanian savannas from Mauritania eastwards to Eritrea, inhabiting desert scrub and stands of acacias (*Acacia*) in wadis. Immediately to the south, the little-known Yellow Penduline-tit (*Anthoscopus parvulus*) occurs in a band of semi-arid soudanian and northern guinean savannas from the Atlantic coast of Senegal east to south Sudan. In the acacias of north-east Africa, it is replaced by the Mouse-coloured

One of three monotypic genera in Remizidae, the

Fire-capped Tit is a taxonomic mystery of forests from the Himalayas to south-central China and northern Indochina. A tiny passerine weighing just 7 g, this species was previously thought to be a type of kinglet (*Regulidae*), and it shares a short tail and largely yellow-green plumage with that group. The Fire-capped Tit differs from all other members of Remizidae in that it nests in tree cavities, in the manner of tits and chickadees (*Paridae*); and it differs from all except the equally intriguing Verdin (*Auriparus flaviceps*) in that it lays blue, rather than white, eggs. These differences notwithstanding, there are good reasons for situating *Cephalopyrus* within this family. Its song is similar to that of *Remiz*, and it has the fine-pointed bill typical of other family members. It also shares several of the family's distinctive foraging techniques, such as using the bill to prise things open and reaching for food with its feet. Only the male has the red forecrown that led to the English and scientific names and, even then, only during the breeding season.

[*Cephalopyrus flammiceps olivaceus*, Doi Inthanon National Park, Thailand.
Photo: Kanit Khanikul]



Penduline-tit (*Anthoscopus musculus*) over most of Kenya and Ethiopia. Moving south, the lush lowland equatorial rainforests, extending from Liberia eastwards to DR Congo, are home to the Forest Penduline-tit and also to the Tit-hylia. East African broadleaf woodlands support a plethora of subspecies of the Grey Penduline-tit, whereas the more arid semi-desert and scrubby savannas of south-west Africa are favoured by the Cape Penduline-tit (*Anthoscopus minutus*).

In Eurasia, the genus *Remiz* provides for some interesting ideas on relationships, which have already been summarized (see Systematics). Suffice it to say that most of Europe, except for the north and north-west, now harbours breeding Eurasian Penduline-tits, which have invaded from eastern Europe and colonized central and western parts of the continent. This is the most northerly member of the genus, with a breeding range extending eastwards from south Scandinavia and the Baltic countries to western Mongolia and, in the south, to the north of the Caucasus, across Kazakhstan; the southern limit of its breeding range is in the Mediterranean region and west and east Iran. This species' eastern counterpart, the Chinese Penduline-tit, has increased dramatically in recent decades, at least in its non-breeding or passage areas; little is known of its breeding grounds, which lie chiefly in north-east China. Both species favour lakeside and riverine swampy vegetation and tidal marshes. They prefer a good mixture of emergent vegetation, including *Phragmites* reedbeds, with reedmace (*Typha*), poplars (*Populus*) and willows (*Salix*). The habitat choice of the Black-headed Penduline-tit is similar to that of the aforementioned two, but the White-crowned Penduline-tit differs from its three congeners in that it breeds in stands of poplars and willows beside lowland rivers and in floodplain meadows. It also breeds locally on bushy hillsides, and in orchards and walnut (*Juglans*) groves, and it can be found even in the Kyzylkum Desert, in Uzbekistan, where it nests in the saxaul (*Haloxylon*) scrub. The White-crowned Penduline-tit, when breeding, ascends as high as 2400 m in the western Tien Shan. In the winter months it utilizes equally as varied a selection of habitats, notably open forest, tamarisks (*Tamarix*), tree-lined embankments, reservoirs, and sometimes reedbeds. Interestingly, this species shuns reedbeds during the breeding season, but this habitat is popular among White-crowned Penduline-tits wintering in Pakistan.



Africa's smallest bird, the **Tit-hylia**, has bewildered taxonomists since its discovery in the mid-19th century. As a tiny, short-tailed inhabitant of the forest canopy, it was originally described as a flowerpecker (Dicaeidae), but has subsequently been placed variously in a remarkable seven different families! This monotypic genus has now come to rest within Remizidae, sharing similar nests, roosting habits and vocalizations with other remizids. The Tit-hylia differs, however, in its decurved culmen and brightly coloured legs. It may take genetic studies to reveal its true taxonomic affinities.

[*Pholidornis rushiae*
rushiae,
Sanaga River, Cameroon.
Photo: Ketil Knudsen]

The remaining two species are both somewhat incongruous in terms of their habitat choice. The Verdin is a bird of desert scrub in the southern USA and the northern half of Mexico. It is especially fond of woody bushes and thickets growing along dry watercourses in low-lying flat desert, and it reaches elevations as high as 2135 m in Mexico. The other isolate is the Fire-capped Tit, which spends the breeding season high in Himalayan and Chinese forests, usually between 1800 m and 3000 m, post-breeding dispersal taking individuals up to 4300 m in south-east Xizang



The vocal talents of the penduline-tits are fairly unremarkable. The song of the male **Eurasian Penduline-tit** is a rather complex twittering, altering in pitch, and sometimes including mimicry of other bird species. Males tend to sing quietly while nest-building, but increase the volume upon detecting an approaching female. They will often sing from exposed songposts. The typical call of the genus *Remiz* is thin and high-pitched, but surprisingly penetrating. As such, it often offers the first clue as to the bird's presence.

[*Remiz pendulinus*
pendulinus,
Kiskunság National Park,
Hungary.
Photo: Markus Varesvuo]

in September. Western populations of the Fire-capped Tit breed in mixed broadleaf forests of oak, hazel (*Corylus*), elm (*Ulmus*) and walnut just below the coniferous alpine zone. In Ladakh, in north-west India, the species is found breeding in alpine scrub, as well as in orchards and stands of poplars, whereas the little-known eastern populations, in China, seem to prefer fir (*Abies*), spruce (*Picea*) and rhododendron (*Rhododendron*) forests. Western populations of this species descend in winter and can be seen in gardens and parks and in willow thickets by rivers and lakesides. Non-breeding visitors spend the season mainly on the plains of central India, where parks and gardens with stands of large trees in fruit or flower attract them.

General Habits

Of the 13 species currently included in the Remizidae, only three or four have been reasonably well investigated. Notable among the older studies is that on the White-crowned Penduline-tit in Transbaikalia and Mongolia carried out 80 years ago by Madame E. V. Kozlova. It is, however, the Eurasian Penduline-tit that has received the most attention, and a monograph on this species, written by M. Schönfeld, appeared in 1994. The fascinating variety of reproductive systems employed by this penduline-tit has been realized only through extensive colour-ringing undertaken by D. Franz and colleagues in the 1980s in Bavaria, in southern Germany, and at Lake Neusiedl, in east Austria. This species' breeding behaviour is discussed in greater detail later (see Breeding).

Eurasian Penduline-tits roost at night both solitarily and communally. Outside the breeding season, they normally roost in reeds or other suitably dense vegetation, such as willow thickets, but in the period preceding breeding they use the partly built nest for this purpose. One small flock was recorded as roosting in a hole in a wall. Early in the breeding season, in the valley of the River Main, in Germany, both local breeders and passage migrants were found to be roosting in reeds or thickets, even though the local breeders were already constructing nests several kilometres from the roosting site. Immediately after the nesting process is completed, the fledged brood, at first accompanied by a parent, gen-

erally sleeps at night in the nest, occasionally using the nest of another pair, or the family-members sometimes roost together in reeds. Little is known about the roosting behaviour of this species at other times of the year. In captivity, four individuals roosted solitarily in the early months of the winter, but later, in January, they slept together in a row, tightly huddled, very much as do Northern Long-tailed Tits (*Aegithalos caudatus*). This warmth-conserving behaviour diminished during February, and by mid-March had ceased altogether. In the Netherlands, wild-living Eurasian Penduline-tits were thought to be roosting in an old nest in December, but no confirmation of such behaviour has been obtained.

In Africa, the members of the genus *Anthoscopus* are basically similar to one another in behaviour, as typified by the Grey Penduline-tit. Unlike the *Remiz* species, they tend to avoid reedbeds and direct contact with wetlands, and are true forest birds. They forage actively in the tree canopy in pairs or in small parties, which are presumed to be family groups. Flitting from tree to tree, in follow-my-leader fashion, they inspect the foliage, sometimes achieving this by swinging upside-down in leaf clusters and flowerheads. Grey Penduline-tits will also feed much lower down, even descending to ground level at times, but chiefly when low-growing shrubs are in flower. Group-members keep in contact with each other by means of constant calling, and they readily associate with mixed foraging parties of other small birds, particularly white-eyes (*Zosterops*) and eremomelas (*Eremomela*).

Extensive studies of the closely related Cape Penduline-tit were made by C. J. Skead, who published the results in 1959. This species replaces the Grey Penduline-tit in semi-desert conditions, spending much of its time in low bushes, but only rarely is it seen on the ground itself. Cape Penduline-tits, too, freely join up with mixed parties of small birds, including Grey Penduline-tits in areas where the two overlap in range; somewhat oddly, however, although Cape Penduline-tits will join foraging Grey Penduline-tits, the latter seem not to join foraging groups of Cape Penduline-tits. The extraordinarily elaborate nest (see Breeding) is utilized also for roosting. Towards the end of the breeding season, two or possibly even three broods of Cape Penduline-tits will roost together with their parents in the nest. In one observed instance, a flock of 21 individuals tried to enter a

Most songs and calls of the genus *Anthoscopus* are variations on a rather prosaic theme, comprising repetitions of a single note. In the case of the **Cape Penduline-tit**, the high-pitched song is rather plaintive. It may be given either from a prominent perch, as here, or from deep within the canopy. The male may draw further attention to himself by performing a short display flight. Members of this species communicate with each other using two types of contact call, one rasping and the other ringing. They also utter a thin hiss, repeated several times.

[*Anthoscopus minutus*
minutus,
West Coast National Park,
Western Cape,
South Africa.
Photo: Peter Ryan]



single nest; 18 of these succeeded, but three were obliged to roost elsewhere. Penduline-tits do not always use their own nests for roosting. Indeed, they often appropriate the disused nests of various species of weaver (Ploceidae) for this purpose.

The peculiar Tit-hylia was originally described as a flowerpecker (see Systematics), and it has much in common with the members of that family. Like them, it is a difficult species to study owing to its tiny size and its habit of foraging high in the canopy of tall forest trees. It travels in small parties of up to seven individuals, flying directly from one tree to another. It moves quickly as it gleans food items within or beneath the foliage, concentrating its effort at bunches of leaves or clusters of flowers. Like the flowerpeckers, it is fond of mistletoe (Loranthaceae) clumps and vine tangles, through which it hops, flicking its wings while peering under leaves and pecking at bark crevices. Because of its tiny size, it sometimes becomes caught up in spider (Araneae) webs. The Tit-hylia is a communal rooster, with up to five individuals reported sharing a nest at night after the end of the breeding season.

In complete contrast to the above-mentioned species, the Verdin is a desert specialist that has to endure extreme temperatures. These range from about 35°C, and occasionally as high as 45°C, in the daytime to below freezing at night, and it is not surprising, therefore, that the Verdin goes to roost early and leaves relatively late in the morning. It is said that, in its harsh desert habitat, it does not drink water; presumably, it is able to acquire sufficient moisture from its diet. The Verdin has received a fair amount of attention, culminating in several papers by W. K. Taylor, in the 1970s, and M. D. Webster's monograph, in 1999. Verdins are usually encountered in pairs or in small family parties, holding both winter and breeding-season territories. They often join mixed-species flocks, but perhaps only when these are moving through the Verdin's territory. This species keeps mostly to bushy cover, preferring not to show itself in the open. It forages through foliage and searches the flowers of desert shrubs, inspecting the bark and leaf clusters by swinging upside-down in tit-like fashion. It utilizes one of its strong feet to pull twigs or leaves towards itself for closer inspection. Each individual builds a number of roosting nests throughout the territory, the two sexes acting independently and not assisting each other, but males build more of these nests than do females. Roost-

ing nests are often smaller than those used for breeding; they tend to be built around a branch fork, and to have a shallower cup and more centrally placed entrance. The adults do not roost together, but the fledged young often occupy a roost nest with one of their parents.

Finally, the kinglet-like Fire-capped Tit possibly bridges the gap between the true tits in the family Paridae and the penduline-tits. It is a sociable species in winter and during migration, and small groups are not unlike Oriental White-eyes (*Zosterops palpebrosus*) in behaviour as they move from tree to tree, foraging with other small birds in the upper canopy of fruiting trees. Fire-capped Tits search for insects in the middle and upper canopy of tall trees, and on passage often in riverine bushes, too. They are usually found in small parties, but considerable gatherings of 100 or so individuals have been reported. Flocks sometimes gather on bare trees on hillsides, when they can be reminiscent of tiny finches (Fringillidae). The species regularly joins with mixed parties of other small birds, especially outside the breeding season. The Fire-capped Tit forages in tit-like fashion, swinging upside-down to investigate leaf bunches, and it climbs along the underside of branches, peering into nooks and crannies. Although it feeds with great agility, it seems to "walk" with a deliberate gait, rather like a tiny parrot (Psittacidae), sidling along twigs to "haul in" rolled leaves with the bill. Then, while holding the leaf securely under the foot, it prises open the leaf roll.

Little is known of the maintenance and comfort behaviour of the Remizidae. In the Afrotropics, the Grey Penduline-tit has been observed to bathe by shuffling among short tufts of wet grass, thereby soaking its plumage, and then to fly back up into a tree in order to preen, and the Tit-hylia has been seen to bathe by brushing its plumage against wet leaves. Elsewhere, sun-bathing has been recorded for the Eurasian Penduline-tit, which adopts a spread-eagle posture as it absorbs the sun's rays.

Voice

The penduline-tits are not renowned for their vocal ability. Nevertheless, the distinctive "seeeoouu" given by members of the genus *Remiz* is often the first indication of the bird's presence. This call, thin but remarkably penetrating and reasonably far-

In the calm of the desert dawn, the rather simple song of the Verdin is an efficient means of communication, as it is audible over a considerable distance. The song consists of a series of plaintive whistles, varying in volume and number, admixed with brief twittering. In contrast, the typical Verdin call is a rather sharp note that is sometimes run together into a harsh, abrupt chatter. Pairs and family parties also keep in contact using a weak contact call. This meagre vocalization is all that is required to communicate in the sparse woody bushes and thickets that form the Verdin's habitat.

[*Auriparus flaviceps ornatus*,
Rio Grande Valley,
Texas, USA.
Photo: Tom Vezo]



Small invertebrates provide the bulk of the diet of all penduline-tits.

Members of the genus *Remiz* mainly consume insects and their larvae, as well as spiders

(Araneae). However, they also make the most of other food sources offered by their habitat. **Chinese Penduline-tits** will feed on the seeds of willows, poplars and reedmace.

When foraging in reedbeds, they use the strong, sharp bill to good effect, breaking into hollow reed stems and prising apart crevices in order to extract invertebrates that lurk within. Like at least two other members of the genus, the Chinese Penduline-tit is relatively sociable outside the breeding season, sometimes forming quite large flocks during migration periods and in winter.

[*Remiz consobrinus*,
Happy Island,
Hebei, China.
Photos: Johannes
Ferdinand]



carrying, is given also in flight as a contact note among individuals in migrating parties. Eurasian Penduline-tits have a rather complex song, rising and falling in pitch, which consists of finch-like trills and twittering phrases interspersed with call notes. The song varies somewhat in intensity. The male emits a subdued song while nest-building, but breaks into a more elaborate version when a prospecting female arrives near the partially constructed nest.

Members of the genus *Anthoscopus* have songs and calls based on the repetition of single notes. The Cape Penduline-tit utters a high-pitched and often plaintive "chawee, chawee" or "tseewee, tseewee", repeated six to eight times from a perch or from inside the canopy. At the height of its song it often takes wing in a short courtship flight, uttering an abrupt "zwayt" as it does so. In the acacia savanna in north-east Africa, the Mouse-coloured Penduline-tit utters a rapid rattling trill reminiscent of the sound made by a tinny machine-gun, which is not too far removed from the rhythmic mechanical buzzing of both the Sennar and the Yellow Penduline-tits of Central African savannas. The song of the widespread Grey Penduline-tit is rather variable, the differences possibly being of taxonomic significance. As an example, the East African subspecies *sylviella* has a song described as a thin, yet metallic trill lasting some 2–3 seconds, whereas that of the west Tanzanian race *pallascens* is said to be a high-pitched trill which slowly fades. Most populations of this species utter a short phrase, repeated three or four times, consisting of a prolonged rising note, often preceded by two to four short ones; these can be delivered as a deep rasping "chi-chi-ch-dzzayzza"

or similar, or as a much sweeter, weaker "tsi-tsi-cheweeeee". In contrast, the Forest Penduline-tit of West and Central Africa utters a high-pitched song very much like the sound made by a cricket (Orthoptera) and therefore easily overlooked as coming from an insect; as a consequence, this penduline-tit is a poorly known species. Interestingly, the other rainforest-dwelling member of this family, the Tit-hylia, also produces a remarkably insect-like trill, although its song is relatively loud and is preceded by three or four whistled notes.

When advertising its presence in desert scrub, the Verdin relies on vocalizations. Its loud, plaintive, whistled "tswee, tswee, tswee, tsweet" carries over long distances in the early-morning desert silence. There is some variation in the number of notes and the strength of delivery, and the song may be intermingled with other notes, including short twittering phrases. The Verdin's usual call is a sharp, loud "chip" or "tschk", which has been likened to the sound produced when two ball-bearings are knocked together. This call is sometimes repeated such that it forms a rapid, staccato chatter.

The Fire-capped Tit's song is a prolonged repeated series of short trills and twittering sounds, seemingly a couple of phrases repeated at different speeds and pitches. It can be given during a short song flight, but the songster prefers to deliver its message from the very top of a tall tree, from which the song rises and falls for several minutes. This species' contact calls include a soft and mellow "whitoo-whitoo", and a high-pitched and abrupt "tsit" which is often repeated. Flocks in winter keep up a persistent twittering, and the human observer, if he or she does not ob-



Penduline-tits are active foragers, constantly on the move and investigating potential food sources. Members of the genus *Anthoscopus* inhabit woodland or forest, and are equally at home feeding in the canopy or lower down, in bushes or even shrubs. The diet of the better-studied species mainly comprises insects, including their eggs and larvae. The **Cape Penduline-tit** fits the mould, but also takes small spiders (Araneae), small fruits and small seeds. This species mainly provisions its young with the larvae of butterflies and moths (Lepidoptera) and beetles (Coleoptera). It has also become somewhat of an expert at breaking into plant galls, to extract the larvae of gall-causers (Cynipidae).

[*Anthoscopus minutus*, West Coast National Park, Western Cape, South Africa. Photo: Peter Ryan]

tain a good view, could confuse these with flocks of Tibetan Serins (*Serinus thibetanus*).

Food and Feeding

The diet of penduline-tits consists primarily of small invertebrates. This is especially so during the breeding season, when young birds require a high-protein food supply. Particularly important are small spiders and their cocoons, non-hairy caterpillars and small beetles (Coleoptera). Members of the genus *Remiz* feed also on the fluffy seeds of reedmace, poplars and willows, plants that are generally prominent in the habitat occupied by these birds (see Habitat). They peck at and pull apart the cylinder of reedmace seeds, which are especially important in the winter months. In late summer, Eurasian Penduline-tits switch to foraging in reedbeds, where they take advantage of the seasonal abundance of the mealy plum aphid (*Hyalopterus pruni*), which forms a particularly important component of the bird's diet at this time of the year. The conical, sharply pointed bill is well designed for prising open small objects or small cracks; the penduline-tit inserts the tip of the bill into a small crevice and then forces the mandibles apart. Hollow reed stems provide ideal hibernation sites for many small invertebrates, particularly larvae and pupae of Lepidoptera, and the sharply pointed bill can break into the stems with ease. The Eurasian Penduline-tit forages in the foliage of the outermost branches of poplars and willows; in spring it visits the flowers of willows, perhaps because they attract insects, but penduline-tits may feed also on nectar. Often, a feeding individual holds a willow catkin or a tuft of reedmace seeds in its foot while it breaks into the seeds. It will hold down caterpillars in a similar manner, and decapitate them before swallowing the food.

All of the African species, in the genus *Anthoscopus*, are purely woodland or forest birds, but they feed in a manner similar to that of *Remiz*. They seem, if anything, to be even more active, flitting from tree to tree, often probing while hanging up-

side-down, inspecting crevices in the bark and investigating leaf clusters and flowerheads. The Grey Penduline-tit has a largely insectivorous diet, which sometimes includes ticks (Ixodidae); it augments its diet with small fruits, and it probes the flowers of mountain aloe (*Aloe marlothii*) for nectar. The Cape Penduline-tit, which inhabits dry, semi-desert scrubby country, has developed a habit of breaking into galls of prickly shrubs in order to reach the larvae of the gall-causer inside. It also takes small fruits, such as those of bony-thorn (*Lycium*), and small seeds have been found among the stomach contents of specimens. This species will use its foot to hold larger food items, which it then rips apart.

The Tit-hyllia feeds almost entirely on small invertebrates, especially insects. A good proportion of its food items consists of the hemipteran bugs known as scale-insects (Coccoidea), but small seeds have been found in stomach contents of this species, too. Similarly, Fire-capped Tits are almost entirely insectivorous, although they do consume a certain amount of vegetable material. They have been observed to eat flower buds and young leaves, and they also take the juice or sap exuded from banyan (*Ficus*) leaves. This species holds larger prey items in its foot, extracting the soft contents and discarding the empty "case", but it has not been reported as breaking up an entire item in the manner of parid tits.

The Verdin's diet is made up mostly of insects and spiders, but in autumn and winter small berries are an important additional component, especially as this desert-inhabiting species is said not to drink water. Verdins use their strong toes to grip twigs or leaf buds and then to pull these towards themselves and inspect them. They hold down caterpillars and spider cocoons under the foot, breaking up food items and consuming the lot, as parid tits do.

Breeding

The penduline-tits are named for the incredibly intricate, rather pendulum-shaped nests that they construct. When complete,

the nest has the appearance of an almost pear-shaped felt bag, woven from spiderweb, wool and soft downy plant materials. It is extremely strong and long-lasting, and is attached by means of twigs, which pass through the narrowing "handle" of the nest top.

In Africa, the Cape Penduline-tit is the most studied of the Afrotropical genus *Anthoscopus*, the members of which, it seems, construct nests even more elaborate than those built by the Eurasian species of the genus *Remiz*. Cape Penduline-tits have reduced the possibility of nest predation by incorporating, below the true entrance and nest-chamber, a false entrance leading to an empty false chamber. Entry to the true chamber is by way of a concealed entrance flap; the bird opens the flap, using its foot for this purpose, enters the chamber and closes the flap, which it then seals "Velcro-fashion" with sticky spider webs. The mouth of the false chamber is particularly thick and strong, and this makes it useful as a platform on which the bird can brace itself while opening the "secret door" into the real nest-chamber. This elaborate nest is built by both sexes, in a period of 20–35 days; if the original nest is destroyed by a predator or by storms, however, a replacement can be produced more quickly, in 13–20 days. During construction, when both adults are searching for materials, the nests are likely to be raided by other small birds, especially sunbirds and the larger members of the finch genus *Serinus*, seeking material for their own nests, sometimes to the point that the tits abandon their nest entirely.

With two exceptions, the members of this family lay white eggs. In the case of the Cape Penduline-tit, the clutch contains from four to eight eggs; very rarely, nests of this species hold as many as ten or twelve eggs, but these apparently large clutches are perhaps the product of more than one female. Incubation is undertaken by both sexes, with change-over at the nest taking place every 30 minutes during the day, and the total duration of incubation is 15 days. Both sexes feed the nestlings, chiefly with insect larvae, and they are sometimes assisted by helpers. The youngsters leave the nest at 22–24 days.

It is not only the nests that make these birds so extraordinary, but also their varied mating systems. Although monogamy

prevails, a good proportion of the population of some of the Remizidae are polygamous and even polyandrous. This is true in the case of the well-studied Eurasian Penduline-tit, and perhaps applies to other members of the genus *Remiz*. Extensive colour-ringing of Eurasian Penduline-tits, carried out by Franz and colleagues in the 1980s in south Germany and east Austria, has provided this insight into the complex variety of mating systems employed by this species. In contrast, the Cape Penduline-tit is monogamous but receives assistance from helpers, these being younger birds from previous broods of the pair in question. In a study of several breeding units, eleven consisted of a single pair, two were trios and one was a group of four individuals.

With the Eurasian Penduline-tit, nest-building is initiated by the male in an attempt to attract females, but sometimes pairing has already taken place before the construction work begins. On other occasions, an unmated male may partially construct five or six nests, up to the basic framework, the so-called "basket" stage, before a female arrives on the scene. The partners may stay together to complete the nest, the female incubating as the male continues with the building work, but sometimes the female chases the male away after mating, and she then takes over the remainder of the task of nest construction. In the latter instance, the male then moves on to begin another nest, usually after one or two days' "rest" from nest-building. Male Eurasian Penduline-tits may eventually incubate and rear one of these broods alone, as the females of this species are equally promiscuous and may mate with up to six males in one season. The building of the first nest of the season takes 15–24 days, but subsequent nests can be completed in as little as six or seven days.

The little Tit-hylia has not yet been well studied, in good part because it is an inconspicuous bird of the forest canopy. It is believed to be primarily a monogamous solitary nester, but it is, at least sometimes, a co-operative breeder. In Angola, four individuals of this species were observed as they combined to build a nest, and later two young at the site were watched as they were fed by four adults. The Tit-hylia's nest is rather large

In common with other remizids, the **Verdin** is an agile forager, reminiscent of the tits and chickadees of the Paridae. Swinging upside-down, the bird clasps a leaf, bud or twig in its foot, manoeuvring it into a position suitable for inspection. The Verdin's most frequent quarry is a small invertebrate, particularly an insect or a spider. Large prey items, such as some caterpillars, are held with one foot, then dismembered and consumed; such behaviour again recalls the parid tits. During autumn and winter, the Verdin supplements its diet by taking small berries; these have the additional benefit of providing water, which is important for a desert species that is thought not to drink.

[*Auriparus flaviceps ornatus*,
Madera Canyon,
Arizona, USA.
Photos: Rob Curtis/
The Early Birder]





The *Tit-hylia* forages in small groups high in the rainforest canopy. These energetic feeders fly rapidly between trees to explore clumps of dense vegetation such as leaves, flowers and vine tangles. Here the *Tit-hylia* searches intently under lichens or leaves and probes crevices, trying to find the small invertebrates that feature strongly in its diet. Scale-insects (*Coccoidea*) are a particular favourite, but the discovery of seeds in the stomach contents of specimens suggests that the *Tit-hylia* is not entirely carnivorous. Like the flowerpecker family (*Dicaeidae*) in which the *Tit-hylia* was previously placed, this species frequently forages amidst *Loranthus mistletoe*. Unlike the case of flowerpeckers, however, there is no evidence that it eats mistletoe berries.

[*Pholidornis rushiae denti*, Bwindi-Impenetrable Forest National Park, Uganda. Photo: Ketil Knudsen]

for the size of the bird. It is a ball 15 cm in diameter, made of felted soft plant materials, with an entrance spout pointing vertically downwards. Unlike the nests of the *Anthoscopus* penduline-tits, there is no false chamber. Nevertheless, it is very well made, and is strongly bound to a branch or mass of twigs, and on one occasion a nest of this species was reported as having been built into the old nest of a *Ploceus* weaver.

The Fire-capped Tit differs from all others in the family in that it nests in tree holes. It is an inhabitant of montane forests in the Himalayas and south China, where it prefers to utilize old holes made by barbets (*Capitonidae*) and woodpeckers (*Picidae*) in trees. In some cases, it will excavate or enlarge a small hole in soft or rotten wood. Unlike many of the true tits, which use a lot of material to fill deep holes, the Fire-capped Tit makes a simple cup of rootlets and dry grass, which it lines with feathers and finer grasses. It seems that the female alone builds the nest, although the male often accompanies her and not infrequently sings nearby. This species and the Verdin are the only members of the family to lay blue-green eggs, rather than white eggs. The average clutch of the Fire-capped Tit consists of four eggs, which is a very low figure compared with that of many of the parid tits. Although the incubation and fledging periods are not known, it appears that only the female incubates. She sits tightly and, if a potential predator attempts to enter the nest-hole, she puffs herself up and hisses, this behaviour being exhibited also by the true tits of the family *Paridae*.

So far as is known, the Verdin is monogamous. Both sexes take part in the constructing of the nest, although it is the male that initiates the work. The female becomes most actively involved towards the end of the process, particularly with regard to the lining of the cup. The elaborate nest is a large globe, up to 20 cm across, with as many as 2000 spiny twigs woven into it and around the supporting branches, these twigs being placed with the thorns facing outwards in order to deter potential predators. This complex structure is built in several stages, beginning with a platform of soft materials woven through the supporting twigs, followed by a dome, inside which is the soft lining of feath-

ers, often with some fur and wool. The twigs and spines are interwoven with a variety of soft materials, including feathers, cobwebs, soft seed pods, wool and leaves. The entrance hole is at the side of the nest, obscured by a projecting awning of twigs. Typically, this striking nest is situated up to 3 m above the ground near the end of a low branch of a thorny desert shrub. During the course of its construction, the pair may take materials from old nests, including the relatively large number of roost-nests built by this species, and this perhaps explains why the completion of the nest can require only 4–6 days.

Together with the Fire-capped Tit, the Verdin has a relatively small clutch size, laying only three or four eggs. These are similarly blue-green but, unlike those of the Fire-capped Tit, are finely speckled with reddish. Although only the female Verdin incubates, for a period of 14–17 days, both sexes feed the young, the female taking on the greater share of this duty during the first week. The young leave the nest at 17–19 days of age, but they are still fed by their parents, chiefly the male, for a further 18 days or so. In the meantime, the female settles down to laying another clutch of eggs, as this species produces at least two broods in a season.

Movements

The Verdin, the *Tit-hylia* and several of the Afrotropical penduline-tits are, so far as is known, sedentary. In complete contrast, all of the species in Europe and Asia are strongly migratory, although some populations of both the Eurasian Penduline-tit and the Black-headed Penduline-tit remain in their breeding areas during milder winters. Both Eurasian and Chinese Penduline-tits, the two northernmost species, have undergone massive population and range increases in recent decades, although the source of the large and increasing numbers of the latter is still unclear, as the known breeding sites of Chinese Penduline-tits are relatively few. These two species are long-distance diurnal migrants, moving overhead in small parties.

This male **Eurasian Penduline-tit** has made sufficient progress with building a nest that he has attracted a female (right) to investigate. The nest is at the so-called "basket" stage: the framework is in place, with the pouch hanging from a "handle" that is sturdily attached to the smaller twigs of a tree or bush, or between reed stems in a reedbed. The pendulum-shaped nests give rise to the penduline-tits' English name. Nests in trees tend to be 3–4 m above ground, whereas those in reedbeds will be only a metre or so above ground or water. If the female is satisfied with the nest as presented, she may mate with the male, then either chase him away or let him leave. The female then finishes building the nest on her own, and the male, after a couple of days' break, constructs another nest framework, with which to attract another female. The process may unfold several times, but with a twist. The Eurasian Penduline-tit is not merely polygamous; the species is also polyandrous, females mating with up to six males in a single breeding season. The female may desert the nest once she has laid the eggs and leave the male to incubate and raise the brood alone.

[*Remiz pendulinus*
pendulinus,
 Villagarcía de Campos,
 Valladolid, Spain.
 Photo: Alejandro Torés]



Eurasian Penduline-tits breeding in eastern Europe move south or south-west to their winter quarters, which lie chiefly around the northern and western shores of the Mediterranean Basin, a few individuals reaching the coast of north-west Africa. Juveniles are the first to move out of the breeding areas, most of these leaving from mid-July onwards; a feature of this is a random dispersal northwards, as well as the main migration to the south and west. Adults tend to move out in the first half of August, passage through Germany being recorded from late September to November. Some overwinter at Lake Neusiedl, in east Austria, and vagrants have occasionally spent the winter months in England, but more notable is the significant winter population of up to 500 Eurasian Penduline-tits in lagoons by the Baltic coast of Latvia. Breeding populations from farther east, across south Russia to east Kazakhstan, migrate to non-breeding areas in southern Turkey and eastwards across Iraq and Iran. In addition, surprisingly large numbers have been recorded flying south through Israel to an as yet unknown wintering area, presumably somewhere in north-east Africa. In Europe, spring passage of this species can begin as early as February, passage through central parts, such as Switzerland, reaching a peak in the first week of April but continuing until mid-May.

The Eurasian Penduline-tit's Central Asian counterpart is the Black-headed Penduline-tit, which is less strongly migratory, although it seems likely that its northern and eastern populations move west or south-west to non-breeding grounds in the Caspian lowlands of north Iran. Some, however, remain as far north as southern Kazakhstan, and two winter specimens from Israel have been identified as hybrids between Eurasian and Black-headed Penduline-tits of the type known as "*altaicus*", originating from the Caspian region (see Systematics). As large numbers of Eurasian Penduline-tits of the subspecies *caspius* spend the winter months in Israel, it seems likely that some Black-headed Penduline-tits could occur with them, and observers should look out for the latter also in south Iran and Iraq. Indeed, there is a sight record of a "black-headed" penduline-tit at Muscat, at the entrance to the Persian Gulf, on 29th March 1971. Even in Central Asia, the spring passage of the Black-headed Penduline-tit begins early, with reported movement through Turkmenistan from late February into early March, and through Tashkent, in



This male **White-crowned Penduline-tit** is putting the finishing touches to a nest. Both sexes build the nest, but once the basic structure is in place, the female switches duties to egg-laying and incubating, while the male completes construction. As in other Remiz species, the nest is a rather long globular pouch, with a downward-pointing entrance tube to one side. It is made of woven plant fibres and down from trees such as willow (*Salix*) and poplar (*Populus*). The nest hangs 6–8 m above ground from the end of a horizontal tree branch.

[*Remiz coronatus coronatus*, near Chilek, east of Almaty, Kazakhstan. Photo: David Fisher]

Uzbekistan, from mid-March to early April. The autumn passage in these regions takes place from late September until the start of the winter.

White-crowned Penduline-tits arrive on their breeding grounds in Mongolia in late May and early June, departing again in September and October, and a similar picture prevails in southern Siberia and Kazakhstan. The entire population of this species is migratory, although, in mild winters, a few remain in the lower-lying parts of Uzbekistan and Tajikistan. Migrants pass through



This **Verdin** is safely tucked away within its nest, where it may be incubating. The Verdin is monogamous, and both partners play a role in building the nest. The male does the bulk of the early work, the female becoming involved towards the end, taking particular responsibility for the soft lining of the cup. The nest is a striking construction, up to 20 cm in diameter, with as many as 2000 spiny twigs woven together into a dome. The spines are deliberately placed towards the outside so as to impede the approach of potential predators. Remarkably, the nest takes just 4–6 days to build, in part because the birds take material from old nests or roosting nests.

[*Auriparus flaviceps ornatus*, Tucson, Arizona, USA. Photo: Rick & Nora Bowers/VIREO]

Members of the Afrotropical genus *Anthoscopus* construct remarkable nests that eclipse even those of the genus *Remiz*. The nest is a strong, durable felt bag, almost pear-shaped and intricately woven from soft plant materials, wool and spider webs. This sturdy construction would probably be enough in itself to deter predators, but members of *Anthoscopus*, such as this **Grey Penduline-tit**, go one step further. By furnishing the nest with an obvious entrance hole, they entice potential predators into what transpires to be a false nest chamber. To access the real nest chamber, the penduline-tit opens a concealed entrance flap or "hidden door" with its foot, enters the chamber, and re-seals the flap with sticky spider webs.

[*Anthoscopus caroli hellmayri*, Stone Hills Game Sanctuary, Zimbabwe. Photos: J. R. Peek]



south-west Turkmenistan en route to non-breeding grounds in east Iran and south-west Afghanistan, where they are present from November to February. Small parties recorded in March in Xinjiang, in north-west China, although initially suggestive of breeding, were probably also on passage. Small wintering flocks arrive in Pakistan from as early as late September in some years, but the majority do not reach that country until December, remaining there until the end of March. On spring passage, White-crowned Penduline-tits have been recorded from mid-March to mid-April farther north in Pakistan, and a few penetrate to the borderlands of north-west India. Elsewhere, a vagrant of this species was trapped on 1st August 1987 at Lake Neusied, in Austria, and it is likely that others reach Europe, and perhaps especially the Near East, where Eurasian Penduline-tits from the north Caspian region are known to occur.

Chinese Penduline-tits are present on their breeding grounds in north-west Jilin from mid-April until late September, and are recorded from late April in south Liaoning, where they may be only passage migrants. This species is fairly common on spring migration through North Korea in April and May, but in nearby South Korea small numbers are present in the non-breeding season, from October to May. The Chinese Penduline-tit appears to migrate on a narrow front through north-east China, its main wintering areas lying along the middle and lower reaches of the River Yangtze, in eastern China, and along the River Nu Jiang, in west Yunnan; increasingly, small numbers can be found in winter at the Mai Po Marshes, in Hong Kong, from November to mid-April, some remaining into May. Since the 1970s, this member of the family has become a locally not uncommon winter visitor to Kyushu and Honshu, in south Japan, and in March 1987 a vagrant was recorded farther south, on Okinawa, in the central part of the Ryukyu chain of islands.

The Fire-capped Tit is an altitudinal migrant, the western, nominate race moving farthest, but the distributional division of the two subspecies in the Nepalese Himalayas is uncertain. Those in the Western Himalayas arrive on their breeding grounds from late March to mid-April, departing again in late August and through September, although few are reported in autumn. This apparent scarcity in autumn is no doubt due to the lack of red on the fresh-plumaged males at that time of the year, rendering them more inconspicuous. Some may remain in the foothills, but the majority spread out over the Indian plains from south Uttar Pradesh and east Rajasthan south through much of Madhya Pradesh. The eastern subspecies, *olivaceus*, is less well known but it seems to move to the foothills of the mountains for the winter, although some do stray farther. There are reports of small parties of Fire-capped Tit appearing as vagrants in the southern Shan States of Myanmar, in north-west Thailand and in north-west Laos.

Finally, the Afrotropical members of the family are more sedentary, but doubtless most species do make movements of varying extent subject to local conditions, such as drought or the intensity of seasonal rainfall. This may apply only at the edge of a species' range, and not over the whole of it. The Yellow Penduline-tit is a good example. This species visits the coastal forest regions of Senegal, Gambia and Mauritania only during the wet season, retreating inland as the dry season advances. In Ghana, it seems to have disappeared from the Mole National Park by the height of the dry season, whereas it is common there during the wet season, from May to September. In contrast, no such seasonal fluctuations have been reported for this species in Nigeria. Similarly, the widespread Grey Penduline-tit is very sedentary, but it does move around according to local conditions. In the austral winter it descends into the Zambezi valley of Zimba-

bwe, and in Kenya its sporadic appearance at Lake Baringo suggests that dispersal of individuals is a regular habit of the species.

Relationship with Man

Penduline-tits have little direct contact with man, although the Eurasian Penduline-tit has increased dramatically since the 1950s, aided partly by changes in habitat and riverbank management (see Status and Conservation). It is, of course, the nest which has always attracted the attention of humans. Indeed, nests of Eurasian Penduline-tits were in earlier times often used as children's slippers in parts of Central Europe. In the equatorial forests of West and Central Africa, the nests of Forest Penduline-tits were traded as curios to European explorers.

Otherwise, any influence that these passerines have had on human beings is minimal. They are popular among birdwatchers, but it seems unlikely that other people would even be aware of their presence, except, perhaps, for wondering what could be the source of some of the vocalizations uttered by the Remizidae (see Voice).

Status and Conservation

None of the 13 members of the family is considered to be globally threatened, and all are deemed to have ranges sufficiently extensive to ensure the survival of the species. There is, nevertheless, some cause for concern over certain populations in Central Asia and southern Siberia. The White-crowned Penduline-tit no longer occurs in the Minusinsk Depression, having been lost as a result of intensified economic development. Similarly, some populations of the Black-headed Penduline-tit have no doubt been eradicated through massive irrigation schemes, causing the drying-up of the Aral Sea, but the main concern with this species centres on the distinctive dark race *nigricans*, restricted to the Sistan depression, in south-east Iran. This subspecies has not been seen for many years, and it may well be extinct, but there is a possibility that it could survive unrecorded in adjacent south-

west Afghanistan, where the massive lake of Hamun-i-Puzak, a Ramsar site, holds permanent water and formerly had extensive reedbeds. On the other hand, periodic droughts in this region of Afghanistan, and reed-cutting by villagers, must have had a negative impact, although the most serious threat is the proposal to build a paper factory in nearby Helmand Province, using reeds as raw materials. It remains to be seen whether or not this proposal will become a reality.

The status of the Chinese Penduline-tit is more encouraging. This remizid has shown a remarkable increase in its populations both on migration and in winter, and it has extended its non-breeding range into southern Japan and south to Hong Kong. The whereabouts of its main breeding grounds, however, remain something of a mystery.

Although none of the African species is currently under threat, certain subspecies of the Grey Penduline-tit are poorly known. This is particularly the case with the distinctive richly coloured race *rankinei* of north-east Zimbabwe, which could possibly represent a separate species and is in particular need of taxonomic investigation (see Systematics). The future of two other Afrotropical species, the Sennar and the Yellow Penduline-tits, seems reasonably bright, as, unlike many specialized small birds, they appear to tolerate habitat degradation caused by chopping for firewood and overgrazing by domestic animals, particularly goats. The larger Forest Penduline-tit and the diminutive Tit-hylia are reasonably widespread, but knowledge of various aspects of their lives remains rather poor. Indeed, the south-east DR Congo race *ruthae* of the Forest Penduline-tit is known from just two specimens and less than a handful of field observations. These inhabitants of lowland rainforest have suffered through excessive tree-felling; they do need forest clearings with flowering trees.

Of the remaining members of the family, only the eastern subspecies of the Fire-capped Tit seems poorly known, this being particularly true in respect of its non-breeding distribution. It is probable that it winters in foothill forest, rather than, entering the Indian plains as does the western race (see Movements).

Since the 1950s, the Eurasian Penduline-tit has increased dramatically, partly as a result of changes in habitat management



This adult **Verdin**, probably a male judging by its chestnut lesser upperwing-coverts, is feeding a nestling. Clutch size in this species is 3-4, but pairs usually make up for this relatively low number by raising two broods per breeding season. The female incubates the eggs alone for 14-17 days. When the eggs hatch, she provides most of the food during the first week, after which the parental balance is more even. When 17-19 days old, the young fledge. They remain dependent on their parents for a further 18 or so days. The male shoulders most of the responsibility for feeding, leaving the female free to lay a second clutch.

[*Auriparus flaviceps acaciarm*, Anza Borrego Desert State Park, California, USA. Photo: Rob Curtis/The Early Birder]

Bringing food to a hungry brood is just one parental task for the **Eurasian Penduline-tit**. It is also the adult's job to keep the nest clean and thereby minimize the risk of disease. An important task is the removal of the faecal sacs excreted by the chicks, which would otherwise build up inside the nest, with the consequent health risks. The adult collects each sac and flies rapidly and discreetly away from the nest, depositing it sufficiently far away to avoid its attracting predators to the brood.

[*Remiz pendulinus pendulinus*, Navarra, Spain.
Photo: José Luis Gómez de Francisco]



made by humans. The spread of fish farms and gravel pits, and the creation of lakes by subsidence from mining, as well as open-cast mining, have all helped to provide better habitats for this species. The eutrophication of lakes and slow-flowing rivers has permitted the growth of many plants that provide penduline-tits with materials, such as hops (*Humulus*) and nettles (*Urtica*), for nest construction. It is possible that similar factors may lie be-

hind the increase in numbers of passage and wintering Chinese Penduline-tits, mentioned a few paragraphs above, but, as stated, the breeding grounds of this species are scarcely known. Another positive factor, this time in parts of Africa, has been the the planting of cotton. This has provided a welcome source of nesting materials for some of the *Anthoscopus* species.

Patchily common over most of its range, the sole New World member of the family, the Verdin, is thought to have increased in Arizona and north-west Mexico along with the spread of mesquite (*Prosopis*) scrub. In the north-east parts of its range, however, it is rare. The large number of nests which each pair produces can create a false impression of abundance, making this a very difficult bird to census. Nevertheless, it is considered not to be at any risk.

General Bibliography

- Ali (1962), Ali & Ripley (1973), Anon. (2007j), Archer & Godman (1961), Ash & Miskell (1998), Bannerman (1948, 1949), Bates & Lowther (1952), Beaman & Madge (1998), Benson (1946), Bent (1948), Bochenki (1998), Bock (1994), Borrow & Demey (2001), Brazil (1991), Britton (1980), Brosset & Érad (1986), Burkovskiy (1997), Butchart & Stattersfield (2004), Chapin (1954), Cheng Tsohsin (1987), Cramp & Perrins (1993), Cyrus & Robson (1980), Dementiev *et al.* (1954a, 1970), Dickinson (2003), Dickinson *et al.* (2006a), Dolgushin *et al.* (1972), Dowsett & Forbes-Watson (1993), Eck & Martens (2006), Evans (1994), Flade & Franz (1993), Flade *et al.* (1986), Franz (1988a, 1991), Fry *et al.* (2000), Gallagher & Woodcock (1980), Gatter (1988), Ginn *et al.* (1989), Grimes (1987), Grimmett *et al.* (1998, 2000), Haffer (1993f), Hagemeijer & Blair (1997), Hall & Moreau (1970), Harrap & Quinn (1996), Hockey *et al.* (2005), Irwin (1981b), Ivanov (1940), Jensen & Kirkby (1980), Jönsson & Fjeldså (2006a), Kinzelbach (1984), Kozlova (1930), Lawson (1961), Lewis & Pomeroy (1989), Löhrl (1981), MacKinnon & Phillippis (2000), Mackworth-Praed & Grant (1960, 1973), Mead (1985), Melville & Galsworthy (1991), Oberholser (1897), Phillips (1986), Portenko (1955), Rasmussen & Anderton (2005a, 2005b), Roberts (1992), Robson (2000b), Rogacheva (1992), Roselaar (1995), Schönfeld (1994), Schüz (1990), Sefc *et al.* (2003), Serle (1965), Sheldon & Gill (1996), Shirihai (1996), Sibley (1996), Sibley & Ahlquist (1990), Sibley & Monroe (1990, 1993), Skead (1959), Snow (1967b), Snow & Perrins (1998), Stepanyan (1990), Stuart Baker (1922, 1932), Taylor (1970a, 1970b, 1971), Terres (1980), Traylor (1968), Vaurie (1950a, 1952, 1957a, 1959), Vernon & Dean (1975), Voous (1977), Webster (1999), Wilder & Hubbard (1938), Williams *et al.* (1992), Wunderlich (1991c), Zimmerman *et al.* (1996).

This brood of five young **Eurasian Penduline-tits** appears to be in the process of leaving the nest; indeed, one juvenile has already ventured outside the increasingly cramped confines of the nest. The nest entrance tunnel has fallen off, presumably as a result of the chicks' movement.

The birds are thus exposed to the elements, and the nest no longer provides effective protection. Once the young have left the nest, they continue to be fed by a parent for a further fortnight before becoming independent. In late summer, neighbouring broods may join together into loose foraging flocks of 20–30 juveniles.

[*Remiz pendulinus pendulinus*, France.
Photo: Frédéric Fève/Bios]





Genus *REMIZ* Jarocki, 1819

1. Eurasian Penduline-tit

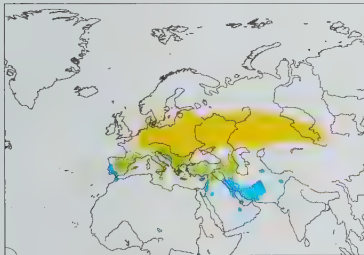
Remiz pendulinus

French: Rémiz penduline **German:** Beutelmeise **Spanish:** Pájaro-moscón Europeo
Other common names: Penduline Tit, Common/European/Masked/Western Penduline-tit

Taxonomy. *Motacilla pendulinus* Linnaeus, 1758, Poland, Lithuania, Hungary and Italy. Forms a species group with *R. macronyx*, *R. coronatus* and *R. consobrinus*, and all four often combined as one species; sometimes present species considered conspecific with *R. macronyx*, and the other two united as a separate species. Treatment as four distinct species based mainly on structural, as well as plumage and habitat, differences. Present species frequently hybridizes with *R. macronyx* by N & SW shores of Caspian Sea; hybrids in N (mouth of R Ural) named as *bostanjogli*, and those in S as, respectively, *loudoni* and *altaicus*; last-mentioned sometimes treated as a valid race. Birds of this species in Syria (and possibly extreme N Israel) of uncertain racial identity, provisionally placed in *menzbieri*. Additional proposed races are *persimilis* (described from Ereğli, in S Turkey), which is synonymized with *menzbieri*, *castaneus* (from Astrakhan), included in *caspius*, and *barabensis* (from Baraba and Kulunda steppes, in Tomsk area of W Siberia), treated as a synonym of *jaxarticus*. Four subspecies recognized.

Subspecies and Distribution.

R. p. pendulinus (Linnaeus, 1758) – breeds Denmark and S Sweden E in W Russia to R Ural, S to Iberia, France, lowland Italy and Sicily, Greece and Crete, W Turkey and foothills of NW Caucasus. *R. p. menzbieri* (Zarudny, 1913) – Turkey (except W), Armenia, Azerbaijan, NW Iran and Syria, possibly also extreme N Israel. *R. p. jaxarticus* (Severtsov, 1873) – E of Urals in W Siberia and N Kazakhstan E to NW foothills of Altai. *R. p. caspius* (Peltsam, 1870) – plains of SW Russia and NW Kazakhstan (R Volga–R Ural, W coastal lowlands of Caspian Sea and foothills of NE Caucasus).



Descriptive notes. 10–11 cm; 8–12.5 g. A small and relatively long-tailed passerine with conical pointed bill with straight culmen. Male nominate race has black mask extending over lores and ear-coverts and narrowly over base of bill, on forehead narrowly edged with chestnut above the black; crown and nape light grey, shading whiter above mask; mantle, back and upperwing-coverts chestnut, becoming lighter, more buffy, on rump, with uppertail-coverts dark brown; flight-feathers dusky, tertials widely edged light buff (forming pale panel); tail blackish, edged light buff; throat and chest whitish, shading to buffish on breast and dull

rufous-buff on flanks; side of breast often has a few chestnut spots (dark feather bases revealed as pale tips worn away); iris dark brown; bill dark grey, paler base and cutting edges; legs dark grey. Female is similar to male but coloration duller, crown and nape darker grey, mask less extensive over ear-coverts and narrower or absent over base of bill, mask also more grizzled with light buff; dark centres of wing feathers less contrasting. Juvenile is rather nondescript, has head and upperparts dull light greyish-buff, contrasting little with light buff of underparts, sometimes whiter throat and diffuse light eyering and supraloral stripe evident, as also are pale tertial fringes in fresh plumage; first-year male may have reduced mask, and can be difficult or impossible to distinguish from adult female. Races differ mainly in plumage tones, but complicated by individual variation and age differences: *menzbieri* is paler than nominate, with almost whitish rump, and lacks chestnut above base of bill; *caspius* male has most of forehead chestnut, sometimes also most of crown and nape (but usually some pale grey on upper nape), rump and uppertail-coverts very pale, latter almost whitish with dark shaft streaks, very pale fringes of wing feathers, more obvious spotting at side of breast, female usually has some rufous patches on crown and forehead, chestnut of upperparts usually restricted to lower mantle, whiter below than nominate; *jaxarticus* is a little smaller than nominate, has slender feet and smaller bill, also paler, with mantle cinnamon-rufous, rather than chestnut. **VOICE.** Usual call a thin, high-pitched and somewhat penetrating “seeoou”, not unlike sound made by unopened gate hinge, and resembling anxiety call of European Robin (*Erithacus rubecula*); varying in pitch and length according to whether bird in flight or foraging or tending nest. Song a variety of twittering phrases, interspersed with call note, and some snatches of mimicry of other bird species’ songs.

Habitat. Favours lakeside and riverine swampy vegetation, including that occurring at fish farms and tidal marshes. Prefers good mixture of emergent vegetation, including reeds (*Phragmites*), with reedmace (*Typha*), poplars (*Populus*) and willows (*Salix*); more locally also in coastal and estuarine tamarisks (*Tamarix*). Mainly lowlands; reported as nesting in poplars and orchards on hillsides in E Turkey and NW Iran, and in E Austria breeds at up to 650 m in some larger valleys.

Food and Feeding. Small invertebrates, chiefly larvae of small insects, also adult stages and their eggs; also seeds. Small spiders (Araneae) particularly important food items in reedbeds; in autumn and winter small seeds, e.g. of willow and reedmace are sought, and in late summer mealy plum aphid (*Hyalopterus pruni*) becomes abundant in reedbeds and then forms particularly important component of diet. Pecks in to hollow reed stems (which provide ideal hibernation sites for many small invertebrates). Forages in foliage of outermost branches of poplars and willows; visits flowers of willows in spring, perhaps for insects, but may also feed on nectar. Often holds willow catkin or tuft of reedmace seeds in its foot while it breaks into seeds; likewise, caterpillars are held down and decapitated before being swallowed. Usually in pairs or small family parties, but in winter and spring sometimes larger gatherings of up to 15 individuals; in late summer, juveniles may form loose groups of 20–30 individuals, with 60 an exceptional gathering. Rarely joins mixed-species parties.

Breeding. Season May–Jun in S Sweden, late Apr to early Jul in C Germany, May in Ukraine, Apr in S France, but not until late Jun in W Russia; reedbeds in E Austria (L Neusiedl) not sufficiently grown until mid-Jun, when birds of present species arrive to commence breeding (having perhaps

already reared a brood elsewhere); some pairs double-brooded. Mating system varies, can be monogamous, but often polygamous or polyandrous, and bond often severed by female after incubation begins. Nest-building takes 15–24 days to complete, but second or third nests constructed in 6–7 days; completed nest a globular pouch of felted plant fibres mixed with cobweb and some feathers, downward-pointing entrance tube at side, sometimes a second entrance tube incorporated, suspended at variable height (generally 3–4 m) from fork in outermost twigs of tree or bush, or between reed stems, often over water; construction started by male in attempt to attract female, female becomes involved when nest framework complete (“basket stage”); after mating, male often leaves completion of nest to female and begins another nest to attract another female, and so on; male may eventually incubate and rear one of these broods alone, as female equally promiscuous (may mate with up to six males in one season). Clutch 2–7 eggs (mean 5); incubation generally by female alone, period c. 13–14 days; chicks usually fed only by female, nestling period 18–26 days (mean 22 days); in some cases (usually with later clutches), male incubates eggs and rears young on his own; juveniles fed for a further 14 days before becoming independent.

Movements. N populations highly migratory; S ones less inclined to move very far. Most move S or SW to winter quarters, European birds wintering chiefly S & E Spain, S Portugal, W France and Italy, a few reaching Mediterranean coast of Morocco; some overwinter in E Austria (at L Neusiedl), vagrants occasionally in England, but more notable is significant winter population of up to 500 individuals in lagoons by Baltic coast of Latvia. Birds from S Russia, E Turkey and N Iran winter mainly from S Turkey and Iraq over S & E Iran E to Baluchistan (W Pakistan). Juveniles depart from breeding areas first, most leaving from mid-Jul onwards, including random dispersal to N as well as to S & W; adults tend to move out in first half of Aug, with passage through Germany from late Sept to Nov. Surprisingly large numbers have been recorded as flying S through Israel, indicating an as yet unknown wintering area, possibly at the Nile Delta (although very few records for Egypt). Spring passage can begin as early as Feb, with peak passage through C Europe (e.g. Switzerland) first week Apr but movement continuing until mid-May.

Status and Conservation. Not globally threatened. Patchily not uncommon over most of range, but distinctly localized and forming small “colonies” along riversides. Population sizes difficult to assess because of the species’ unusual mating behaviour; breeding numbers cannot be given as pairs, but density can be expressed in terms of nests, highest densities of which range are 9.4–13.8/10 km², or of simultaneously reproductive females, with 4.8–7.8/10 km². Nevertheless, most summaries refer to “pairs”, with basic summaries of up to 200 pairs in France, at least ten in Belgium, five in Luxembourg, 250 in Netherlands, well over 5000 in Germany, 150 in Denmark, up to 100 in Sweden, up to 300 in Latvia, 10,000 in Poland, 5000 in Czech Republic, up to 10,000 in Slovakia, 3000 in Hungary, about five in Switzerland, up to 14,600 in Spain, up to 30,000 in Italy, 3000 in Greece, 2000 in Albania, up to 10,000 in Croatia, 300 in Slovenia, up to 10,000 in Bulgaria, 8000 in Romania, up to 100,000 in European Russia, 12,000 in Ukraine, 1000 in Moldova, 800 in Belarus and up to 500,000 in Turkey. Breeding sporadic in Portugal, Iraq and Syria; exceptionally, has bred in England. Present in Spain since 1950s; in S France had disappeared from Camargue by early 1980s but has become more frequent W of Rhone delta, and now breeding also in N France. Since 1950s, this species has undergone considerable range expansion to W in a series of waves across Europe, but cannot be considered common anywhere; reached C Poland, Denmark, Slovakia, E Germany and E Austria by 1965, then S Sweden and C Germany by 1975, and S Finland, N Netherlands and NE France by 1985. Changes in habitat and riverbank management, the creation of fish farms and gravel pits, and creation of lakes through mining subsidence, as well as open-cast mining, have helped to provide additional and better habitats, of which the species has taken full advantage. Further, eutrophication of lakes and slow-flowing rivers has permitted the growth of many plants which provide materials suitable for nest construction, i.e. hop (*Humulus*) and nettles (*Urtica*).

Bibliography. Beaman & Madge (1998), Bekhuis *et al.* (1993), Cramp & Perrins (1993), Darolová & Kristofík (1993), Darolová *et al.* (1997), Dementiev *et al.* (1954a, 1970), Elias & Ferreira (1994), Flade & Franz (1993), Flade *et al.* (1986), Formon (1987), Franz (1988b, 1991), Franz & Theiß (1983), Gargallo (1996), Giacola (1996), Hagemeijer & Blair (1997), Harrap & Quinn (1996), Hartert (1907a), Haupt *et al.* (1992, 1993), Hudec (1983), Kinzelbach (2002), Löhl (1990), McCarthy (2006), Patrikeev (2004), Persson & Öhrström (1989), Quaglierini (2001), Roselaar (1995), Schleicher, Hoi *et al.* (1997), Schleicher, Valera & Hoi (1993), Schönfeld (1994, 1999), Shirihai (1996), Snow & Perrins (1998), Stepanyan (1990, 2003), Valera, Hoi & Schleicher (1997), Valera, Rey *et al.* (1990), Vaurie (1950a, 1952, 1957a, 1959), Villarín (2003).

2. Black-headed Penduline-tit

Remiz macronyx

French: Rémiz à tête noire **Spanish:** Pájaro-moscón Cabecinegro
German: Schwarzkopf-Beutelmeise

Taxonomy. *Aegithalus* [sic] *macronyx* Severtsov, 1873, Shymkent (Chimkent), Syr Darya, south Kazakhstan.

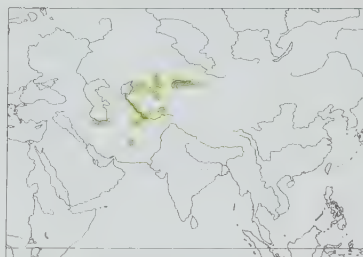
Forms a species group with *R. pendulinus*, *R. coronatus* and *R. consobrinus*, and all four often combined as one species; sometimes present species considered conspecific with first of those, and the other two united as a separate species. Treatment as four distinct species based mainly on structural, as well as plumage and habitat, differences. Present species frequently hybridizes with *R. pendulinus* by N & SW shores of Caspian Sea; hybrids in N (mouth of R Ural) named as *bostanjogli*, and those in S as, respectively, *loudoni* and *altaicus*; last-mentioned sometimes treated as a valid race. Moreover, *ssaposhnikowi* believed probably to have originated as hybrid between nominate race of present species and race *jaxarticus* of *R. pendulinus*, although neither parent found within current range of *ssaposhnikowi*. Race *neglectus* sometimes synonymized with nominate. Birds from Aral Sea region described as race *aralensis*, but considered inseparable from nominate. Four subspecies currently recognized.

Subspecies and Distribution.

R. m. neglectus (Zarudny, 1908) – N Iran and SW Turkmenistan.
R. m. macronyx (Severtsov, 1873) – SW Kazakhstan, Uzbekistan, N & SE Turkmenistan, Tajikistan, and probably NE Afghanistan.
R. m. ssaposhnikowi (H. E. Johansen, 1907) – SE Kazakhstan (L Balkhash, L Sasykkol and L Alakol).
R. m. nigricans (Zarudny, 1908) – SE Iran (Sistan) and probably SW Afghanistan.

Descriptive notes. 10–11 cm; c. 9.3–10.5 g. A small, dark-hooded, buffy penduline-tit; strong legs with large hind claw. Male nominate race has entire head to throat and upper breast sooty black or

On following pages: 3. White-crowned Penduline-tit (*Remiz coronatus*); 4. Chinese Penduline-tit (*Remiz consobrinus*); 5. Sennar Penduline-tit (*Anthoscopus punctifrons*); 6. Yellow Penduline-tit (*Anthoscopus parvulus*); 7. Mouse-coloured Penduline-tit (*Anthoscopus musculus*); 8. Grey Penduline-tit (*Anthoscopus caroli*); 9. Cape Penduline-tit (*Anthoscopus minutus*); 10. Forest Penduline-tit (*Anthoscopus flavifrons*); 11. Verdin (*Auriparus flaviceps*); 12. Fire-capped Tit (*Cephalopyrus flammiceps*); 13. Tit-hylia (*Pholidornis rushiae*).



warm dark brown (feathers finely tipped pale buff when fresh), narrow pale buff collar bordering upper mantle (adding to hooded effect); mantle and upper scapulars chestnut, feathers fringed cinnamon, lower scapulars and back to uppertail-coverts pale cinnamon, becoming almost whitish on uppertail-coverts, which have dark shaft streaks; upperside feathers reddish-brown or blackish, fringed pale cinnamon in fresh plumage; tail blackish, edged off-white; sides of breast chestnut, each feather fringed pale buff, remainder of underparts light buff with dark feather bases (which may be visible to varying extent as pale tips

abrade); iris dark brown; bill dark grey, paler base and cutting edges; legs dark grey. Differs from congeners mainly in absence of grey or white areas on head and nape. Female is similar to male but less well marked, has buff feather tips more extensive, so throat less dusky when plumage fresh. Juvenile is rather nondescript, head and upperparts dull greyish, contrasting little with light buff of underparts; seemingly indistinguishable from juvenile of *R. coronatus*. Races differ mainly in plumage tone and pattern, but confused by individual variation through age, sex and plumage wear: *neglectus* is similar to nominate but smaller; *nigricans* is darkest, dark colour of hood extending over mantle and most of underparts, becoming even darker when plumage worn (most of dark feather bases of underparts then revealed); *ssaposhnikovi* is variable, darker individuals close to nominate, paler ones with some chestnut and whitish on crown and nape and whitish throat (latter easily confused with both *R. coronatus* and hybrids between *R. pendulinus* and present species from Caspian region). VOICE. Poorly documented; calls said to have louder and coarser tone than those of *R. pendulinus*, and male said to give brief, quiet trill in spring.

Habitat. Low-lying lakesides and riverbanks with stands of reeds (*Phragmites*) and reedmace (*Typha*); avoids dense reedbeds.

Food and Feeding. Small invertebrates, chiefly larvae of small insects, also adult stages and their eggs, also small spiders (Araneae); seeds of aquatic plants, particularly Compositae, also taken. Spends most of foraging time in reeds, avoiding trees. Few other details on behaviour; presumed to be much as that of *R. pendulinus*, but flight action said to be slower.

Breeding. Breeds from late May to mid-Jun, following spring rains, and many recently fledged juveniles by mid-Jul. No information on mating system, but perhaps equally as complex as those of *R. pendulinus*. Nest an elongated globular pouch, downward-pointing entrance tube at side, made from felted plant down, feathers and cobwebs along with reed flowerheads, reed leaves stripped into narrower pieces and woven into base, typically built between two reed stems, these usually "tied" together with plaited strips of plant fibres below nest for extra support in windy conditions; often placed as low as 30–120 cm above water level, but if built in tree can be as high as 3 m. Clutch 6–7 eggs; incubated probably by female alone, but little information available; no information on duration of incubation or on nesting period.

Movements. Primarily resident. Some remain all year as far N as S Kazakhstan; likely, however, that at least some of N & E populations move W or SW to winter in Caspian lowlands of N Iran. As large numbers of *R. pendulinus* of Caspian race (*caspius*) spend non-breeding season in Israel, possible that some individuals of present species could occur with them, perhaps also in S Iran and Iraq; sight record of "a black-headed" penduline-tit in N Oman (Muscat, at entrance to Persian Gulf) on 29th Mar 1971 could refer to this species. Passage through Turkmenistan reported from late Feb into early Mar, and through Tashkent (Uzbekistan) from mid-Mar to early Apr; autumn passage from late Sept until start of winter.

Status and Conservation. Not assessed. Common to fairly common in most of range; rare, possibly extinct, in SE Iran. Common along S shores of Caspian Sea in N Iran and in adjacent S Turkmenistan; has been reported even as locally abundant in N Iran, where nests spaced at c. 250 m in prime habitats. Changes in agriculture in C Asia have been dramatic, and Aral Sea virtually lost through massive irrigation schemes; effects on populations of this species probably equally dramatic, but little information available. In S of range, in Sistan depression (in SE Iran), distinctive dark race *nigricans* has not been seen for many years, and possibly extinct; perhaps survives in adjacent SW Afghanistan, where massive lake Hamun-i-Puzak (a Ramsar site) holds permanent water and formerly had extensive reedbeds, but periodic droughts, combined with reed-cutting by local villagers, must have had negative impact; most serious threat in SW Afghanistan is proposal to build a paper factory (using reeds as raw materials) in nearby Helmand Province, but whether or not this will become a reality remains to be seen.

Bibliography. Cramp & Perrins (1993), Dementiev *et al.* (1954a, 1970), Dolgushin *et al.* (1972), Evans (1994), Gallagher & Woodcock (1980), Gavrilov & Zhatkanbaev (1995), Harrap & Quinn (1996), Hartert (1907a), Ivanov (1940), McCarthy (2006), Shirihai (1996), Stepanyan (1990, 2003), Vaurie (1950a, 1952, 1957a, 1959).

3. White-crowned Penduline-tit

Remiz coronatus

French: Rémiz couronnée **German:** Kronenbeutelmeise **Spanish:** Pájaro-moscón Coronado
Other common names: Crowned/Black-headed(?) Penduline-tit

Taxonomy. *Aegithalus* [sic] *coronatus* Severtsov, 1873, Nau, near Khodzhen, Tajikistan.

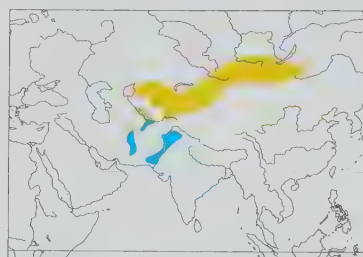
Forms a species group with *R. pendulinus*, *R. macronyx* and *R. consobrinus*, and all four often combined as one species; probably most closely related to *R. pendulinus*, but sometimes considered conspecific with *R. consobrinus* (the other two then united as a separate species). Treatment as four distinct species based mainly on structural, as well as plumage and habitat, differences; present species differs from others in genus in bill and leg structure, as well as habitat preferences. Races intergrade in SE Kazakhstan. Proposed races *centralasiae* (from C Asia) and *yeniseensis* (from Sayan and Tannu-ola, on upper course of R Yenisey, in S Russia) both considered inseparable from *stoliczkae*. Two subspecies recognized.

Subspecies and Distribution.

R. c. coronatus (Severtsov, 1873) – breeds S & SE Kazakhstan, N Uzbekistan, S Turkmenistan and Amu Darya valley, Kyrgyzstan, NW China (Ili valley, in NW Xinjiang), Tajikistan and NE (probably also NW) Afghanistan; non-breeding E Iran, N & W Afghanistan, Pakistan and NW India (E to Haryana).

R. c. stoliczkae (Hume, 1874) – breeds E Kazakhstan, S Russia (from Altai E to Chita, in S Transbaikalia), NW & C Mongolia and NW & N China (Xinjiang E, excluding Ili valley, to Ürümqi; N Ningxia).

Descriptive notes. 10–11 cm; 9.3–10.5 g. A clearly patterned penduline-tit with small, narrowly conical bill and relatively slender legs and toes. Male nominate race has black mask over lores and ear-coverts extending narrowly over base of bill, and more obviously across upper nape; crown



very light grey, shading whiter above mask, crown appearing almost white in the field (blackish feather bases always concealed by wide whitish tips on forecrown, but often abrading to show dusky markings over rear crown); nape, side of neck and uppermost mantle whitish (giving effect of wide white collar), lower mantle and scapulars chestnut, latter widely tipped cinnamon, back to uppertail-coverts dull cinnamon-buff, each feather narrowly fringed paler (slightly mottled appearance); upperside-coverts dark grey, tipped cinnamon, primary coverts blackish, tertials, secondaries and primaries dark grey,

widely edged buffy white; tail blackish, edged whitish, particularly on outermost feather; throat, breast and fore flanks off-white (with wear, chestnut bases of breast feathers revealed as random spotting), remainder of underparts buffy white; iris dark red or dark brown; bill dark grey, paler base and cutting edges; legs dark grey. Distinguished from superficially similar *R. pendulinus* mainly by more clearly contrasting plumage pattern, no chestnut on crown, broad black mask extending across upper nape and highlighting almost white collar on lower nape, also by particularly small and fine bill and more slender legs and toes. Female is similar to male but duller, with crown and nape greyer, mask browner and less extensive (usually not extending over base of bill and diffusing on upper nape), rump and uppertail-coverts also greyer, less buffish. Juvenile is rather nondescript, having head, side of breast and upperparts dull grey, becoming washed with cinnamon-buff on rump and scapulars, wing as adult but duller, underparts uniform light buff; first-year male may have reduced mask and be difficult or impossible to distinguish from adult female, but has mantle and scapulars richer chestnut. Race *stoliczkae* has even smaller bill than nominate, upperparts paler and buffier, less chestnut or rufous, and mask more dusky and diffuse, especially on upper nape (where incomplete). VOICE. Usual call a thin and high-pitched "seeoo", very much like that of *R. pendulinus* but perhaps a little shorter and fuller, less fading; other calls include "ti-ti-ti-ti-ti", given also in flight, and various single notes e.g. "sweet" or "tsi", all high-pitched and plaintive.

Habitat. Breeds in stands of poplars (*Populus*) and willows (*Salix*) by lowland rivers and in meadows of floodplains, locally also on bushy hillsides, and in gardens, orchards and walnut (*Juglans*) groves; in Kyzylkum Desert (Uzbekistan) nests in turanga trees (*Populus euphratica*) in the saxaul (*Haloxylon*) scrub; breeds as high as 2400 m in W Tien Shan. In non-breeding season found in equally varied selection of habitats, notably open forest, tamarisks (*Tamarix*), tree-lined embankments, reservoirs, and sometimes reedbeds (shunned in breeding season, but popular in winter in Pakistan). In limited area of range overlap with *R. pendulinus*, present species prefers bushy slopes, rather than reedbeds.

Food and Feeding. Small invertebrates, chiefly small insects and their larvae, and small spiders (Araneae); also seeds. Large number of seeds, especially those of reedmace (*Typha*), taken in winter months; in Mongolia, willow seeds form important component of diet through breeding season. Forages nearly always in poplars and willows, in general avoiding reedbeds; in Pakistan, passage migrants in spring tend to forage in canopy of trees. Forms small flocks outside breeding season, with reports of up to 50 individuals together in autumn and 40 on spring passage.

Breeding. Breeds from late May to mid-Jun in C Asia and in Jun in Mongolia and extreme NE of range (Buryatia, in Russia); fledged young in first week Jul. No information on mating systems, but perhaps monogamous. Nest built by both sexes, but female settles down to incubate as soon as bowl complete, while male continues to build remainder of nest; an elongated globular pouch, downward-pointing entrance tube at side, typically of woven plant fibres and down from willows and poplars, suspended c. 6–8 m above ground from near tip of horizontal branch of tree. Clutch 3–9 eggs; incubation by female, fed on nest by male; no information on duration of incubation and fledging periods; fledged juveniles gather into small flocks.

Movements. Strongly migratory. Arrives on breeding grounds in Mongolia in late May to early Jun, departing again in Sept and Oct; timing similar in S Siberia and Kazakhstan. In mild winters a few remain in lower-lying parts of Uzbekistan and Tajikistan. Passes through SW Turkmenistan en route to non-breeding grounds in E Iran and SW Afghanistan, where present Nov–Feb; small parties recorded in NW China (Xinjiang) in Mar probably also on passage (although initially suggestive of breeding). Wintering birds arrive in Pakistan as early as late Sept in some years, but normally majority arrive in Dec, remaining until end of Mar; on spring passage noted mid-Mar to mid-Apr farther N in Pakistan. A few penetrate into borderlands of NW India. Non-breeding quarters of race *stoliczkae* (breeding in NE of range) unknown. A remarkable case of vagrancy involved an individual trapped on 1st Aug 1987 at L Neusiedl, in E Austria.

Status and Conservation. Not globally threatened. Locally fairly common to uncommon. Not considered common anywhere in range, and is particularly uncommon over extreme N parts of distribution in Siberia; no longer occurs in Minusinsk Depression (SC Siberia), having been lost as a result of intensified economic development. In E Kazakhstan, however, appears to be relatively numerous, with density of 1 nest/100 m² in prime habitats. In Iran and Afghanistan it is an uncommon and localized winter visitor (main wintering areas are riverine plains of Pakistan). Status in China requires clarification. Possibly breeds also in NE Iran; alleged breeding in India based on a specimen said to have come from Ladakh (NW India) in Jun, but this considered dubious.

Bibliography. Cramp & Perrins (1993), Dementiev *et al.* (1954a, 1970), Dolgushin *et al.* (1972), Gavrilov & Zhatkanbaev (1995), Harrap & Quinn (1996), Ivanov (1940), Jones (1931), Kozlova (1930), McCarthy (2006), Rasmussen & Anderton (2005b), Roberts (1992), Rogacheva (1992), Stepanyan (1990), Vaurie (1950a, 1952, 1957a, 1959).

4. Chinese Penduline-tit

Remiz consobrinus

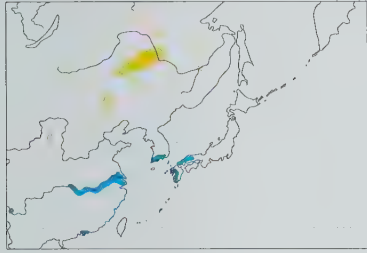
French: Rémiz de Chine **German:** Chinabeutelmeise **Spanish:** Pájaro-moscón Chino

Taxonomy. *Aegithalus* [sic] *consobrinus* Swinhoe, 1870, Sha-she (= Shasi), below Ichang, Hubei, China.

Forms a species group with *R. pendulinus*, *R. macronyx* and *R. coronatus*, and all four often combined as one species; probably most closely related to *R. pendulinus*, but sometimes considered conspecific with *R. coronatus* (and the other two then united as a separate species). Treatment as four distinct species based mainly on structural, as well as plumage and habitat, differences. Monotypic.

Distribution. Breeds locally in Russian Far East and in NE China (in E Nei Mongol and adjacent Heilongjiang, NW Jilin, S Ningxia, possibly also S Liaoning); non-breeding mainly E & S China

(middle and lower Yangtze valley, also Yunnan and Hong Kong), S Korea and S Japan (chiefly Kyushu and Honshu).



Descriptive notes. 10.5 cm; 7.5–11.9 g. A typical penduline-tit, clearly patterned and with rather long and narrowly conical bill. Male has black mask extending over lores and ear-coverts and narrowly over base of bill; crown, nape and side of neck grey, feathers tipped dull cinnamon in fresh plumage (making nape appear buffy grey), border of mask, including forehead, rear ear-coverts and submoustachial area, whitish; upper mantle chestnut, feathers tipped cinnamon, becoming cinnamon on lower mantle and scapulars, latter with dark feather bases (may become visible with wear), back to uppertail-coverts dull cinnamon-buff, each

feather narrowly fringed paler (slightly mottled appearance); upperwing dark grey, all feathers tipped or fringed with cinnamon or buff; tail blackish, all feathers widely edged buff; chin, throat and breast light buff, contrasting with white of submoustachial area, and with chestnut mottling against rufous-buff background at side of breast, latter meeting rusty colour of upper mantle (forming a collar); remaining underparts buff, washed cinnamon on flanks; iris dark brown; bill dark grey, paler base; legs dark grey. Differs from somewhat similar *R. coronatus* mainly in having less extensive black mask surrounded by (and highlighted by) white border, with greyer crown and nape, no blackish on upper nape (lacks whitish-collared appearance), buffy colour below extending to chin and throat and highlighting white submoustachial area. Female is much duller than male, with crown, nape and mantle light buffy brown, mask dark brown or reddish-brown, weakly mottled buff, and with dull off-whitish surround; back, rump and uppertail-coverts as male, wings buffy grey, all feathers tipped or fringed paler, tail blackish, all feathers widely edged buff; throat and underparts warm buff, in worn plumage sometimes some rusty spotting at side of breast and on mantle. Juvenile is not well known, rather nondescript, being more or less uniform dull brownish-buff; first-year male as female, but mask blacker and upper mantle distinctly chestnut. **VOICE.** Use call a thin and high-pitched “tsee” or “psee”, very similar to call of *R. pendulinus*; other calls also similar to latter’s, including fuller “piu” and a “siu, siu, siu, siu” series. Song a repetition of “si, si, tiu, si, si, tiu”, given in see-sawing rhythm like that of a parid tit.

Habitat. Variety of wetland habitats, particularly with reedbeds fringed by bushes and trees, especially poplars (*Populus*) and willows (*Salix*) for nest materials; found both by freshwater marshes and lakes and by tidal saltmarshes. More unusual away from water in poplar plantations and orchards. Outside breeding season can be encountered in wider range of habitats, including weedy rank vegetation in coastal districts.

Food and Feeding. Small invertebrates, chiefly small insects and their larvae, and small spiders (Araneae); also, in winter months, large amount of seeds taken. Spends much time in reedbeds, investigating panicles of reed-heads; foraging behaviour seems to be much as that of *R. pendulinus*. Forms small to quite large flocks outside breeding season, particularly at passage times and in winter.

Breeding. Not well studied. Probably breeds from late May to mid-Jun in China. No information on mating systems, but perhaps monogamous. Nest typically an oval pouch, entrance tube near top, made from woven plant fibres and down from willows and poplars, suspended from near tip of reeds, or in bush, once 4 m above ground in poplar tree several hundred metres from water at edge of a plantation. Clutch 5–10 eggs. No other information.

Movements. Strongly migratory. Present on breeding grounds in NW Jilin from mid-Apr until late Sept, and in S Liaoning (where possibly breeds) from late Apr. Seems to migrate on narrow front through NE China, with main wintering areas along middle and lower reaches of R Yangtze and in W Yunnan (along R Nu Jiang), and small but increasing numbers wintering in Hong Kong (at Mai Po Marshes) from Nov to mid-Apr and occasionally into May; locally not uncommon winter visitor in Japan (Kyushu and Honshu) since 1970s, and in nearby S Korea small numbers from Oct to May. Fairly common on spring migration through N Korea in Apr and May. Vagrant recorded in C Ryukyu Is (Okinawa) in Mar 1987.

Status and Conservation. Not globally threatened. Poorly known. Breeds very locally in NE China, and recently discovered to be breeding in Russian Far East. Although extent of breeding grounds not well known, observations outside breeding season have increased massively since c. 1980s, indicating that this species is not at any immediate risk. Migration studies reveal population explosion on scale similar to that demonstrated by *R. pendulinus* in W Eurasia; for example, at Beidaihe, in coastal Hebei (China), only a handful of individuals passing in 1920s and 1940s, compared with maximum day count of 2715 moving S in 1988 (on 11th Oct). In Japan, considered a winter vagrant until 1970s, now an uncommon to locally common winter visitor, sometimes in large flocks, to Kyushu and W Honshu. Much farther S, in Hong Kong, first recorded in Apr 1980, thereafter small waves of migrants, with maximum day count of 250 passing over in 1991 (24th Nov). Origins of all of these migrants a mystery, but this penduline-tit is evidently a successful species.

Bibliography. Brazil (1991), Burkovskiy (1997), Chen Youling & Tang Zhaohe (1998), Cheng Tsohsin (1987), Cramp & Perrins (1993), Harrap & Quinn (1996), MacKinnon & Philipps (2000), Melville & Galsworthy (1991), Song Yujun *et al.* (1984), Tong Junchang *et al.* (1985), Turnbull *et al.* (2007), Vaurie (1950a, 1952, 1957a, 1959), Wilder & Hubbard (1938), Williams *et al.* (1992), Zhang Lixun *et al.* (2006), Zhao Zhengjie *et al.* (1984).

Genus *ANTHOSCOPUS* Cabanis, 1851

5. Sennar Penduline-tit

Anthoscopus punctifrons

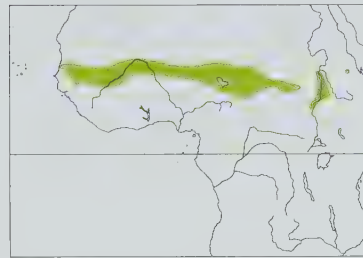
French: Rémiz du Soudan **German:** Sudanbeutelmeise **Spanish:** Pájaro-moscón Sudanés
Other common names: Sudan Penduline-tit, Kapok/Cappoc Tit

Taxonomy. *Aegithalus* [sic] *punctifrons* Sundevall, 1850, Sennar, east Sudan.

Forms a superspecies with *A. parvulus*, *A. musculus*, *A. caroli* and *A. minutus*. Monotypic.

Distribution. Extreme S Mauritania and NE Senegal E in Sahel zone to S Mali and N Burkina, S Niger, extreme NE Nigeria, C Chad, extreme N Cameroon, C & EC Sudan and W Eritrea.

Descriptive notes. 7.5–8.5 cm; c. 6–8 g. Tiny unmarked olive-and-whitish passerine with small, conical, sharply pointed bill; legs quite strong, tibia short. Forehead and forecrown are yellow,



or blackish-brown; bill blackish, becoming paler towards base and on cutting edges; legs slate-grey or blue-grey. Differs from *A. musculus* mainly in having green tones in plumage, much stronger spotting on forehead; from *A. parvulus* in duller general appearance, lacking obvious bright yellow. Sexes similar. Juvenile is duller than adult, more greyish (less olive) in tone above, but usually with hint of yellowish on forehead. **VOICE.** Variety of thin, high-pitched notes, e.g. “seewi-seewi-seewi...” or more buzzy “dzzeewi-dzzeewi-dzzeewi...”, repeated 6–9 times, often accompanied by a prolonged rattle from a second individual; abrupt “tsit” also reported, as well as a churring “whut-chrrrrrrrr” and harsh “tchuwhee-whree”.

Habitat. Semi-desert or desert-steppe with scattered scrub and larger trees and bushes in wadis; favours presence of water, hence especially fond of larger trees near bore holes, wells, etc. In Eritrea, at least, usually found below 1075 m.

Food and Feeding. No information on diet; birds foraging in acacia (*Acacia*) canopy appeared to be searching for insects. Forages actively, usually in parties of three individuals, keeping in contact with constant calling. Basic behaviour seems to differ little from that of congeners.

Breeding. Very little known. Breeding season Jun–Sept in Mauritania, Jun–Aug in Senegal, Jul–Aug in Mali, Jul in Nigeria, Jul–Sept in Chad, Feb–Mar and Sept in Sudan, and possibly May in Eritrea. Several nests found, but none well documented; nest described as being very similar to that of *Remiz pendulinus* and rather large for such a small bird. Nest in Chad on 23rd Sept held two juveniles almost ready to fledge. No other information.

Movements. Apparently sedentary.

Status and Conservation. Not globally threatened. Locally common. Despite scant knowledge of its breeding habits, this species seems to be locally numerous, although evidently shunning large expanses of suitable habitat. Abundant along R Senegal and a little to N in S Mauritania and N Senegal, and widespread and locally abundant in wooded country by water-holes and lakes in S Mali. No recent records from Niger; in Nigeria known only from extreme NE in vicinity of L Chad, and similarly in Cameroon recorded only in L Chad area and in Waza National Park, both in extreme N. In Chad quite common in the Sahel and soudanian savannas across centre of country, and in Sudan widely reported across Darfur and along Blue Nile and White Nile; no records from Ethiopia, but in Eritrea an uncommon and little-known species in W of the country.

Bibliography. Borrow & Demey (2001), Fry *et al.* (2000), Hall & Moreau (1970), Harrap & Quinn (1996), Mackworth-Præd & Grant (1973).

6. Yellow Penduline-tit

Anthoscopus parvulus

French: Rémiz à ventre jaune **German:** Senegalbeutelmeise **Spanish:** Pájaro-moscón Amarillo
Other common names: West African/Least Penduline Tit

Taxonomy. *Aegithalus* [sic] ? *parvulus* Heuglin, 1864, Bongo, Bahr-el-Ghazal, south Sudan.

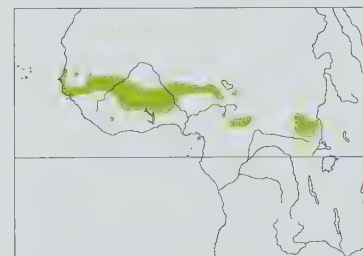
Forms a superspecies with *A. punctifrons*, *A. musculus*, *A. caroli* and *A. minutus*. Geographical variation sometimes considered to be clinal, and complicated by effects of plumage wear; species treated by some authorities as monotypic. Proposed race *citrimus* (described from Bozoum, near Bouar, in W Central African Republic) considered inseparable from *senegalensis*. Three subspecies provisionally recognized.

Subspecies and Distribution.

A. p. senegalensis (Grote, 1924) – extreme S Mauritania, Senegal, Gambia and Guinea Bissau E to N Benin, N Nigeria (E to W & S areas of L Chad), N Cameroon (Bénoué National Park) and W Central African Republic.

A. p. aureus Bannerman, 1939 – NW Ghana (Bole).

A. p. parvulus (Heuglin, 1864) – S Chad (S & E from E shores of L Chad), S Sudan and N DR Congo, possibly also extreme NW Uganda.



Descriptive notes. 8 cm; c. 6–8 g. Tiny unmarked olive-yellow passerine, the brightest member of the genus, with small, sharply pointed conical bill and quite strong legs and feet, with short tibia. Nominate race has forehead and forecrown bright yellow, freckled with dusky, relatively weak yellowish supercilium merging with yellow forehead; dull greyish stripe through eye, darker and more conspicuous on lores; crown and upperparts, including side of neck, yellowish olive-green, tinged greyish, becoming yellower on rump and uppertail-coverts; upperwing blackish-brown, feathers edged yellow-green, primaries

edged buffish-white (forming narrow whitish panel in fresh plumage); tail blackish-brown with yellow-green feather edges; chin to undertail-coverts rich yellow with very faint olive wash; with plumage wear, wing and tail become bleached brown (feather fringes abraded) and underparts become dingier yellow; iris brown or blackish; bill blackish, becoming paler towards base and on cutting edges; legs slate-grey or blue-grey. Distinguished from congeners mainly by much brighter, more extensively yellow coloration. Sexes alike. Juvenile is duller than adult, and paler yellow on forecrown and underparts. Races differ mainly in intensity of yellow in plumage: *senegalensis* is brighter than nominate, more yellow-looking, lacks greyish tinge above, yellow of forehead contrasting less with yellower crown; *aureus* is dull, with duller yellow forecrown and somewhat duller underparts, but in fresh plumage has stronger whitish wingpanel. **VOICE.** Contact calls a thin “si, shi-shi”, said to be vaguely reminiscent of calls of Northern Long-tailed Tit (*Aegithalos caudatus*). Song a tuneless, rapid, urgently repeated “ska-ska-ska-ska...” or double-noted “pichee” in bursts of 6–12 notes for 1–2 seconds.

Habitat. Dry or semi-arid sandy or short-grass savanna of soudanian type, in places extending S into guinean zone and N into more arid Sahel. Favours large shady trees growing by watercourses, or stands of large acacias (*Acacia*); also, very locally (Zaria, in N Nigeria), in bushy scrub and light woodland plantations grown for fuel. Can be found even in quite degraded and overgrazed savanna.

Food and Feeding. Known food items are small insects and their larvae. Forages chiefly in upper canopy; flits with buoyant flight from tree to tree, when relatively bright yellow coloration renders it conspicuous. Forages in parties of 3–6 individuals, or often in pairs; small flocks of up to 30 individuals sometimes encountered. Readily associates with mixed feeding flocks of other small birds, particularly white-eyes (*Zosterops*) and eremomelas (*Eremomela*).

Breeding. Poorly known. Birds in breeding condition in Mar in Gambia, Feb–Mar in Mali (Bamako), Jan in Ghana and Jun in Nigeria (Argungu). Only one nest described, a hanging pouch of beautifully woven, extremely strong felted materials, with self-closing short tubular entrance (bird using foot to open this), attached to twig c. 5–5 m above ground near very top of soft-leaved tree. Clutch 2 eggs. No further information.

Movements. Chiefly sedentary, but some seasonal movements in at least some parts of range. In S Mauritania considered to be only a wet-season visitor, and likewise in Gambia seems to be only a wet-season visitor to coastal forests from upriver; in Ghana, apparently disappears from Mole National Park by height of dry season, whereas it is common there from May to Sept (during wet season). In contrast, no such seasonal fluctuations reported from Nigeria.

Status and Conservation. Not globally threatened. Surprisingly poorly known, and generally considered to be uncommon or scarce over much of range. Recorded at a wide scatter of sites in Senegal and adjacent Gambia, Guinea-Bissau and extreme S Mauritania; has been described as locally common in parts of Mali, and this appears to be the case right across soudanian zone to S Sudan, although records sparse and gaps in known range large over much of E portion of range. Occurs in a number of protected areas, including Mole National Park, in Ghana, Arli-Pendjari National Park, in Burkina, and Kainji Lake National Park, in Nigeria; also in Bènoué National Park, the only confirmed locality for Cameroon. The future for this species, however, seems reasonably secure: unlike many specialized small bird species, it appears to tolerate habitat degradation caused by chopping for firewood and overgrazing by domestic animals, particularly goats.

Bibliography. Bannerman (1948), Borrow & Demey (2001), Fry *et al.* (2000), Hall & Moreau (1970), Harrap & Quinn (1996), Jensen & Kirkeby (1980), Mackworth-Præd & Grant (1973), Serle (1943b).

7. Mouse-coloured Penduline-tit

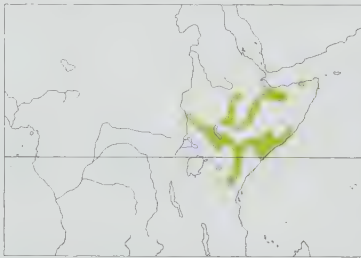
Anthoscopus musculus

French: Rémiz souris **German:** Graubeutelmeise **Spanish:** Pájaro-moscón Gris
Other common names: Mouse-coloured Tit

Taxonomy. *Aegithalus* [sic] *musculus* Hartlaub, 1882, Lado, Upper Nile, south Sudan.

Forms a superspecies with *A. punctifrons*, *A. parvulus*, *A. caroli* and *A. minutus*. Birds from Kenya have been separated as a geographical race (*guasso*) on basis of rather greyer plumage compared with birds from farther N, but age-related feather wear could be responsible for such apparent differences. Monotypic.

Distribution. SE Sudan (E from Lado and Tombe), Ethiopia, NW, N & S Somalia, NE Uganda, Kenya and extreme NE Tanzania.



Descriptive notes. 8 cm; c. 6–8 g. Tiny unmarked dull grey-brown passerine with whitish underside, very short tail, short, pointed conical bill, and quite strong legs and feet with short tibia. Has most of head and upperparts dull brownish-grey; forehead and ear-coverts indistinctly washed light buff, weakly freckled darker, in the field head appearing relatively plain but with dusky loreal line, bordered above by indistinct pale supraloral line; wing and tail feathers darker, with lighter greyish fringes; chin, throat and underparts off-white, lightly washed buff on belly and undertail-coverts; iris brown; bill blackish, becoming paler

towards base and on cutting edges; legs dark blue-grey or blackish. Distinguished from *A. caroli* mainly by entirely whitish underparts. Sexes similar. Juvenile (in fresh plumage) is slightly warmer brown, less greyish-tinged, on upperparts than is adult. **Voice.** Typical contact call a high-pitched “tit, tit, tit...”; also gives abrupt, nasal “tzeee” or “bzeu”. Song consists of several repeated phrases, including rapid rattled “di-di-di-di-di...”, ringing “we-cha-we-cha-we-cha-we-cha...” and thin “tsee-tsi, tsee-tsi, tsee-tsi...”.

Habitat. Open acacia (*Acacia*) woodland, dry bush and short-grass savanna in arid or semi-arid country. Recorded between 400 m and 1600 m in plains and mountain foothills.

Food and Feeding. No specific details on diet, but assumed to be primarily small insects and their larvae. Forages in pairs or in family parties, often associating loosely with groups of other small bird species. Feeds low down in scrubby bushes, as well as in canopy of large acacias. Very active, constantly on the move, one moment swinging upside-down in typical remizid fashion, the next stretching as if on “tip-toe” to reach food item. Can be quite confiding during foraging, seemingly unworried by human presence.

Breeding. Nesting reported in Dec in Sudan, Feb–Mar and Sep–Oct in Ethiopia, Nov in Somalia and Apr–May in Kenya. Nest a pear-shaped pouch of felted soft plant fibres virtually identical to that of *A. caroli*, intensely worn to produce false chamber (which a predator enters via false entrance hole), true entrance concealed by flap, which parent secures when leaving; few nests found, one was quite exposed, situated 2 m above ground in thorn bush, others reported as sited 1–5–6 m above ground in acacia. Clutch 4 eggs; so far as is known, incubation primarily, perhaps wholly, by female. No further information.

Movements. None documented; presumably disperses during conditions of extreme drought.

Status and Conservation. Not globally threatened. Not uncommon; easily overlooked owing to tiny size and inhospitable habitat. Recently found to be not uncommon at several sites in Ethiopia and Kenya; only sporadic reports in N & NW Somalia and adjacent E Ethiopia. In Sudan common in extreme S, between Bor and the foothills of Dongotona Mts; one exceptional record from Kassala region of NE Sudan. In Somalia scattered records from throughout interior, but breeding reported only in S. Occurs in several protected areas, including e.g. Awash National Park, in Ethiopia, Kidepo Valley National Park, in Uganda, Marsabit, Meru, Samburu and both Tsavo East and Tsavo West National Parks, in Kenya, and Arusha National Park and Mkomazi Game Reserve, in Tanzania. Greatest threat to the species is habitat degradation through overgrazing by goats and the lopping of acacias for fuel.

Bibliography. Archer & Godman (1961), Ash & Miskell (1998), Austin (1978b), Benson (1946), Britton (1980), Fry *et al.* (2000), Hall & Moreau (1970), Harrap & Quinn (1996), Lewis & Pomeroy (1989), Mackworth-Præd & Grant (1960), Zimmerman *et al.* (1996).

8. Grey Penduline-tit

Anthoscopus caroli

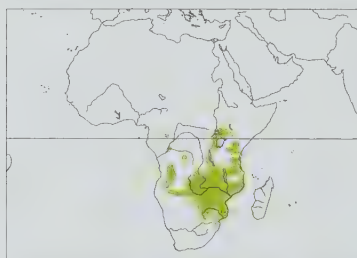
French: Rémiz de Carl **German:** Weißstirn-Beutelmeise **Spanish:** Pájaro-moscón Africano
Other common names: African Penduline-tit; Rungwe/Buff-bellied Penduline-tit (*sylviella* and *sharpei*); Zambesi Penduline-tit (*rankinei*)

Taxonomy. *Aegithalus* [sic] *caroli* Sharpe, 1871, Ovaquenyama, Damaraland, Namibia.

Forms a superspecies with *A. punctifrons*, *A. parvulus*, *A. musculus* and *A. minutus*. Races can be divided into five groups, “nominate group” (incorporating also *hellmayri*, *robertsi* and *winterbottomi*), “ansorgei group” (with *rhodesiae* and *pallascens*), “*sylviella* group” (with *sharpei*), and two single-species “groups” consisting of, respectively, *roccatii* and *rankinei*. The “ansorgei group” (in which *ansorgei* intergrades with *rhodesiae*) and the “*sylviella* group” sometimes treated as two additional species, latter exhibiting apparent vocal differences from others; in addition, occurrence of *rankinei* close to other races (*hellmayri* and *robertsi*) with no signs of intergradation suggests that this race, too, may warrant treatment as separate species; taxonomic review required. Other proposed races are *rothschildi* (described from Simba, in C Kenya), which is synonymized with *sylviella*, and *taruensis* (from Samburu, in coastal Kenya), synonymized with *robertsi*; supposed differentiating characters of both forms are insignificant. Eleven subspecies recognized.

Subspecies and Distribution.

A. c. ansorgei E. J. O. Hartert, 1905 – N & SE PR Congo, W DR Congo and C Angola.
A. c. roccatii Salvadori, 1906 – Uganda and W Kenya S to E Burundi and extreme NW Tanzania.
A. c. pallascens Ulfstrand, 1960 – W Tanzania (Kungwe-Mahali Peninsula).
A. c. winterbottomi C. M. N. White, 1946 – S DR Congo and adjacent NW Zambia.
A. c. rhodesiae W. L. Sclater, 1932 – SE DR Congo, N Zambia and SW Tanzania.
A. c. caroli (Sharpe, 1871) – S Angola, N Namibia, SW Zambia and Botswana.
A. c. sylviella Reichenow, 1904 – SC Kenya S to NE & C Tanzania.
A. c. sharpei E. J. O. Hartert, 1905 – SW Kenya S to N Tanzania.
A. c. robertsi Haagner, 1909 – E Tanzania, NE Zambia, Malawi and N Mozambique.
A. c. rankinei Irwin, 1963 – NE Zimbabwe.
A. c. hellmayri Roberts, 1914 – E & S Zimbabwe, S Mozambique and NE South Africa.



Descriptive notes. 8 cm; 6–7 g. Tiny, short-tailed greyish and buff passerine, some races olive and yellowish, with small, sharply pointed conical bill and quite strong legs and feet with short tibia. Nominate race has forehead and short supercilium dull buffy white, freckled with dusky (when feathers worn), dusky loreal line extending behind eye to upper ear-coverts; crown and upperparts, including side of neck, light grey (with hint of olive when plumage fresh); tail and wing feathers dark greyish-brown, narrowly edged greyish-buff, tertials fringed more olive-grey, greater upperwing-coverts narrowly tipped whitish

(forming narrow wingbar when fresh), wing and tail become bleached brown as feather fringes abrade; chin and throat whitish, breast washed light buff, becoming warmer buff on flanks and deep tawny-buff over ventral region; iris brown or blackish; bill blackish, becoming paler towards base and on cutting edges; legs slate-grey or blackish. Sexes similar. Juvenile is duller than adult, and paler buff on underparts. Races differ mainly in intensity of buff and grey in plumage, and in presence or not of yellowish and olive tones: *hellmayri* is close to nominate, but has throat and breast washed pale buff and is rather darker buff on ventral region; *robertsi* has slight olive wash above, is washed light yellow on throat and breast and yellowish-buff on lower underparts; *winterbottomi* is poorly differentiated, slightly more olive-toned above than previous (appearing intermediate between nominate and *rhodesiae*); *ansorgei* is green above, with yellowish forehead, whitish underparts washed pale yellow; *rhodesiae* is duller olive above than last, has whitish underparts washed pale buff over ventral region; *pallascens* is greyish-olive above, pale greyish below, lightly washed yellow and buff on lower underparts; *roccatii* has yellowish forehead and supercilium, otherwise greyish-olive above and pale yellow below, sullied greyish on throat, side of head and neck, becoming buffier over lower underparts; *sylviella* is grey above and buff below; *sharpei* is like last but more richly coloured; *rankinei* is almost slate-grey above, with whitish ear-coverts and supercilia, whitish below, lower underparts shading to pinkish-buff. **Voice.** Song a short phrase repeated 3–4 times, consisting of prolonged rising note, often preceded by 2–4 short ones; these delivered in several versions, a deep rasping “chi-chi-ch-dzzayzza” or similar, or much sweeter, weaker “tsi-tsi-chewee...”; some apparent geographical variation, e.g. *sylviella* song described as a thin yet metallic trill lasting c. 2–3 seconds, while that of *pallascens* said to be high-pitched trill which slowly fades. Calls include, among others, a buzzy “jaa” and a thin “jip”.

Habitat. Variety of woodlands; typically open woodland in more humid, lush conditions than those favoured by either *A. musculus* or *A. minutus*, but in parts of S Africa where latter species absent frequently in dry acacia (*Acacia*) savanna. In Kenya favours areas with moderate to high rainfall, generally at 1000–2200 m along E foothills of C & W highlands; formerly occurred also in coastal lowlands of SE Kenya. In Angola mostly above 1500 m, and in Malawi has been found as low as 80 m but commonest between 750 m and 1550 m. In S of range favours broadleaf woodland, especially miombo (*Brachystegia*), bushwillows (*Combretum*), cluster-leaf (*Terminalia*) and *Burkea*.

Food and Feeding. Diet small invertebrates, primarily insects and their larvae, but ticks (Ixodidae) also taken; also takes small fruits, and probes flowers of mountain aloe (*Aloe marlothii*) for nectar; nestling diet chiefly insect larvae, particularly caterpillars and beetle (Coleoptera) larvae. Forages in tree canopy, where very active, flitting from tree to tree, foraging upside down in leaf clusters and flowerheads; will feed also much lower, even down to ground level at times, chiefly when low-growing shrubs in flower. Forages in pairs or in small parties of up to seven individuals (presumed to be family groups), group-members keeping in contact with constant calling; readily associates with mixed flocks of other small birds, particularly white-eyes (*Zosterops*) and eremomelas (*Eremomela*).

Breeding. Breeds chiefly during rainy seasons; birds in breeding condition Aug–Apr in S Africa, Sept–Nov in Zambia and Oct–Nov in Malawi; Mar–Sept (largely the dry season) in DR Congo, whereas in E Africa mainly Feb, Apr–Jun and Sept–Dec (chiefly in rains, but some dry-season records). Monogamous; report of three individuals building same nest suggests that co-operative breeding also possible. Nest built by both sexes, an intricate construction, almost a pear-shaped

bag woven from spider webs and soft downy plant materials, extremely strong and long-lasting, with self-closing short tubular entrance (which has to be opened by the bird's foot), below this hidden nest-chamber is a more obvious false chamber entrance (more likely to be visited by potential predators); suspended up to 10 m above ground from fork in twigs (passing through top of nest) near tip of branch and often quite exposed. Clutch 3–6 eggs; incubation period c. 15 days (some estimates of 17–19 days); chicks fed by both sexes, during busy periods entrance hole may be left open for 5 minutes when parents repeatedly bringing in food, nestling period 22–28 days.

Movements. Chiefly sedentary, but seasonal movements in at least some parts of range. In winter descends into Zambezi valley in Zimbabwe; in Kenya sporadic in appearance at L. Baringo, suggesting that dispersal a regular habit.

Status and Conservation. Not globally threatened. Widespread but uncommon over much of its extensive range; locally scarce. Population densities in S Mozambique suggest up to 20,000 birds present, with 1 pair/50 ha in prime *Burkea* woodland on sandy soils in Limpopo Province. In Kenya decidedly uncommon or scarce, and population in coastal lowlands of SE extirpated in recent decades. Distinctive race *rankinei* of NE Zimbabwe very poorly known, and in particular need of taxonomic investigation. This species occurs in a number of national parks and other protected areas, and there is little reason for concern over its future.

Bibliography. Austin (1978b), Britton (1980), Cyrus & Robson (1980), Fry *et al.* (2000), Ginn *et al.* (1989), Hall & Moreau (1970), Harrap & Quinn (1996), Harrison *et al.* (1997), Hockey *et al.* (2005), Hoesch (1933), Irwin (1963, 1981b), Lawson (1961), Lewis & Pomeroy (1989), Mackworth-Præd & Grant (1960), Schüz (1990), Zimmerman *et al.* (1996).

9. Cape Penduline-tit

Anthoscopus minutus

French: Rémiz minute **German:** Kapbeutelmeise **Spanish:** Pájaro-moscón de El Cabo
Other common names: African/Southern Penduline-tit, Southern Kapok

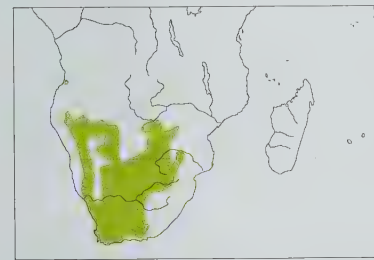
Taxonomy. *Sylvia minuta* Shaw, 1812, Heerenlogement, Western Cape, South Africa. Forms a superspecies with *A. punctifrons*, *A. parvulus*, *A. musculus* and *A. caroli*; possibly closest to *A. parvulus*, which may be its N counterpart. Geographical variation somewhat clinal, plumage colour darkening from N to S. Three subspecies recognized.

Subspecies and Distribution.

A. m. damarensis Reichenow, 1905 – CW & SW Angola, N Namibia, much of Botswana (except SW) and W & C Zimbabwe S to N South Africa (Limpopo Province).

A. m. minutus (Shaw, 1812) – W & S Namibia, SW Botswana and W & C South Africa (S to Western Cape, E to NW Free State and Mpumalanga).

A. m. gigi Winterbottom, 1959 – S South Africa (SW Free State S to W Eastern Cape).



Descriptive notes. 8–9 cm; 6–7.5 g. Tiny, short-tailed passerine with light greyish and yellowish plumage, small and sharply pointed conical bill, and quite strong legs with short tibia. N nominate race has forehead grizzled black and white, lowermost forehead and lores black, short supercilium white, short black line extending a little behind eye; crown and upperparts light brownish-grey; upperwing and tail darker grey-brown, tips of wing-coverts light grey, tertials with light grey-brown fringes (when fresh), rectrices with buffy fringes; wing and tail become bleached brown as feather fringes abrade; lower ear-coverts and sides of

head and neck, as well as chin and throat, whitish; entire underparts, including breast and undertail-coverts, pale buffy yellow; iris light brown to dark brown; bill grey or blackish, becoming paler towards base and on cutting edges; legs slate-grey or blackish. Sexes alike. Juvenile is duller and browner, less greyish, above and paler yellow below than adult, with fringes of tertials, flight-feathers and tail distinctly yellowish, rather than grey-brown. Races differ mainly in colour saturation: *damarensis* is paler and greyer above and paler yellow below than nominate, lacking latter's buffy tones; *gigi* is duller overall, being darker above and washed dull olive on underparts. VOICE. Song, from prominent perch or inside canopy, a high-pitched and often plaintive "chawee, chawee" or "tseeewee, tseeewee", repeated 6–8 times; also an abrupt "zwayt" during courtship flight. A number of other calls include bell-like "tillink", loud rasping "zizzit" (both are forms of contact call), and a thin "weess", repeated five or six times.

Habitat. Desert and semi-desert scrub, bushes and small trees, particularly open acacia (*Acacia*) woodland at desert edge, including rock outcrops (kopjes). In Botswana occurs also in isolated thorn bushes in C Kalahari, and has distinct preference for proximity of *Acacia karroo*.

Food and Feeding. Diet of small invertebrates, primarily insects and their eggs and larvae, also small spiders (Araneae); takes small fruits, e.g. of bony-thorn (*Lycium*), and small seeds have been found in stomach contents of some specimens. Nestling diet chiefly insect larvae, especially caterpillars and beetle (Coleoptera) larvae. Breaks into galls to reach larvae inside. Larger food items held in one foot and ripped apart. Forages in bushes and tree canopy, where very active, flitting from tree to tree, often probing while hanging upside-down, inspecting crevices in bark and in leaf clusters and flowerheads; although spends much time in low bushes, is rarely seen on ground. Forages in pairs or in small parties of up to seven individuals (presumed to be family groups), exceptionally as many as 21 in a flock. Often associates with mixed parties of small birds, including *A. caroli* in areas where ranges overlap; although it will join up with foraging *A. caroli*, latter seems not to join foraging flocks of present species.

Breeding. Laying in Jan–Feb in Namibia, Sept and Nov–Jan in Botswana, Oct and Feb in Zimbabwe, and in South Africa Oct–Jan in N, Jul–Oct in SW and Jun–Dec in S; those inhabiting most arid parts of range (e.g. Kalahari) more opportunistic, breeding when local conditions suitable; double-brooded, locally perhaps several broods in a season. Monogamous; often co-operative breeder, with helpers from pair's previous broods (in a study of several breeding units, eleven were pairs, two trios and one a group of four). Executes short courtship flight. Elaborate nest built by both sexes, in 20–35 days (replacement nest, if original destroyed, can be made in 13–20 days), an almost pear-shaped felt bag, woven from spider webs, wool and soft downy plant materials, extremely strong and long-lasting, has self-closing short tubular entrance (which has to be opened by bird's foot), below this hidden nest-chamber a more obvious hole to false chamber (more likely to be visited by potential predators), mouth of false chamber particularly thick and strong and useful as a platform on which parent braces itself while opening "hidden door" of real nest-chamber (which strongly sealed by a flap held tightly by spider webs); nest located 2–3 m above ground in top of thorny shrub, where attached by twigs through top of nest; other small birds, e.g. sunbirds (Nectariniidae) and larger serins (*Serinus*), often steal materials for building their own nests, some-

times causing owners to abandon nest entirely. Clutch 4–8 eggs, very rarely as many as 10 or 12 (perhaps product of more than one female); incubation by both sexes, with change-over every 30 minutes during day, period 15 days; chicks fed by both sexes, also by helpers if present, leave nest at 22–24 days; towards end of breeding season, two or even three broods roost with parents in nest or in that of another pair, or even in disused nest of another species, e.g. weaver (Ploceidae).

Movements. Sedentary. Occasional reports of individuals away from normal range suggest post-breeding dispersal out of the most arid habitats.

Status and Conservation. Not globally threatened. Widespread but not common over much of its extensive range. Studies in S Mozambique suggest population density of 1 pair/7.5 ha in mixed acacia woodland in Limpopo Province, whereas in South Africa density estimated at 27 birds/100 ha in Koeberg Nature Reserve (in Western Cape). Occurs in many other reserves and protected areas, e.g. Hwange National Park (in Zimbabwe), and there is little reason for any concern over its future.

Bibliography. Austin (1978b), Clancey (1997), Fry *et al.* (2000), Hall & Moreau (1970), Harrap & Quinn (1996), Harrison *et al.* (1997), Hockey *et al.* (2005), Hoesch (1934), Irwin (1981b), Skead (1959).

10. Forest Penduline-tit

Anthoscopus flavifrons

French: Rémiz à front jaune **Spanish:** Pájaro-moscón Frentigualdo
German: Goldstirn-Beutelmeise
Other common names: Yellow-fronted Penduline-tit

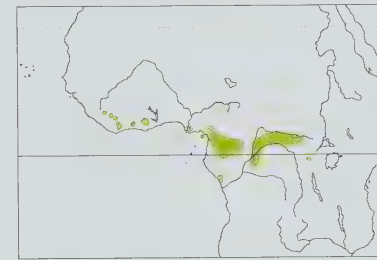
Taxonomy. *Aegithalus* [sic] *flavifrons* Cassin, 1855, Moonda River, Gabon. Has been considered a member of the superspecies formed by *A. punctifrons*, *A. parvulus*, *A. musculus*, *A. caroli* and *A. minutus*, but structural features, plumage coloration and rainforest habitat all suggest more distant affinities than exist among those five. Race *waldroneae* initially named "waldroni", but this is an incorrect original spelling. Three subspecies recognized.

Subspecies and Distribution.

A. f. waldroneae Bannerman, 1935 – N Liberia (N Lofa County, Mt Nimba), S Ivory Coast (forests of Taï, Fresco and Yapo) and SW Ghana (Goaso and Kakum forests).

A. f. flavifrons (Cassin, 1855) – SE Nigeria (Itu and Umuagwu), S Cameroon (Lolodorf, Elat and Aboulou), Equatorial Guinea (Mbini), N Gabon (Belinga, M'Bes, Makokou, M'Passa and Moondah estuary), N & SW PR Congo (Odzala and Nouabale-Ndoki National Parks; Kouilou) and N DR Congo (Equateur and Orientale Provinces).

A. f. ruthae Chapin, 1958 – E DR Congo (SE Kivu).



Descriptive notes. 9 cm; c. 7–9 g. Tiny plain olive-green passerine with yellowish forehead, small, conical and sharply pointed bill proportionately larger than that of congeners (and may give impression of having downward curve), quite strong legs with short tibia. N nominate race has golden-yellow forehead, sometimes lightly speckled (yellowish forehead very difficult to see in gloom of forest canopy); crown, nape and upperparts olive-green, wing and tail feathers blackish-grey, fringed olive-green, except for flight-feathers, which narrowly edged dull yellow; lores and sides of head and neck dusky olive, finely streaked olive-yellow,

paling on chin and lower ear-coverts; throat and underparts dull yellowish-olive, slightly mottled darker, yellowest on belly; in worn plumage becomes drabber as yellowish-green feather fringes abrade, exposing dusker feather bases; iris brown or blackish; bill blackish, becoming paler towards base and on cutting edges; legs slate-grey or blue-grey. Sexes similar. Juvenile is duller than adult, more greyish-green above, with narrower, buffer forehead band, underparts unmottled, washed buff on breast, distinctly yellowish on belly. Races differ mainly in intensity of yellow or buff tones in plumage: *waldroneae* is brighter yellowish-green above than nominate, and has breast paler and clearer yellow; *ruthae* has forehead buffy rufous and speckled with black, underparts paler off-white, washed light yellowish-buff (brightest on belly and undertail coverts), lower ear-coverts and throat cinnamon-buff, diffuse brownish patches at side of breast. VOICE. Not very vocal, or possibly most calls are high-pitched and pass unheard by humans. Calls include extremely high and thin "tseet" or "tit", sometimes accelerating into a trill; also an almost orthopteran-like "pshit", and a clear "tsi" which accelerates into a shrill, trilling "tsi-si-si-si...".

Habitat. Lowland evergreen forest, favouring forest edge, clearings and the like. Found also in well-grown secondary forest and overgrown plantations, especially those with flowering or fruiting trees, e.g. cotton trees (*Bombax*), figs (*Ficus*) and haronga (*Harungana*). Lowlands, to 600 m.

Food and Feeding. Food items include small insects and small pulpy fruits. Forages in middle and upper canopy, sometimes much lower; easily overlooked. Forages actively, partially concealed by leaves, quickly moving from one tree to another. Has a particular passion for clumps of mistletoe (*Loranthus*) and large sticky flowers of such trees as *Bombax*, where has been seen to forage inside the flowers themselves. Generally found in pairs or in small parties of 3–5 individuals, often scattered in canopy of one tree; readily associates with other small birds, such as the smaller sunbirds (Nectariniidae). An exceptional flock of at least 30 individuals reported; these were pulling apart the debris of old nests of red weaver-ant (*Oecophylla*) in low foliage. Has been seen also to break into old nests of social spiders (Araneae).

Breeding. Few observations. Birds in breeding condition (or in act of nesting) in Nov in Nigeria, Dec in Cameroon, Oct and Mar in Gabon, Oct in PR Congo and Jul and Oct in DR Congo. One observation of three or four birds visiting same nest, and another observation of three males (all with enlarged gonads) at or near nest on same day, suggest possible communal breeding. Nest typically suspended from twigs, very well made and can last for several years, a felt bag constructed from soft plant materials, e.g. *Bombax* ovary hairs (kapok) or cotton (*Gossypium*) heads, has self-closing short tubular entrance, and below this a false entrance (aimed at enticing predators, notably some predatory ants), with wall between real chamber and false chamber especially thick and impenetrable. No further information.

Movements. None documented, probably sedentary.

Status and Conservation. Not globally threatened. Not well known. Generally regarded as rare, and infrequently seen, but is probably not uncommon; clearly under-recorded, being difficult to locate among leaves of forest canopy owing to its small size and featureless coloration. Population assessments for such an elusive species difficult to make, but density of 3–5 pairs/km² estimated in Gabon; in complete contrast, only two sightings in 53 days in the field at a site in Ivory Coast (Taï Forest). Most mysterious is E race *ruthae*, which is known from only two specimens and a couple of sight records. Although much lowland rainforest has already been felled, this species' reliance on forest clearings with flowering trees makes it less vulnerable than are many other small forest

birds in its range. It is known to be present in several national parks, and at several sites its presence has been indicated by its obvious nests, which can remain intact for several years.

Bibliography. Bannerman (1948), Borrow & Demei (2001), Brosset & Erard (1986), Chapin (1954), Fry *et al.* (2000), Grimes (1987), Hall & Moreau (1970), Harrap & Quinn (1996), Mackworth-Præd & Grant (1973).

Genus *AURIPARUS* S. F. Baird, 1864

11. Verdin

Auriparus flaviceps

French: Auripare verdin **German:** Goldköpfchen **Spanish:** Pájaro-moscón Baloncito

Taxonomy. *Aegithalus* [sic] *flaviceps* Sundevall, 1850, "California" = Baja California, Mexico. Relationships uncertain. Has been placed with the tits and chickadees (Paridae) and in the past even with the previously monotypic Bananaquit (Coerebidae); results of research on DNA-DNA hybridization, however, suggest affinities with the New World gnatcatchers and gnatwrens (Polioptilidae), rather than with any other group. Nevertheless, this species does share a number of features with the penduline-tits, in particular nest details, vocalizations, bill shape and incomplete post-juvenile moult; pending further research, it is considered better retained in present family. Geographical variation confusing, and somewhat clinal, with several races intergrading; number of races could potentially be reduced following taxonomic review. Birds of this species in SW New Mexico (SW USA) and C Durango (NC Mexico) of uncertain race, provisionally included in *acaciurum*. Proposed race *fraterculus* (described from Chinobampo, in south Sonora, in Mexico) is synonymized with nominate. Six subspecies currently recognized.

Subspecies and Distribution.

A. f. acaciurum Grinnell, 1931 – SW USA (SE California, S Nevada, SW Utah, Colorado Valley of W Arizona, and SW New Mexico) and NW Mexico (S to S Baja California Norte, C Sonora, WC Chihuahua and C Durango).

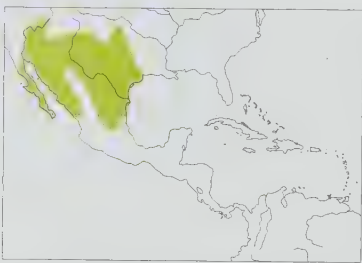
A. f. ornatus (Lawrence, 1851) – S USA (SE Arizona, S & C New Mexico, Texas and SW Oklahoma) and NE Mexico (NE Sonora, N Chihuahua, Coahuila, N San Luis Potosí and CS Tamaulipas).

A. f. flaviceps (Sundevall, 1850) – NW Mexico (C Baja California, S Sonora and N Sinaloa).

A. f. lamprocephalus Oberholser, 1897 – NW Mexico (S Baja California).

A. f. sinaloae A. R. Phillips, 1986 – NW Mexico (NW Sinaloa).

A. f. hidalgensis A. R. Phillips, 1986 – NC Mexico (NE Jalisco, SC Guanajuato, S San Luis Potosí and C Hidalgo).



Descriptive notes. 10–11 cm; 6–8 g. A small dull grey tit-like passerine with small but quite stout, conical, sharply pointed bill and quite stout legs and feet. Male nominate race in fresh plumage (Sept–Feb/Mar) has yellow crown and brighter yellow forehead (yellow feathers have grey tips, becoming yellower with wear); nape grey, washed olive-yellow, grey upperparts with scattered yellow feathers on rump and back; wing feathers dark grey-brown, fringed and edged greyish-olive, except for reddish-chestnut lesser upwing-coverts and almost black primary coverts; tail dark grey-brown with olive-grey feather fringes, outermost

feathers fringed and tipped whitish; lores dark grey-brown, otherwise side of head, chin and throat dull olive-yellow, cleaner but paler yellow on throat, lower throat feathers tipped grey, side of neck and breast pale grey, shading into off-white of remainder of underparts; in worn plumage (breeding plumage, Apr–Aug), olive-grey tips of feathers lost, revealing brighter feather bases, especially on head and throat (which become quite bright chrome-yellow), wings and tail uniformly dark grey, or bleached brown by sun, sometimes a small reddish area on forehead as a result of extreme wear of yellow frontal band (which has red at very base of feathers); iris dark brown; bill blackish or dark blue-grey; legs dark blue-grey. Female is similar to male but duller (when sexes seen together), has lesser coverts browner and with greyish inner webs (visible only in hand), but individual feather wear and its effect on brightness of colour makes determination of sex (and age) difficult. Juvenile lacks yellow tones in plumage, appears completely grey, with paler underparts, bill fleshy orange with darker culmen and tip, soon darkening; juvenile male has lesser coverts olive or chestnut, juvenile female dull grey. Races vary mainly in brightness of coloration and in size: *ornatus* is somewhat larger and longer-tailed than nominate, also duller, with yellow areas less bright; *acaciurum* is paler overall than previous, with buff wash on upperparts and flanks; *lamprocephalus* is similar in size to nominate but upperparts paler, male tends to show small reddish patch on forehead (when plumage worn), crown and throat clear yellow; *sinaloae* has more extensive yellow on underparts in worn plumage (yellow extending over breast and sometimes even belly), also washed with yellow on upperparts, especially rump, lacks any obvious red on forehead; *hidalgensis* is very dark, with strong brown tones in plumage, has crown and throat area deep dull yellow. Voice. Usual call a sharp, loud "chip" or "tschk" (has been likened to sound made by two ball-bearings being knocked together), sometimes repeated to create an often rapid, staccato chatter; also a weaker "cheep" or "tseet" as contact call. Song far-carrying in early-morning desert silence, a loud, plaintive, whistled "tswee, tswee, tswee, tsweet"; some variations in number of notes and strength of delivery, and may be intermingled with other notes, including short twittering phrases.

Habitat. Desert scrub, especially woody bushes and thickets along dry watercourses. Prefers low-lying flat desert, in USA reaching 915 m in California, but as high as 1830 m in Texas; from sea-level to 2135 m in Mexico. Endures extremes of temperature, from 35°C, occasionally as high as 45°C, in the daytime to below freezing at night.

Food and Feeding. Small invertebrates, chiefly insects and spiders (Araneae); in autumn and winter small berries an important component of diet, especially as this desert species is said not to drink. Forages in foliage and around flowers of desert shrubs, inspecting bark and leaf clusters by swinging upside-down in tit-like fashion. Uses strong foot to pull twigs or leaves towards itself in order to inspect them. Uses foot also to hold down caterpillars and spider cocoons, breaking up food item and consuming the lot, as do parid tits. Usually found in pairs or in small family parties, holding both winter and breeding-season territories. Often joins mixed-species flocks, but perhaps only when these moving through its territory.

Breeding. Season early Mar to Jun in much of range, in Arizona and Texas sometimes late Feb and continuing to Aug/Sept; at least two broods in a season. Monogamous, solitary nester. Nest built by

both sexes, taking 4–6 days, male begins construction but female more actively involved towards end (particularly in lining cup), a large elaborate globe up to 20 cm in diameter and constructed from as many as 2000 spiny twigs woven around supporting branch structure (twigs placed with thorn side facing outwards to deter potential predators), entrance hole at side and obscured by projecting awning of twigs, twigs and spines woven into place with variety of soft materials, including feathers, cobwebs, soft seed pods, wool and leaves, interior of structure lined with feathers, often also some fur and wool; typically sited up to c. 3 m above ground near end of low branch of thorny shrub; during construction work, materials may be taken from old nests, including roost nests (pair builds a number of roosting nests throughout territory, partners not assisting each other, male building more than female, these nests often smaller than breeding nests, with shallower cup and more centrally placed entrance, and tending to be built around a branch fork). Clutch 3–4 blue-green eggs; incubation by female only, period 14–17 days; chicks fed by both sexes, mostly by female during first week, leave nest at 17–19 days; juveniles fed by parents, chiefly male, for a further c. 18 days, while female settles down to laying second clutch; fledged young often occupy roost nest with one of the parents.

Movements. Basically sedentary.

Status and Conservation. Not globally threatened. Patchily common over most of range, especially in Sonora and Baja California (Mexico) and in Arizona (USA), where considered to have increased with the spread of mesquite (*Prosopis*) scrub. Elsewhere in S USA it is less numerous, but not uncommon in parts of W Texas; uncommon in Utah and distinctly rare in N Texas and Oklahoma. The large number of nests produced by each pair can give false indication of abundance, making this a very difficult bird to census. It is known to be present in several national parks.

Bibliography. Austin (1971, 1976, 1977, 1978a), Austin & Rea (1971), Bent (1948), Buttemer *et al.* (1987), Harrap & Quinn (1996), Howell & Webb (1995), Oberholser (1897), Phillips (1986), Powell & Steidl (2002), Sheldon *et al.* (1992), Taylor (1970a, 1970b, 1971), Terres (1980), Webster, J.D. (2000), Webster, M.D. (1999), Webster, M.D. & Weathers (2000), Whitaker (1943), Zink *et al.* (2001).

Genus *CEPHALOPYRUS* Bonaparte, 1854

12. Fire-capped Tit

Cephalopyrus flammiceps

French: Rémiz tête-de-feu **German:** Flammenstirichen **Spanish:** Pájaro-moscón Carirrojo
Other common names: Fire-capped Tit-warbler

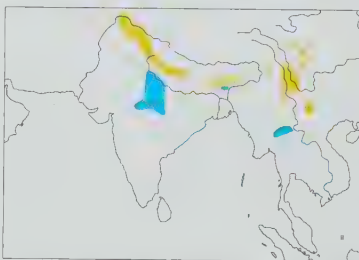
Taxonomy. *Aegithalus* [sic] *flammiceps* E. Burton, 1836, Himalayas = Mussoorie, Himachal Pradesh, India.

Relationships uncertain; formerly considered to be a kinglet (Regulidae). Placement in present family not entirely satisfactory, as this species differs from others in that it nests in tree holes, as do the true tits and chickadees (Paridae); in addition, it lays blue (not white) eggs, as also does *Auriparus flaviceps*. Nevertheless, song is typical of those of the genus *Remiz*, as is its small cone-shaped bill; pending further research, it is better retained in present family. Geographical variation slight and somewhat clinal, with E birds darkest; an additional race, *saturatus*, has been described from Sikkim, but has for long been synonymized with *olivaceus*. Two subspecies recognized.

Subspecies and Distribution.

C. f. flammiceps (E. Burton, 1836) – breeds N Pakistan (Gilgit) and Kashmir E to W Nepal; non-breeding NC India.

C. f. olivaceus Rothschild, 1923 – breeds E Nepal E to Bhutan and NE India (Assam, Arunachal Pradesh), and SC & S China (S Ningxia, SE Gansu, S Shaanxi, SC Sichuan, SE Xizang, Yunnan and W Guizhou); non-breeding in foothills, also (rarely) E Myanmar, NW Thailand and NW Laos.



Descriptive notes. 8.5–9.5 cm; 7 g. Tiny olive-and-yellow passerine with slightly notched short tail (two-thirds of which concealed by long uppertail-coverts) and small, slightly decurved, narrowly conical and sharply pointed bill; in plumage superficially resembling various leaf-warblers (*Phylloscopus*). Male nominate race breeding (Feb–Jul) has varying amounts of bright orange or red on forecrown, chin and throat; remainder of head and upperparts yellowish-olive, brightest on rump; uppertail dark olive-brown, feathers edged pale yellowish (clear wingbars and pale tertial fringes when feathers fresh); tail blackish-

brown, feathers fringed yellowish-green and tipped white (when fresh); lores and area around eye deep yellow, sometimes washed orange or reddish; underparts yellow, often quite bright, shading into bright orange or red of throat; iris brown to dark-brown; bill blackish, with some grey; legs dark blue-grey. Non-breeding male lacks reddish on crown, throat and face, resembles female but is brighter yellowish-olive above and yellower below, and has whiter throat. Female is duller than male, more greyish-olive on crown and nape, becoming more yellowish-olive on rump and uppertail-coverts, with greyish-white underparts washed pale yellow on belly and flanks; in breeding plumage becomes yellower on throat, face and breast, contrasting with off-white lower belly and ventral area. Juvenile resembles a dull female, having no yellow below and being very greyish-olive above, but by autumn many are quite bright yellow below (latter, however, possibly fresh-plumaged non-breeding males). Race *olivaceus* is darker green above than nominate, with yellow of underparts sullied olive, also male has smaller areas of orange on crown and throat. Voice. Song, from top of tall tree, less often in flight, a prolonged series of short trills and twittering sounds, seemingly a couple of phrases repeated at different speeds and pitches, rising and falling for several minutes. Contact calls include soft and mellow "whitoo-whitoo", high-pitched abrupt "tsit", sometimes repeated; flocks in winter keep up persistent twittering, could be confused with Tibetan Serin (*Serinus thibetanus*) if not seen well.

Habitat. Breeds in broadleaf mountain forest in W Himalayas, generally between 1800 m and 3000 m, favouring woodland of oak (*Quercus*), hazel (*Corylus*), elm (*Ulmus*) and walnut (*Juglans*) just below alpine coniferous zone; in Ladakh in alpine scrub, as well as in orchards and stands of poplars (*Populus*), during post-breeding dispersal ascending higher, up to 4000 m. In China breeds in fir (*Abies*), spruce (*Picea*) and rhododendron (*Rhododendron*) forests; on post-breeding dispersal, found at up to 4300 m in SE Xizang in Sept. On migration occurs also in gardens, parks, and willow (*Salix*) thickets by rivers and lakesides. In winter W population descends to plains of C India, where at-

tracted to parks and gardens with stands of large trees in fruit or flower; non-breeding distribution of E populations much less known, but seems to be foothill forest, rather than plains.

Food and Feeding. Small invertebrates, chiefly insects; some vegetable material also taken, e.g. observed to eat flower buds and young leaves, and also to take juice or sap exuded from banyan (*Ficus*) leaves. Forages in middle and upper canopy of tall trees; on passage also often in riverine bushes. Forages in tit-like fashion in canopy, swinging upside-down to investigate leaf bunches, or climbs along underside of branches, peering into nooks and crannies. Although feeds with tit-like agility, seems to “walk” with deliberate gait rather like a tiny parrot (Psittacidae), sidling along twigs to pull in rolled leaves with bill, and then, while holding leaf securely underfoot, prises it open. Holds larger prey items in foot, extracting soft contents. Usually found in small parties, but considerable gatherings of c. 100 individuals also reported; flocks may gather on bare trees on hillsides, looking like tiny finches (Fringillidae). Also joins mixed-species flocks, especially outside breeding season.

Breeding. Season early Apr to Jun, sometimes later, as juvenile reported as being fed on 31st Aug in Ladakh. Monogamous, solitary nester. Male performs short song flight, but more often prefers to deliver song from very top of tall tree. Nest seemingly built entirely by female, male in close attendance and often singing, a cup of small rootlets and dry grass, lined with finer grasses and feathers, normally placed 6–12 m from ground (sometimes as low as 1 m) in hole in tree, preferentially old hole of woodpecker (Picidae) or barbet (Capitonidae), where possible, and if necessary bird will enlarge existing cavity in soft wood. Clutch 3–5 eggs, mean 4; incubation believed by female only, she sits tight and puffs herself up and hisses if potential predator attempts to enter hole, no information on duration of incubation period; chicks fed by both sexes, although only female removes faecal sacs, no information on fledging period.

Movements. Short-distance and altitudinal migrant, W race moving farthest, but distributional division of the two forms in Nepal obscure. Arrives on breeding grounds in W Himalayas from late Mar to mid-Apr, departing in late Aug through Sept, although few reported in autumn (lack of red on fresh-plumaged males at that time of year making them less noticeable); some may remain in foothills, but most spread out over plains of C India (mainly E Rajasthan, S Uttar Pradesh and Madhya Pradesh). E race (*olivaceus*) less well known, but seems to move to foothills of mountains for winter, although some stray farther; rare non-breeding visitor (small flocks) in E Myanmar (S Shan States), NW Thailand and NW Laos. Often said to occur as a vagrant in Afghanistan, but this remains unproven.

Status and Conservation. Not globally threatened. Not well known; clearly much under-recorded, as it is difficult to locate among leaves of tall forest trees. Locally quite common in W Himalayas, especially Kashmir and Ladakh and in the Kulu and Simla districts of Himachal Pradesh, but decidedly scarce and somewhat irregular in appearance in Nepal; seen with regularity in Bhutan, notably in forest patches leading to the Pele La; in NE India, relatively few reports from N West Bengal or from hills flanking Brahmaputra valley in Assam and Arunachal Pradesh. In China generally poorly known, but reasonably widespread in C & S mountains. In winter months, nominate race should be looked for in gatherings of birds in fruiting trees; even trees in gardens of Taj Mahal, at Agra, have attracted the occasional small party in recent years. With such an elusive species it is difficult to assess population levels, but its tolerance of patchy forest and forest clearings with flowering trees makes it less vulnerable than many other small forest birds in its range. Known to be present in several national parks.

Bibliography. Ali (1962), Ali & Ripley (1973), Bates & Lowther (1952), Grimmett *et al.* (1998, 2000), Harrap & Quinn (1996), Hartert (1907a), Holmes (1986), Inskipp & Inskipp (1991), Inskipp *et al.* (1999), Löhrl (1967c), MacKinnon & Philipps (2000), Rasmussen & Anderton (2005b), Roberts (1992), Robson (2000b), Stuart Baker (1922, 1932), Vaurie (1950a, 1959), Wunderlich (1991c).

Genus *PHOLIDORNIS* Hartlaub, 1857

13. Tit-hylia

Pholidornis rushiae

French: Mésangette rayée **German:** Strichelköpfchen **Spanish:** Pájaro-moscón Estriado
Other common names: (Tiny) Tit-weaver, Tiny Tit-warbler

Taxonomy. *Diceum* [sic] *Rushiae* Cassin, 1855, Moonda River, Gabon.

Relationships uncertain, and systematic history remarkable. Originally described as a flowerpecker (Dicaeidae), it has since been placed at different times with the sunbirds (Nectariniidae), the waxbills (Estrildidae), the Old World warblers (Sylviidae), the tits and chickadees (Paridae), alongside the unrelated Green Hylia (*Hylia prasina*) in a new family Hylidae, and with the Australian honeyeaters (Meliphagidae). Placement in present family, on basis of assumed closer relations to genus *Anthoscopus*, provisional; fairly close similarities to other members in nest construction, roosting habits, vocalizations, juvenile plumage, general behaviour and basic appearance. Further research, especially DNA investigation, required. Birds of this species in SW Nigeria of uncertain race, provisionally included in *ussheri*. Four subspecies recognized.

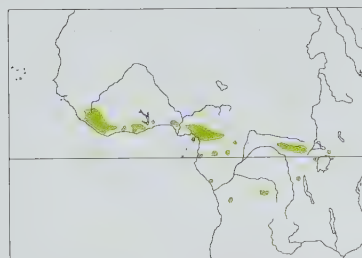
Subspecies and Distribution.

P. r. ussheri Reichenow, 1905 – S Sierra Leone, SE Guinea, Liberia, S Ivory Coast, S Ghana, SW Togo and SW Nigeria.

P. r. rushiae (Cassin, 1855) – SE Nigeria and W & C Cameroon, S to Gabon.

P. r. bedfordi Ogilvie-Grant, 1904 – Bioko I (Fernando Poo).

P. r. denti Ogilvie-Grant, 1907 – SE Cameroon, N & SW PR Congo, NW Angola, C & E DR Congo and W & E Uganda; single record from SC Central African Republic.



Descriptive notes. 7.5 cm; 4.6–5.9 g. Tiny, short-tailed dusky passerine of upper canopy, with small, slightly decurved and pointed bill and bright yellow legs. Male nominate race has head, neck, mantle, scapulars and upper back dark brown, feathers narrowly fringed light greyish-buff, those of crown and nape also pale-tipped and slightly spiky in texture; lower back, rump and uppertail-coverts yellow, weakly washed olive, those of back and longer uppertail-coverts with dusky bases; upperwing dark brown, feathers narrowly edged pale greyish-buff, tail blackish-brown; chin to breast greyish-white, each feather with dusky shaft

streak, streaks on sides of head and breast broader and merging with darker upperparts; underparts from breast downwards dull yellow, washed lightly with olive, and dusky-streaked on flanks and ventral area; in worn plumage, becomes almost blackish on upperparts and breast as pale feather fringes lost; iris orange-brown to reddish-brown or red; bill blackish, yellow at base of lower mandible; legs bright yellow, pale claws. Female resembles male, but has pale grey-brown or creamy eyes. Juvenile is browner, more uniform, on upperparts, with rump and uppertail-coverts more olive and less clearly yellow, streaking on throat and breast finer and less obvious, often broken up into tiny spots or coalescing on malar region, lower underparts paler yellow, lacking streaks on flanks and ventral region, iris grey or dull brown, yellow at base of lower mandible more extensive. Races differ mainly in degree of olive tones in upperparts and boldness of streaking, especially on throat and breast: *ussheri* has feather fringes of upperparts more olive, rather than light buffy grey of nominate, and throat and breast streaking finer; *denti* has rump and uppertail-coverts and lower underparts almost orange-yellow, breast streaks fewer and softer; *bedfordi* is on average largest, has bold dark streaking on throat and breast, extending along flanks and across belly, also feathers of rump and uppertail-coverts dark-centred. **VOICE.** Song, from tree canopy (singer moving around in canopy), far-carrying, basically two clear trills, second trill faster than first, often preceded by two grating notes, the whole lasting c. 2 seconds. Calls include brief “ptu” or “pituu”, and shrill “psi”.

Habitat. Lowland secondary evergreen forest and fringes of primary forest, from sea-level to 1200 m (in Liberia). Favours forest edge, including riverbanks, and clearings. Also gardens and plantations with isolated large trees, especially silk-cotton trees (*Bombax*).

Food and Feeding. Small invertebrates, especially insects, scale-insects (Coccoidea) representing a good proportion of food items; small seeds found in stomach contents. Forages in middle and upper canopy, between 5 m and 15 m in tall forest trees, only occasionally coming lower. Travels in small parties of up to seven individuals, flying directly from tree to tree; quickly gleans items in or beneath foliage, spending concentrated effort at bunches of leaves or clusters of flowers; fond of mistletoe (*Loranthus*) clumps and vine tangles, through which it hops, flicking wings, while peering under leaves and pecking at bark crevices. Said not to associate with other small birds, but will feed alongside sunbirds at flowers. Because of its tiny size, sometimes becomes trapped in spider webs.

Breeding. Birds in breeding condition or nesting in Nov–Apr (most Jan–Mar) in Liberia; nest-building Apr and dependent fledglings Nov–Jan in Ghana, and fledglings in Dec in Nigeria, Mar in Gabon and Aug and Nov in Angola. Monogamous; possibly sometimes co-operative breeder, as four adults building a nest in Angola and two young fed by four adults there. Nest rather large for size of bird (15 cm in diameter), a very well-made ball of felted soft plant materials, entrance spout pointing vertically downwards (unlike nests of *Anthoscopus*, no false chamber), sited 3–20 m above ground and strongly bound to branch or mass of twigs; once reported as built into old nest of weaver (of genus *Ploceus*). Clutch 2 eggs; no information on incubation and fledging periods; up to five individuals reported as sharing a nest at night after end of breeding season.

Movements. None documented; probably sedentary.

Status and Conservation. Not globally threatened. Probably not uncommon; throughout range generally regarded as infrequently seen, but tiny size and dark general coloration make it difficult to locate among leaves of forest canopy, and species no doubt greatly under-recorded. Consequently, population level difficult to assess; in Kouilou basin, in SW PR Congo, estimate of 5–10 territories/km². Although much lowland rainforest has already been felled, this species’ reliance on forest clearings with flowering trees makes it less vulnerable than are many other small forest birds in its range. Known to be present in several national parks.

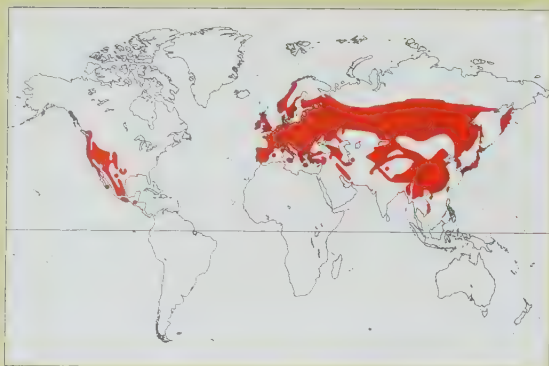
Bibliography. Bannerman (1949), Bochenki (1998), Borrow & Demei (2001), Dean (2000), Dowsett & Forbes-Watson (1993), Dowsett-Lemaire & Dowsett (1991), Fry *et al.* (2000), Gatter (1988), Hall & Moreau (1970), Harrap & Quinn (1996), Hartert (1907b), Mackworth-Præd & Grant (1973), Ripley & Heinrich (1966), Sefc *et al.* (2003), Serle (1965), Vernon & Dean (1975).

Class AVES

Order PASSERIFORMES

Suborder OSCINES

Family AEGITHALIDAE (LONG-TAILED TITS)



- Small to tiny passerines with medium-long to very long tail, short rounded wings and short, stubby bill.
- 8.5–16 cm.



- Palearctic and Oriental Regions, with one species in Nearctic Region.
- Forest, forest edge, open woodland, scrub, parks and gardens.
- 4 genera, 13 species, 48 taxa.
- No species threatened; none extinct since 1600.

Systematics

The family Aegithalidae comprises four genera. The largest genus, *Aegithalos*, was established by J. Hermann in 1804, the monospecific genus *Psaltria* by C. J. Temminck in 1836, the monospecific *Psaltriparus* by C. L. Bonaparte in 1850, and the genus *Leptopoecile* by N. A. Severtsov in 1873.

Whether in the museum or in the field, the various members of the genus *Aegithalos* are obviously very closely related, and there is no suggestion that they should be anything other than congeners, but their relationship to *Psaltria* and *Psaltriparus* is less clear. The Pygmy Tit (*Psaltria exilis*) is poorly known, but soon after it was described, in 1836, it was allied with *Aegithalos* on the basis of, for example, its habits, calls and food. There has been no challenge to such a relationship, but thus far no genetic evidence is available to support it. The Bushtit (*Psaltriparus minimus*), on the other hand, is a well-studied species. It appears to be close to *Aegithalos* in many features, such as its vocalizations and breeding biology, and it has, indeed, been placed within *Aegithalos* by several authors, among them D. W. Snow in his 1967 treatment in J. L. Peters's *Check-list of Birds of the World*. More recent evidence from DNA–DNA hybridization, however, indicates a significant divergence between these genera, although they appear to be sister-groups, as suggested by F. H. Sheldon and F. B. Gill in 1996. Subsequent genetic studies have all confirmed this relationship. In 1990, using the results of DNA–DNA hybridization, C. G. Sibley and J. E. Ahlquist postulated that the ancestor of the Bushtit entered North America by means of a Bering Sea land-bridge 10–12 million years ago.

The position of *Leptopoecile* within Aegithalidae is uncertain. The White-browed Tit-warbler (*Leptopoecile sophiae*) was described by Severtsov in 1873, and the Crested Tit-warbler (*Leptopoecile elegans*) by N. M. Przevalski in 1887. The Crested Tit-warbler was perceived to be sufficiently distinct from the White-browed Tit-warbler for it to be placed in a new genus, *Lophobasileus*, erected in 1890 by T. Pleske. The differences between the two genera were, however, slight, and *Lophobasileus* was eventually synonymized with *Leptopoecile* by most authors, although the former genus was still being used by some authors as recently as 1987. *Leptopoecile* has traditionally been placed with the Old World Warblers in the family Sylviidae, despite several allusions to its being “tit-like”. Its resemblance to a tit (Paridae) is, of course, celebrated in the English vernacular name for the genus, tit-warbler, and even more so in the generic name of

Leptopoecile. As a point of interest, Severtsov, the great zoologist and explorer of Turkestan, gave the White-browed Tit-warbler the name of *Leptopoecile sophiae*, “Sophia’s Resplendent Titmouse”, in honour of his wife, Sophia Aleksandrovna.

In 1951, E. Mayr and D. Amadon commented: “More doubt exists as regards the central Asiatic *Lophobasileus* and *Leptopoecile*. These little birds suggest *Regulus*, but might be related to titmice, notably *Aegithalos*. We follow custom in leaving them near *Regulus* and *Phylloscopus*. Their mossy ground nest favors this assignment.” The perceptive comment about a possible relationship to *Aegithalos* was forgotten, and thereafter *Leptopoecile* was placed with the sylviid warblers, a position that came to be regarded, both by taxonomists and by birdwatchers, as the logi-



All but four of the 13 species in the family Aegithalidae are housed in the genus *Aegithalos*, which provides the family with its name. Members of *Aegithalos*, such as the **Black-browed Tit**, are rather consistent in morphology. These tits have very small bodies and short, rounded wings, which stand in contrast to a long or very long, graduated tail. The legs tend to be long and are slender, as is the norm for arboreal birds. The bill is short, rather deep and laterally compressed, and both mandibles are usually markedly curved. The irides of *Aegithalos* tits are usually pale, lending them a beady-eyed look.

[*Aegithalos bonvaloti*
bonvaloti,
Cangshan Mountain,
Yunnan, China.
Photo: Li liwei]

cal one for it. Sibley and B. L. Monroe, for example, in 1990, placed it in the subfamily Acrocephalinae of their family Sylviidae. More recently, a relationship with Aegithalidae has been revived. On the basis of mitochondrial DNA data, a close relationship between *Leptopoecile* and *Aegithalos* was suggested by C. Sturmbauer and co-workers in 1998. This view was followed in 2003 by E. C. Dickinson, who put *Leptopoecile* in Aegithalidae; and it was corroborated in 2006 by P. Alström and colleagues.

Having established that the four genera that make up the Aegithalidae form a natural unit, one must then determine what is the relationship of this family to other passerine families. Despite their obvious differences from *Parus*, the genera *Aegithalos*, *Psaltria* and *Psaltriparus* remained for most of the twentieth century within the family Paridae, which had almost by default become the home for any small, fluffy, ten-primaried oscine passerine. There was, however, a recognition that the Paridae as then constructed was a heterogeneous, polyphyletic grouping, and C. E. Hellmayr, in 1911, elevated the different groups to the status of subfamilies. In 1921, E. Stresemann drew attention to the complete post-juvenile moult exhibited by *Aegithalos*, *Psaltria* and *Psaltriparus*, as well as by the parrotbill genera *Panurus* and *Paradoxornis*, whereas the members of the genus *Parus* have only a partial post-juvenile moult. In 1951, Mayr and Amadon again treated the groups as constituting separate subfamilies, stating that "The tits [Paridae] appear to be a polyphyletic group of genera placed together on the basis of superficial resemblance due to arboreal habits and a fine, more or less conical bill. Three groups can be distinguished...". The first of these groups was the "true titmice", consisting of the genus *Parus* and the closely related Sultan Tit (*Melanochlora sultanea*); the second contained the genera *Remiz* and *Auriparus*, of the modern penduline-tit family Remizidae; and the third group comprised the genera *Aegithalos*, *Psaltriparus* and *Psaltria*. Mayr and Amadon went on to state that, in their complete juvenile moult, cranial characters and, as described in 1890 by F. A. Lucas, nest structure, the long-tailed tits and bushtits differ radically from the Paridae. "The young hatch naked, while young of the true titmice are partly downy. They share several of these characters with *Panurus* and *Paradoxornis* and are perhaps nothing but an offshoot of the Timaliinae [babbler]. The fact that the parrotbills make a cup-like nest, while the nest of the present group is bag-like, is not, however, favorable to this suggestion." Five years later, how-

ever, in 1956, Mayr and J. C. Greenway, reporting on the work of an international committee appointed at the Eleventh International Ornithological Congress, did not subdivide the Paridae.

Going even further, C. Vaurie, following the suggestion of J. Delacour, elevated Aegithalidae and Remizidae each to family status, and this treatment was followed in 1967 by Snow and in 1977 by K. H. Voous. The latter author, however, wrote that "The recognition of a family Aegithalidae is a matter both of caution and of ignorance." Voous's comment reflected the fact that the major part of the only evidence available to taxonomists for the elucidation of the relationships of the long-tailed tits consisted of morphology and, to a lesser extent, behaviour. Morphological characters are extremely plastic and difficult to use in an objective manner, hence his caution.

In the traditional classification, the order Passeriformes is divided into two suborders, the Tyranni, or suboscines, and the Passeres, or oscines. Within the oscines, Aegithalidae was considered to be closely related to Paridae, as detailed above, and as a consequence the two were placed next to each other in world checklists. Genetic evidence became a factor in avian taxonomy with the advent of techniques involving DNA-DNA hybridization, the findings of which were summarized by Sibley and Ahlquist in 1990. Although relatively crude, DNA-DNA hybridization indicated very strongly that Aegithalidae was distinct from Paridae. More refined biochemical techniques have subsequently permitted the examination of mitochondrial genes and, more recently, nuclear genes, and much recent phylogenetic work has combined both in analytical investigations.

The advent of genetic evidence has resulted in a radical reorganization of passerine families. This work is continuing, but a consensus concerning much of the basic structure of the "new" evolutionary tree is rapidly emerging, and in 2006 K. A. Jönsson and J. Fjeldså reviewed 99 genetic studies in an attempt to construct a tentative "supertree" of relationships among all passerine birds. In their arrangement, the oscine passerines are divided into the two "parvorders" Corvida and Passerida, the Corvida being split into "Basal" and "Crown" sections. The Passerida is then subdivided into three superfamilies, the Muscicapoidea, the Passeroidea and the Sylvioidea, and all of these major branches are well supported by the available evidence. Jönsson and Fjeldså placed the Aegithalidae together with the Paridae in the superfamily Sylvioidea, with the treecreepers (Certhiidae) and the nuthatches (Sittidae) far removed in the superfamily

A stocky hind toe and long claw provide this **Black-throated Tit** with a firm grip on the slenderest of branches. This smart species fits the classic Aegithalos plumage mould, members usually being grey or brown above, with striking black and white facial markings, and often warm tones elsewhere on the body. Sexes are similar, but juveniles are duller. Juvenile Aegithalos tits undergo a complete post-juvenile moult—a strategy quite distinct from the partial moult of juvenile tits in the genus *Parus*, with which Aegithalos was formerly and erroneously grouped, in the family Paridae.

[*Aegithalos concinnus*
iredalei,
Tirthan Valley,
Great Himalayan
National Park,
Himachal Pradesh, India.
Photo: Adesh Shivkar]





The **Northern Long-tailed Tit** is the most widespread and best known of the Aegithalidae. Plumage pattern and tones vary considerably across the species' range, which extends north to Fennoscandia, west to Ireland and Portugal, east to central Japan and south to Iraq. The 17 races fall into four groups, of which two are depicted here: the "nominate group" of northern Europe and Asia (above); and the "alpinus group" of Mediterranean Europe and south-west Asia (below). Apparent hybridization is known in areas of overlap between the groups, resulting in a confusing variety of plumage characteristics. Even without such intergrades, the array of plumage attributes in this species is impressive. Northern birds are strikingly crisp, with an unmarked white head, underparts and tertials contrasting with a jet black mantle and subtle pink scapulars. Other groups tend to be duller and less clean-cut. Most races have dark lateral crown stripes, with varying amounts of dark streaking on the sides of the head, the neck and the breast. Subspecies such as *irbii* of southern Iberia (below) have the mantle grey rather than black, and substitute a rosy flush to the flanks for pink scapulars. Eyelids also vary in colour from yellow to red. Intriguingly, one study found that mist-netted birds with red eyelids were more likely to give distress calls than those with yellow eyelids, suggesting that eyelid colour may reflect the internal "mood" of the individual.

[Above: *Aegithalos caudatus caudatus*, Hanko, Finland. Photo: Markus Varesvuo.

Below: *Aegithalos caudatus irbii*, Navalvillar de Pela, Badajoz, Spain. Photo: Alejandro Torés]



The only member of the genus *Psaltiriparus*, the **Bushtit** is also the only representative of its family in North America. It shares several morphological characteristics with the genus *Aegithalos*, being very small and long-tailed, and possessing a tiny bill with a decurved upper mandible. The Bushtit is rather more drably attired than the *Aegithalos* tits, however. Its unmarked grey-brown upperparts and whitish underparts are washed grey, buff or pinkish. The ten races fall into three groups that differ mainly in colour tones, notably on the crown, and facial markings: some races have a striking black mask.

[*Psaltiriparus minimus californicus*, Kern County, California, USA.

Photo: Bob Steele/VIREO]



Muscicapoidae, within which they are placed in the same clade. It is apparent, therefore, that the long-tailed tits, in Aegithalidae, and the tits and chickadees, in Paridae, are not at all closely related to the nuthatches and treecreepers, but how close to each other are the two families of "tits"?

Jönsson and Fjeldså divided the Sylvioidea into 13 clades, although some of these were not well supported. The family Aegithalidae, including the genera *Aegithalos*, *Psaltiriparus* and *Leptopoecile*, is placed in clade 7, in which it forms a subclade; the other subclade comprises a mixed bag of "cettid warblers", including the genera *Cettia*, *Tesia* and *Abroscopus* and the Tithylia (*Pholidornis rufiae*). The family Paridae is placed in clade 2, thus revealing that the Paridae and the Aegithalidae are not very closely related.

Further work on passerine relationships is in progress. Within clade 7, Alström and colleagues have recommended the continued recognition of Aegithalidae as a family, and the formal recognition of a family Cettidae to cover the other subclade.

At the species level, there are several matters which would repay further investigation. The Silver-throated Tit (*Aegithalos glaucogularis*) of China has often been treated as conspecific with the Northern Long-tailed Tit (*Aegithalos caudatus*), an arrangement still preferred by some authorities. Its plumage, both as adult and as juvenile, is, however, distinctive, and this, combined with an absence of reports of regular intergradation or hybridization with Northern Long-tailed Tits in north-east China, supports its separation as a distinct species.

A more complex situation involves the White-throated (*Aegithalos niveogularis*), Rufous-fronted (*Aegithalos iouschistos*), Black-browed (*Aegithalos bonvaloti*) and Burmese Tits (*Aegithalos sharpei*). The last two of these are usually treated as conspecific, but the Burmese Tit is distinctive in appearance, being more like the White-throated Tit, and is geographically remote from the Black-browed Tit. Furthermore, both of these have sometimes been combined with the Rufous-fronted Tit or the White-throated, or all four species have been treated as conspecific. On the other hand, these four *Aegithalos* species seem to be fairly distinct morphologically, and, notwithstanding the fact that their ranges overlap only minimally or not at all, there is no evidence of intergradation or hybridization between any of them. For the time being, it seems best to treat these four species as forming a superspecies.

Further research may also lead to the splitting of one or more of the currently recognized species. The Black-throated Tit (*Aegithalos concinnus*), for example, may be found to consist of several distinct species. Moreover, the White-browed Tit-warbler exhibits marked geographical variation, and its four subspecies can be divided into two groups. The nominate race and *obscurus* are both relatively dark in plumage, whereas the two other subspecies, *major* and *stoliczkae*, are pale. The combined ranges of the dark races almost entirely encircle those of the pale races. In addition, the two groups may be separated ecologically, with darker populations at higher elevations and paler ones at lower altitudes, at least where the two groups overlap. If this

The **Pygmy Tit** is endemic to the island of Java. The only member of its genus, Java's smallest bird is a tiny, long-tailed aegithalid with a relatively stubby, broad-based bill. In contrast to other strikingly plumaged members of the family, the Pygmy Tit is drab greyish-brown above and dull pinkish-buff below. Sexes are similar, but the juvenile is still undescribed. This is perhaps surprising given that Pygmy Tits are fairly common at Java's favourite site for birdwatchers, Mt Gede and its adjacent botanical gardens. It thus remains a mystery for visiting birders to uncover!

[*Psaltia exilis*, Cibodas Botanical Gardens, Mt Gede, Java. Photo: Ketil Knudsen]





The two species of tit-warbler (*Leptopoecile*) are notable among the aegithalids in that they are very colourful, being adorned in blue, violet and chestnut. The male **Crested Tit-warbler** is a stunning creature, with a chestnut face, head sides, throat and upper breast, offset by delicate pink flanks and a lovely sky-blue mantle. Its tail and wings appear predominantly turquoise as a result of blue fringing to the individual feathers. Worn individuals have rather more washed-out plumage, which is reinvigorated following the annual complete post-breeding moult. This species is unique in the family for having a distinct, pointed white crest, as reflected in its English name.

[*Leptopoecile elegans*, Huzhu Beishan, Qinghai, China. Photo: Jussi Vakkala]

apparent ecological separation were to be confirmed, this would provide an argument for treating the groups of subspecies as constituting two separate species.

Morphological Aspects

Members of the genus *Aegithalos* are morphologically very homogenous and very well characterized. As their niches do not appear to be highly specialized, this suggests a recent radiation from an ancestral species, with little time for substantial differentiation. The body is very small. The bill is tiny, being short and conical, rather thick and somewhat laterally compressed; both the upper mandible and the lower mandible are strongly curved. The nostrils are rounded and covered in short feathers, the rictal bristles being inconspicuous. The legs are relatively long and slender, with the tarsal scutes often fused, and have a relatively stout hind toe with a long, strong claw. *Aegithalos* species often have eyes that are contrastingly pale, with a narrow ring of bare skin around each the eye, and in the case of the Northern Long-tailed Tit, at least, the colour of this skin can change depending on the age of the individual but probably also on its mood. The wings are short and rounded, with ten primaries, the outermost of which is much reduced, its length being approximately 40% of that of the longest primary. The tail is disproportionately long to very long, graduated and emarginated, with twelve, rather narrow feathers, the central pair shorter than the adjacent pair. *Aegithalos* species have soft, thick and lax plumage, giving them the appearance of a tiny ball of fluff, and they are usually strikingly patterned. Most species are grey or brown above, sometimes tinged pink, with prominent black and white markings on the head and a white rim around the tail. The underparts are white, often with a black or brown bib or collar and with a tinge of pink or buff on the flanks. The sexes are similar, but juveniles are distinct, being much duller and drabber than the adult and typically lacking the brighter pink, cinnamon and buff tones. Identification of adults is usually straightforward, and juveniles, although duller and less distinctive, are almost always found together with adults.

This genus has a very simple moult strategy. The adults undergo a complete post-breeding moult, and the juveniles a com-

plete post-juvenile moult. It is, incidentally, a rare strategy among temperate-zone passerines for the post-juvenile moult to be a complete one.

The Bushtit, sole member of the genus *Psaltiriparus*, is a tiny long-tailed bird with a very small bill. Its plumage is rather drab, although some individuals have a contrasting dark facial mask. Juveniles are most reliably separated by the shape of the outermost primary. The sexes are variably distinct, but there is considerable geographical variation in the plumage differences between them. The most reliable character for sexing individuals of this species is the eye colour, the male having a dark eye whereas the female is pale-eyed. This sexual difference may be evident a few days after fledging, but some individuals may take several weeks to change eye colour. Bushtits are generally easy to identify, but some juveniles require careful separation from the Verdin (*Auriparus flaviceps*). As with *Aegithalos*, both the adult post-breeding moult and the post-juvenile moult are complete.

The poorly known Pygmy Tit is very similar to *Aegithalos*. This tiny, long-tailed tit has a short, stubby, broad-based bill, but it is much duller than any member of the genus *Aegithalos*, although it is reminiscent of a juvenile Bushtit. The sexes are similar to each other, and it is thought that the juvenile is more or less identical to the adult.

In contrast to the other members of the family, the two tit-warblers comprising the genus *Leptopoecile* are brightly coloured, with areas of blue and violet in the plumage. The Crested Tit-warbler has a crest, making it the only member of the family to possess such an adornment. The nostrils are covered by folds of skin, and the feet and claws are conspicuously long. The sexes are distinct, even as well-grown nestlings, but juveniles are rather similar to adults. Adults have a complete post-breeding moult. A partial post-juvenile moult is reported for the genus; this includes a variable number of greater wing-coverts, tertials and, in the case of the Crested Tit-warbler, tail feathers.

Habitat

All members of the genus *Aegithalos* are essentially inhabitants of forest. Within this habitat, however, they favour a well-devel-

The two species of tit-warbler (*Leptopoecile*), tiny passerines with fairly long, graduated tails, are unique among the Aegithalidae in showing significant sexual dimorphism in plumage. In the **White-browed Tit-warbler**, the male (above) is vividly coloured, with extensive areas of lilac-blue, mauve and chestnut all catching the observer's eye. In contrast, the female (below) is drab greyish-brown, the only nod to colour being a faded chestnut crown and vaguely rufous flanks. This sexual dimorphism starts early, and is even apparent in mature nestlings. However, whereas sexual differences in the congeneric Crested Tit-warbler (*Leptopoecile elegans*) extend to eye colour, the male's being darker, both male and female White-browed Tit-warblers have fiery red irides. In addition to sexual dimorphism, there is also considerable plumage variation between the four races of White-browed Tit-warbler, with dark and pale subspecies pairs. These photos depict dark subspecies; pale-race males have predominantly buffy underparts. Where the races' ranges overlap, as in north-west China, dark birds occupy higher altitudes. This suggests an ecological separation that could justify elevation of each subspecies pair to full species.



[Above: *Leptopoecile sophiae sophiae*, Ala Archa, Kyrgyzstan. Photo: Hanne & Jens Eriksen.

Below: *Leptopoecile sophiae obscurus*, Xiahe, Gansu, China. Photo: Jussi Vakkala]



Most aegithalids, particularly the core genus *Aegithalos*, are markedly sociable creatures.

The gorgeous **Black-throated Tit** is typical in being highly gregarious. It usually occurs in flocks, sometimes numbering 40 individuals. Although such large flocks are most frequently encountered outside the breeding season, small groups continue to forage together during the nesting period. These tend to comprise failed or early breeders, or non-breeders, and parties often tag along with mixed-species feeding flocks. Research into the well-studied Northern Long-tailed Tit (*Aegithalos caudatus*) suggests that flocks usually comprise families and any breeding helpers, and the same is likely to be true for other *Aegithalos* tits.

[*Aegithalos concinnus*.
Photo: Chien Te Wang]

oped understorey and shrub layer, and this tends to be best represented in edge habitats, as in natural systems along rivers and streams, and around clearings caused variously by fires, floods, wind-throw or the browsing of large herbivores. The long-tailed tits probably benefit from limited forest degradation and fragmentation by humans, and in Europe, at least, the Northern Long-tailed Tit has spread widely into semi-natural and cultural landscapes such as heathland, maquis, bushes and hedges in farmland, well-wooded gardens, parks, temple grounds and cemeteries. This species is even more widespread in such habitats in the non-breeding season. As a genus, *Aegithalos* has a preference for deciduous or mixed deciduous-coniferous forests, and even in mixed forests its members favour the stands of deciduous trees along watercourses and similar places. They mostly avoid pure coniferous forest, but in Siberia the Northern Long-tailed Tit is recorded in open forests of spruce (*Picea*), fir (*Abies*), larch (*Larix*) and Siberian stone pine (*Pinus sibirica*), and several of the Oriental species occur in pine woodland as well as in deciduous forest.

The Northern Long-tailed Tit is found mostly in the lowlands, below 1000 m, and only very locally extends to higher altitudes. It reaches its highest elevation, at 2000 m, in south-east Europe and Turkey. The closely related Silver-throated Tit is similarly a lowland species in the north of its range, but more montane in the south. All the other members of the genus are montane, with some altitudinal zonation. Thus, the Sooty Tit (*Aegithalos fuliginosus*) of central China breeds at the lowest altitudes, from about 1000 m to 2500 m, followed by the Black-throated Tit in the Himalayas and eastwards to Vietnam, at 1500–2500 m, and the White-cheeked Tit (*Aegithalos leucogenys*) in the western Himalayas, found above 1500 m and at up to sometimes 3660 m. Finally, the group formed by the White-throated, Rufous-fronted, Black-browed and Burmese Tits ascends even higher, typically breeding above about 2000–2200 m and extending to high elevations, in some cases to 4000 m or even 4400 m.

Of the remaining species in the family, the Pygmy Tit is found in montane forest above 1000 m, favouring conifers and other open trees, often on the forest edge. The Bushtit, by contrast, occupies a great variety of habitats, from forested mountains to arid brush, the latter including such habitats as, for example, pine-oak (*Pinus-Quercus*) woodland, second growth, riverine wood-

land and scrub, coastal chaparral and sage (*Artemisia*) scrub. Generally, however, this species prefers open mixed woodland with some evergreen foliage or shrubby understorey, and it avoids pure stands of conifers. It adapts well to suburban areas, and occurs down to sea-level in some coastal areas, but it is largely montane in the interior, ranging locally up to about 3500 m.

In the other genus of the family, the White-browed Tit-warbler is a bird of subalpine scrub at or above the tree-line, wintering at lower levels in both forest and scrub, while the Crested Tit-warbler breeds in coniferous forest and in the non-breeding season is occasionally found also in scrub. Both species occur at high altitudes, the White-browed Tit-warbler having been recorded at up to 5000 m.



The intense sociability of the aegithalids is not restricted to the daytime. By night, these tits roost communally. Flocks of **Bushtits** roost out in the open. Individuals will normally sit a few centimetres apart, but extremely cold weather drives them to huddle together as a means of conserving heat, and thus energy. While taking a break from foraging, juveniles, in particular, will also huddle together during the day—each vying for the prime central position.

[*Psaltiriparus minimus saturatus*,
Victoria, British Columbia,
Canada.
Photo: Jukka Jantunen/
VIREO]



Bathing is as essential for aegithalids as for any other woodland passerine. Washing feathers helps keep them in excellent condition. This activity, however, risks attracting the attention of avian and mammalian predators. These **Northern Long-tailed Tits**, seen above with a Common Blue Tit (*Cyanistes caeruleus*) and a Great Tit (*Parus major*), have thus taken care to choose a secluded woodland pool for their ablutions. Standing belly-deep in the water, the bird will briefly duck its breast and perhaps head underwater, roll back and forth, or shift from side to side, splashing water over itself by fluttering its wings in and out of the water. Fluffing out its feathers exposes the bare skin at the feather bases, ensuring that both plumage and flesh get a good soaking. A narrow black line down the centre of the otherwise grey mantle is characteristic of the subspecies *irbii* of southern Iberia.

[*Aegithalos caudatus irbii*, Benaolán, Málaga, Spain. Photos: Eduardo Alba]

General Habits

In the genus *Aegithalos*, the Northern Long-tailed Tit, with a range extending from Europe eastwards in a band through central Asia to the north-west Pacific Ocean, is relatively well known, but the remaining species, found in the Himalayas, China and South-east Asia, are poorly known and have not been the subjects of any systematic studies. Casual observations suggest, however, that their behaviour is very similar to that of the Northern Long-tailed Tit. All are very sociable, and are found in flocks throughout the year. Flocks of Northern Long-tailed Tits normally comprise approximately five to 30 individuals and are based around the parents and their offspring of the previous breeding season, together with any adult helpers that had been involved in raising the brood (see Breeding). These flocks are stable and "closed", and in winter each flock occupies a well-defended territory, the extent of which depends upon the number of birds that make up the group. Separate flocks do, however, occasionally amalgamate temporarily, and large groups of up to 300 or more individuals are reported at times.

In the late winter and early spring, the flocks break up, unmated females moving away and pairing with males in adjacent flocks, perhaps usually "switching sides" during territorial disputes. Display includes a butterfly-like jerky flight in which the presumed male flies up to a height of 5–6 m, alternately fanning and closing the tail before diving vertically downwards; three or four individuals may display in quick succession, or even simultaneously. Each pair sets up a loosely defended territory within the area occupied by the winter flock of which the male was a member, but both partners continue to roost with other members of the flock until the nest is sufficiently well built to be used as a roost, this usually being so when the dome is completed. They then roost in the nest until the young fledge. The flock may temporarily re-form in cold weather; alternatively, some individuals remain unmated in the early spring and may then be prone to wander.

Among Northern Long-tailed Tits, periods of quiet feeding alternate with noisy rapid movement, in follow-my-leader fashion, to a new area. The flight is weak and whirring, with rapid wingbeats, the speed and direction being rather irregular. When



about to cross an open area, the flock-members gather together, calling excitedly, before flying across the gap in single file. Individuals separated from the flock become agitated, uttering loud calls and searching for their companions.

When roosting, members of the Northern Long-tailed Tit flock huddle together on a horizontal branch, usually in a thorny thicket, each with the plumage ruffled such that it looks like a ball of feathers. The distance between individuals depends on the ambient temperature. On cold nights all are huddled very close and, in very cold weather, they may sleep in a hole in the ground, among roots or even in snow holes. The position that an individual occupies in the roost plays an important part in its chances of survival; those at the end of the line are the first to die in cold weather, and dominant birds therefore occupy the centre of the row. It has

All *Aegithalos* tits are highly vocal, a trait that is clearly related to their marked sociability. Flock members remain in contact by calling almost constantly as they move. The normal contact calls of the **Northern Long-tailed Tit** display variation typical of the genus, some vocalizations being high-pitched and weak, others short and abrupt, and yet others trilling and musical. Such communication reaches an excited crescendo when the group crosses an open area.

[*Aegithalos caudatus* caudatus,
Hanko, Finland.
Photo: Markus Varesvuo]



The aegithalid diet consists primarily of invertebrates, which the birds hunt throughout the year. *Aegithalos* tits have a particular taste for bugs (Hemiptera) and moth and butterfly (Lepidoptera) eggs and larvae. During autumn and winter, when insects in particular are less abundant, they take nutritional supplements in the form of small amounts of vegetable material such as seeds and even olives. This **Northern Long-tailed Tit** has just caught a bug which it is manoeuvring in its bill into a position suitable for swallowing. Should an *Aegithalos* tit catch a prey item too large to swallow immediately, the bird will happily hang from a twig by just one foot, hold the item in the other, then eat it piecemeal.

[*Aegithalos caudatus* caudatus,
Latvia.
Photo: Markus Varesvuo]

The long-tailed tits are arboreal birds, foraging from the shrub layer to the canopy, but rarely venturing down to the ground. They adeptly glean prey items from the surface of twigs, leaves and buds. On occasion, they may hover or even flycatch, but it is more usual to see these acrobatic passerines hang upside down from a branch, clinging on with a single foot. This **Sooty Tit** has just taken a prey item while foraging in the upper branches of a small tree. Like its congeners, it usually forages in flocks outside the breeding season, sometimes in tandem with other woodland passerines.

[*Aegithalos fuliginosus*,
Wanglang Nature Reserve,
Sichuan, China.
Photo: John & Jemi Holmes]



been suggested that such communal roosting is essential for the survival of this tiny passerine, and may be the main reason for its great sociability. When loafing during the daytime, pairs and members of the same social group similarly clump together, each in body contact with one or more others. Despite this species' extremely sociable nature, however, it has not been recorded as allopreening.

Although poorly known, the Pygmy Tit is, like *Aegithalos*, very active and it travels in small flocks. The Bushtit, too, is highly gregarious. It is usually found in flocks of about six to 40 and more individuals, moving through the vegetation in a follow-my-leader fashion, in much the same way as flocks of Northern Long-tailed Tits. Its flight is weak and usually over short distances, although it can fly up to about 200 m in one go, its

flightpath over these longer distances being undulating. Occasionally, it drops to the ground to collect nesting material or food, and it may hop short distances on the ground.

Once they are established, flocks of Bushtits are very stable, with little or no interchange between groups, and contain many of the same individuals from one year to the next. Non-members are usually driven off once the flock has formed. During the non-breeding season, these flocks range over large areas and have moderately well-defined territories, but the boundaries of different territories may overlap and chance contacts precipitate loud calling, pursuits and fights among males. Bushtit flocks may join mixed-species foraging flocks for short periods as the latter move through the area.

Flocks begin to break up in January and February, pairs usually then nesting within their flock's winter range, although some individuals may move, sometimes as much as 3–4 km, to nest and subsequently join the local flock there. During the early part of the breeding season, Bushtit pairs, and any helpers that they may have, maintain very poorly defended, non-exclusive areas around the nest from which other flock-members may be repelled, although they are often simply ignored. Once the eggs have been laid, there is no longer any defence of this area against other flock-members, which may enter the nest or steal nesting material. Breeding pairs continue to associate with all members of the flock throughout the breeding season, and move freely throughout the flock's foraging home range of about 100 ha; the "nesting home range" of the entire flock lies within this foraging home range, covering about 32 ha of it, and does not overlap with other nesting home ranges. Although flocks of Bushtits can be encountered throughout the breeding season, these generally consist of individuals which have not yet completed the nest-building stage and which return to the flock for overnight roosting. Some are composed of adults and young from early-breeding pairs.

Flocks of Bushtits roost in the open, among dense branches. Individuals are usually well separated from each other, but, when temperatures are below freezing, they perch in close contact, tightly huddled together, presumably as a means of conserving energy. In the winter and early spring, flocks often use the same roosting location night after night. During at least the early part of the breeding season, several flocks may coalesce to roost in

In terms of diet and foraging strategy, the two *Leptopoeile* tit-warblers are not dissimilar to the members of *Aegithalos*. They are active and agile foragers that prey upon invertebrates such as small insects and spiders, but may also resort to seeds and fruit outside the breeding season. This **Crested Tit-warbler** feeds high up in trees, rather like a kinglet or firecrest (*Regulus*), but will also clamber along small branches like a nuthatch (*Sitta*). In the non-breeding season, the Crested Tit-warbler sometimes joins mixed-species foraging flocks which descend from the trees into scrubland.

[*Leptopoeile elegans*,
Huzhu Beishan,
Qinghai, China.
Photo: Jussi Vakkala]



the same tree and the mated pairs return to the flock to roost; once the outer shell of the nest is complete, however, the breeding pair and any helpers will normally roost in the nest. Bushtits will at times huddle also during the day, while loafing, regardless of the temperature. Fledglings and juveniles, in particular, prefer to huddle during the day while loafing, often competing for central positions.

Of the two *Leptopoecile* species, the Crested Tit-warbler is confined to China and is very poorly known. The White-browed Tit-warbler, which has a broader distribution, has been well studied in Central Asia. The latter species is gregarious. It forms family parties after the breeding season, and several families may join together to create flocks of up to 25 and more individuals; it may join mixed-species foraging flocks. The pair roosts in the nest with the young and, as with *Aegithalos* species and the Bushtit, roosting strategies may be a key to survival in cold, high-altitude habitats, as it is often noted that White-browed Tit-warblers are sensitive to the cold. Thus, fledglings, even when they are able to fly well, remain close to the nest and roost there. In the Nan Shan, in north-central China, one pioneer observer found, on several occasions, two or three old nests close together and all containing droppings; these were presumed to be used for a time as roost-sites, and the young tit-warblers certainly use the nest for this purpose for 7–12 days after fledging. When an entire family is roosting in a nest, the structure is obviously under considerable strain and faeces may also accumulate in the bottom of it; most nests do not, therefore, last for long. E. P. Gavrilov and colleagues reported that, when they repaired collapsed nests that were no longer suitable for roosting, the tit-warblers started to utilize them again. There appears to be no information available on the roosting habits of White-browed Tit-warblers at other times of the year.

Relatively little has been reported with regard to the comfort behaviour of the Aegithalidae. Head-scratching by the Northern Long-tailed Tit and its congeners is by the indirect method, with the leg brought up over the wing. These species bathe by standing in water and splashing, but it is likely that some of them, at least, also perform foliage-bathing, in which the bird takes advantage of dew-laden or rain-sodden foliage. Bushtits, too, will bathe in water. Sunning has been recorded for the Northern Long-tailed Tit and is of the lateral style. There are no records of anting for any member of the family.



Voice

All members of the genus *Aegithalos* are very vocal, a fact undoubtedly related to the highly social nature of these passerines. Flock-members communicate almost constantly, emitting a variety of calls, often soft, clipped monosyllables and short silvery trills; some calls are quiet and subdued, whereas others are louder and relatively far-carrying. In contrast, they do not have a territorial song, but both sexes utter a quiet twittering and trilling, especially during aggressive encounters with conspecifics and during copulation. This "song" is seldom heard, and includes some of the call notes rapidly repeated in a jumbled, bubbling chatter.

While birds are able to extract water from their food, there is no substitute for the real thing. Water sources—whatever form they take—are thus of some importance. Pools, ponds and streams may hold larger quantities of water, but their terrestrial location requires would-be drinkers to compromise on safety. This **Northern Long-tailed Tit** has spotted an alternative—a melting icicle—and is hovering to sip drips of meltwater at its tip. Hovering, also termed "reguline" foraging, is also a technique used by *Aegithalos* tits to seek out insects hidden underneath foliage or trapped in spiders' webs.

[*Aegithalos caudatus*, Bavaria, Germany. Photo: Berndt Fischer/Oxford Scientific Films]



For **Northern Long-tailed Tits**, the breeding season tends to start in March. Following the break-up of non-breeding flocks in late winter, unpaired females enter the territory of a nearby flock and join available males. Once the pair have established a territory within the flock's home range, they spend up to 33 days constructing their elaborate nest. Both sexes collect nest material such as cobwebs, moss, lichen and animal hair. They weave this material into a compact dome that is roughly equal in height to the bird's length.

[*Aegithalos caudatus* *rosaceus*, Essex, England. Photo: Alan Williams/NHPA]

Bushtits take their time when constructing their nest. They investigate several potential nest-sites, affixing spiders' web at each until one takes the male's fancy. If the pair reuses material from earlier failed nests, construction may take as little as two weeks.

Building a nest from scratch, however, may take as much as seven weeks. The gourd-shaped nest itself can be as much as 30 cm tall with a diameter of up to 10 cm—an impressively large home for such a tiny passerine. The nest is constructed from materials as varied as twigs, moss, feathers and flowers.

Bound together with spiders' webs, the nest is lined with soft material such as plant down and hair; the parents continue to supplement the lining until their brood fledges.

Pairs are not too fussy about their nest's location: it can be as low as one metre above ground or as high as 30 m, and can be thoroughly concealed in dense vegetation or exposed to the elements.

The Bushtit has a complex breeding system. While monogamous pairs predominate and some pair-bonds span successive breeding seasons, up to a third of nests in some areas comprise co-operative breeding efforts. The brood helpers can be any age of either sex, but most appear to be males that are either unmated or unsuccessful breeders.

Such approaches to procreation appear to be most frequent during population booms.

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[*Psaltirparus minimus saturatus*,
Discovery Park, Seattle,
Washington, USA.

Photo: Rob Curtis/
The Early Birder]





In general, little is known about the breeding characteristics of Asian members of *Aegithalos*, the **Black-throated Tit** being the best studied. This species' breeding season starts as early as late February. Both sexes build the nest, construction lasting a couple of weeks. In common with congeners, the nest is a sphere, with an entrance hole towards the top on one side. It is built from a variety of plant material and animal hair, and bound together with spider webs, while feathers or plant down provide the soft lining necessary for effective insulation. The sexes probably share incubation. The pair are sometimes assisted by a helper, suggesting that co-operative breeding might be a regular strategy.

[*Aegithalos concinnus*.
Photo: Chien Te Wang]

The voice of the Pygmy Tit is very similar to that of *Aegithalos*, and the vocalizations of the Bushtit and the White-browed Tit-warbler are likewise reminiscent of those of the genus *Aegithalos*. These species, too, lack a territorial song.

Although the Crested Tit-warbler is, by comparison, very poorly known, its calls seem to be similar to those of its sole congener the White-browed Tit-warbler, and include a very thin, plaintive, descending "pseee". Other vocalizations of the Crested Tit-warbler are said to be reminiscent of those made by the Goldcrest (*Regulus regulus*), but it does utter a rather soft "dep" call at times.

Food and Feeding

Members of this family feed largely on invertebrates throughout the year. This diet is supplemented in the autumn and winter with variable but usually small amounts of vegetable material.

The *Aegithalos* species forage in the shrub layer and the canopy, and only rarely visit the ground. They may join mixed-species foraging flocks. They glean food items from the surface of twigs, leaves and buds. Although they are able to hover, and although they sometimes indulge in aerial flycatching, these techniques seem to be employed relatively seldom. These species are very active and agile, often hanging upside-down by one or both feet when seeking food. When dealing with an insect that is too big to be swallowed immediately, they will hang by one foot from a twig and hold the food in the other foot in order to peck at it. *Aegithalos* species are especially fond of bugs (Hemiptera) and the eggs and larvae of butterflies and moths (Lepidoptera). They occasionally take some vegetable material in the autumn and winter, and they have been recorded also as drinking sap. The young are fed exclusively on insects and spiders (Araneae). The members of this genus are not known to store food.

Little is known about the Pygmy Tit other than the fact that it forages at low levels and eats insects and spiders. The Bushtit, on the other hand, is far better known. It is very agile and active, foraging among the leaves and smaller outer branches of trees and bushes. It frequently hangs upside-down and by one foot, and it will use a foot to bend back a leaf so as to expose the central area of a foliage clump. It feeds mostly on small insects

and spiders, especially scale insects (Coccoidea) and other bugs, as well as beetles (Coleoptera) and the caterpillars and pupae of butterflies and moths; in addition, it consumes small quantities of seeds and fruit, perhaps especially during the winter months. Large caterpillars, those more than 1 cm in length, are repeatedly beaten against a branch until they are dead. Very rarely, a Bushtit will hold a prey item in one foot, with its tarsus resting on a branch, and use its bill to tear at the food. The young are fed with



Leaving its well-camouflaged and deftly concealed nest, this adult **Bushtit** heads off to find food for the young. Most Bushtits lay between four and eight eggs, clutch size appearing to increase with latitude. Larger clutches are thought to relate to breeding groups with two or more laying females. With the breeding cycle taking just one month from egg-laying to fledging, many Bushtits are double-brooded. Indeed, birds barely pause to recover strength between clutches, the female laying again within a few days of the chicks leaving the nest.

[*Psaltriparus minimus*
minimus,
Newport, Oregon, USA.
Photo: George K. Peck]

In many bird species, nestlings have evolved striking plumage, colours and behaviour in an attempt by the individual to receive a greater share of parental investment.

Depending on the species, chicks may call, open the gape wide—as seen with this **Northern Long-tailed Tit** brood—jostle, and/or quiver their wings to obtain more food quicker from the provisioning adults. For those species that gape, ornithologists used to consider that mouth colour made nestlings detectable to parents. Recent research reveals, however, that this is the function of the surrounding flange, rather than the gape itself.

[*Aegithalos caudatus*
aremorius,
Landes de Blendecque,
Pas de Calais, France.
Photo: Jean-Claude
Carton/Bios]



a high proportion of lepidopteran larvae. Bushtits are tiny birds, and their small body mass in relation to the surface area results in significant heat loss. They need to consume about 80% of their mass each day in order to avoid losing weight.

In the genus *Leptopoecile*, little is known of the Crested Tit-warbler. The White-browed Tit-warbler eats small insects and spiders, and also, especially in autumn and winter, some seeds and fruit. It is very active and agile, foraging mostly among herbs

and shrubs, and sometimes on the ground, where it investigates root tangles and lichen-covered rocks. Unlike *Aegithalos* species and the Bushtit, the White-browed Tit-warbler does not hang upside-down from branches, although there are some published statements to the contrary. Nor is it known to hold down prey with its feet and hammer at it with the bill.

Breeding

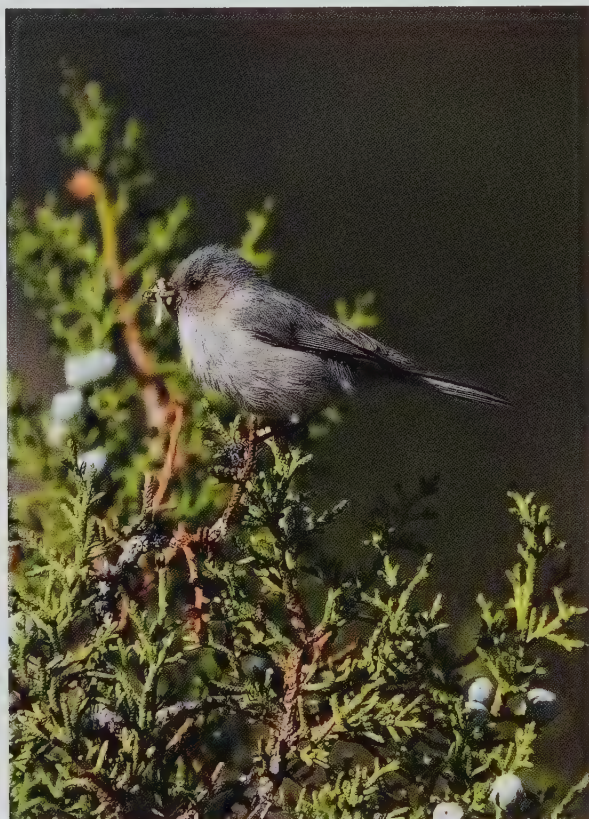
In the genus *Aegithalos*, breeding is well documented for the widespread Northern Long-tailed Tit but poorly known for most of the southern Asian species. The data that are available suggest, however, that the Northern Long-tailed Tit is typical of the genus. Despite its highly sociable nature, the Northern Long-tailed Tit is a solitary, monogamous nester, although some pairs have helpers. Like all members of the genus, it constructs a beautifully camouflaged domed nest. This is generally placed in a low thorny bush, but nests at greater heights, in a tree fork or against the trunk of a tree or hanging among the outer twigs of a conifer, have also been recorded, and there are a few records of nests being placed in holes in the ground. The nest itself, which is built by both sexes, is a compact, domed oval ball of moss, woven together with cobwebs and hair, and covered with numerous flakes of lichen, which serve as excellent camouflage. The average height of this structure is 160 mm and the average diameter 100 mm, and the entrance hole is placed to one side near the top. The nest is lined with a large quantity of small feathers, and the parents may continue to add these during the laying period.

Clutch size is typically around 8–12 eggs, with a range of 6–15. Clutches laid by Northern Long-tailed Tits at higher latitudes tend to be at the top end of this range. This trend is apparent also among the Himalayan and Chinese members of the genus, which, so far as is known, lay rather smaller clutches, normally up to six eggs. For the Black-throated Tit, which is relatively well known for the region, clutches of three to six eggs, and occasionally up to eight eggs, have been recorded in the Himalayas, with three in north-east India and north Myanmar and three to five in west Myanmar.

The Northern Long-tailed Tit's eggs are white, unmarked or with tiny reddish freckles, and measure approximately 14 × 11

With up to eight young to feed, adult **Bushtits** must spend the majority of breeding-season daylight hours foraging if they are to satiate the brood's incessant hunger. Spiders and small insects form the bulk of the nestlings' diet, and this adult is returning to the nest with quite a large caterpillar. Sizeable prey items are usually beaten against a branch to make them easier to swallow. Once fledged, juveniles normally only return to their natal nest if helping to feed their parents' second brood. Juveniles from all the nests in the flock's territory usually group together for foraging until all the broods have been raised, and the flock reunites for the winter.

[*Psaltriparus minimus*
plumbeus,
Colorado National
Monument,
Colorado, USA.
Photo: Andy & Gill Swash]





mm. The female alone incubates, for a period of 12–18 days, during which she is fed on the nest by the male. The chicks are naked on hatching, and they have the interior of the mouth unspotted yellowish. Both sexes care for the young, which leave the nest after 14–18 days. The fledglings continue to be fed for at least a further 14 days, and the family-members then remain together as a unit throughout the winter. The species is single-brooded.

One aspect of the breeding biology of the Northern Long-tailed Tit that has been observed for only one other member of the genus is the presence of helpers. This may reflect a genuine difference among the various *Aegithalos* species, but it is more likely to be merely the result of a lack of data. The breeding pair is assisted by a variable number of helpers, up to eight having been recorded at a single nest. These are often adults which have failed in their own breeding attempt, and it has been noted that the later in the breeding cycle a nest fails, the more likely are the adults to become helpers at another nest. The male and female of a failed pair, when they become helpers, do not, however, assist at the same nest; in those cases in which the relationship has been established, the helper has been found to be a sibling of the male of the breeding pair, thus helping its brother to breed. Helpers assist in the feeding of the nestlings, and they continue to feed the young after they have fledged. In various studies, it has been found that the presence of helpers significantly increases the breeding success of the pair. The only other *Aegithalos* species for which helpers have been recorded is the Black-throated Tit. In a study of this species in north-east Sichuan, in central China, three nests were found to be attended each by a single helper; at all three, the helper took part in the incubation of the eggs and the feeding of the nestlings.

The other well-studied member of the family, the Bushtit of western North America and Mexico, has a markedly social breeding system. It is perhaps usually monogamous, and pairs can sometimes persist from year to year; conversely, a pair with a nest may split up and each member then mate with another individual, usually after the destruction or attempted takeover of a nest. The Bushtit is also at times possibly polyandrous, polygynous and polygynandrous, and breeding units recorded in Arizona have consisted variously of two or more males and one female, of two males and two females, and of one male and two females. Such systems may be most likely when population levels are high.

A variable percentage of Bushtit nesting attempts is attended by more than two individuals, with up to six recorded. These helpers may be rare in some years or in some regions, or they may be present at up to 40% of nests. Both high population levels and a high degree of predation may encourage such helping behaviour, since the number of birds in the flock which lack nests or the nests of which have been lost increases. Helpers assist at all stages, and are usually birds from the same flock, mostly the adult males from failed nests. After losing a nest, pairs or lone individuals can attempt to usurp an existing nest by overpowering its owners. If this takeover is successful, they become the new owners of the nest; if not, they may become helpers, the timing of the attempted takeover determining the potential for the laying or fertilizing of eggs by the helpers. Thus, if a male attempts to become a helper during the building, egg-laying or incubation stage, the resident male attempts to repel him; but if the intruder persists and is accepted, there is then often no distinction between the behaviour of the original male and that of the helper. Males that become helpers after the eggs have hatched do so uncontested, and up to five such males have been recorded at a single nest. The adults that join too late to contribute eggs to the nest function as non-breeding helpers, but they may have the opportunity to contribute eggs to a second nest. Helpers can also be adult males which do not have a mate or which have lost a mate, or, rarely, juveniles from the first brood in the nest.

Courtship begins in the flock and involves excited contact calls, trills, and posturing. Prior to copulation, the male chases the female and pecks at the region around the base of her tail and cloaca. During egg-laying, both partners continue to associate with other flock-members, and there is a clear potential for extra-pair copulations. DNA-fingerprinting of nestling Bushtits in 1992 in south-east Arizona, however, revealed only monogamy, but it should

While a bird bringing food to nestlings is often assumed to be a parent, this is not necessarily the case with the **Northern Long-tailed Tit**, as its sociable nature extends to its breeding system. Pairs breed monogamously but are often assisted by up to eight helpers. Helpers are usually adults whose own breeding attempt has failed; the later in the season the failure, the greater the chances that the disappointed would-be parents will follow their parental instincts by helping others provision their young. Not surprisingly in a relatively tight-knit flock, helpers and beneficiaries appear to be related, and are often siblings.

[*Aegithalos caudatus caudatus*,
Helsinki, Finland.
Photo: Markus Varesvuo]



Northern Long-tailed Tits are ambitious parents, usually laying between eight and twelve eggs, though occasionally up to 15. As with other tits of the genus *Aegithalos* for which data exist, clutch size tends to increase with latitude. The nestlings require feeding almost constantly for the 14–18 days that they are in the nest. These tough demands keep both parents, and any adult helpers, busily foraging all day, every day, and probably explains why Northern Long-tailed Tits raise only a single brood. Parental care continues for the first fortnight following fledging, until the young reach independence. Thereafter, the family remains together throughout the autumn and winter, roaming across the territory of the wider flock. While most Northern Long-tailed Tit nests are sited just a couple of metres above ground in a thorny bush, the nest of the bird seen here is among a minority that are placed in a tree fork. This individual is of the subspecies *taiti*, which occurs from southern France south to central Iberia.

[*Aegithalos caudatus taiti*,
Belorado, Burgos, Spain.
Photo: José Luis Gómez de Francisco]

Unlike the cases of some other aegithalids, there is no evidence to suggest that the **White-browed Tit-warbler** ever engages in co-operative breeding. Instead, birds breed monogamously, without assistance from adult helpers. Records of *Leptopoecile* nests side-by-side suggest that the species might nest colonially, but may simply relate to the existence of additional roost-sites nearby. White-browed Tit-warblers lay between four and eight eggs, and these hatch after a fortnight. The parents take turns in brooding the chicks during the first week, and the young fledge after 18–20 days. The fledglings continue to be fed by their parents, as seen here, and roost in their natal nest for a further 7–12 days before becoming independent.

[*Leptopoecile sophiae*,
Huzhu Bei Shan,
Qinghai, China.

Photo: John & Jerni Holmes]



be borne in mind that this was in a year of very low population with no helpers, so that this finding is perhaps not typical.

Bushtits build a gourd-shaped nest 165–300 mm high and with a diameter of 65–100 mm, with the entrance hole usually at one side near the top. It is placed in a tree or shrub, usually fairly low down, and is suspended from the end of a single twig or branch in full view or, alternatively, is woven around and supported by several twigs and thus more concealed. The site is apparently selected by the male. The nest is constructed by both sexes from twigs, rootlets, moss, lichen, leaves, plant down, cocoons, grass, wool, feathers and flowers, all bound together with spider webs. The interior is lined with plant down, hair and feathers, and the adults continue to add material until the young fledge. Nest-building can be a prolonged affair, the duration of the work varying because of the reuse of material from nests which have been lost to predation or through bad weather. These may be dismantled and recycled in the same season, by the building pair or by other pairs, allowing later nests to be constructed more rapidly than initial nests. Indeed, if disturbed during nest-building, egg-laying or incubation, a pair of Bushtits will often desert, and the partners may then change mates and build a new nest. A single pair can make up to five nesting attempts in one season. Occasionally, one or both partners are expelled from an active nest by other Bushtits. First nests are almost always completed well before egg-laying commences but, if the nest is destroyed or the residents driven out, the pair will either attempt a takeover of another nest in the flock's nesting home range (see General Habits) or build a new nest, and the clutch may be started before completion of the second nest.

Clutches of 4–8 eggs are normal for the Bushtit. Larger clutch sizes, of up to 15 eggs, have been reported, but these may well be the result of more than one female laying in the same nest. As with the Northern Long-tailed Tit, there may be a latitudinal variation in clutch size, with the smallest clutches in Mexico and Guatemala. The eggs are plain white, and measure about 13.7×10 mm. Both sexes incubate, for a period of 12–13 days, and both also brood and feed the young, which are reported as being naked on hatching. The adults have been recorded as removing faecal sacs from the nest. The chicks fledge after about 18 days, but they are capable of leaving the nest earlier, after 14 days or so, if disturbed. They are fed for at least a further 14 days. Bushtits are normally double-brooded, the second clutch being laid about 3–4 days after

the first brood has left the nest, and when the fledglings are still dependent on their parents and helpers; occasionally, a new clutch is laid before the first brood fledges. Rarely, Bushtit nests are parasitized by Brown-headed Cowbirds (*Molothrus ater*).

Fledglings of this species never return to the nest except as visitors to a second brood or as helpers. Once fledglings have left the nest, juveniles from other flock-members' nests often show a marked interest in them and attempt to huddle with them. The juveniles from all of the flock's nests gather in large, mobile units, which contain adults and young of varying ages. Most juveniles remain with their flock over the winter period and go on to breed in the following spring, but some dispersal by first-year females takes place in the late summer or early in the next spring.

The nest of the Pygmy Tit is described as a pouch of leaves and grass, lined with moss, with a small entrance hole near the top, suspended from a branch. It is said to be reminiscent of the nest of a flowerpecker (Dicaeidae). The Pygmy Tit lays a clutch of two or three eggs, which are white with fine red spots. Nothing further is known of its breeding biology.

There are almost no data on the breeding biology of the Crested Tit-warbler, but that of the White-browed Tit-warbler is well known. The latter breeds in simple pairs, and there is no indication that it may be a social or co-operative breeder. Its nest is very like that of the Northern Long-tailed Tit, being an oval ball with the entrance hole to one side, well camouflaged with lichen and similar material, and copiously lined with feathers. Clutches laid by this tit-warbler vary from four to eight eggs, and these are pure white, spotted and flecked with light brown and reddish-brown. They are incubated by both sexes. On hatching, the young tit-warblers are naked, with delicate flesh-pink skin, and have an unspotted orange-yellow mouth and a yellow, unspotted tongue. Both parents brood the chicks and roost in the nest with them. After leaving the nest, the juveniles remain close to it and roost there for 7–12 days after fledging. The White-browed Tit-warbler is single-brooded, but, if a clutch is lost for any reason, it may lay replacement clutches.

Movements

Most members of the genus *Aegithalos* are sedentary, although populations breeding in mountain regions make seasonal



In central China, the nestling period of the **Black-throated Tit** has been found to last 14 days, and in this same region a study revealed that additional helpers sometimes assist in supplying provisions for the growing young. When the young birds leave the nest, they will remain dependent on their parents for at least another ten days before becoming fully independent. The juveniles seen here feeding on berries have yet to attain the striking black bib that is so characteristic of this species.

[*Aegithalos concinnus talifuensis*, Kunming Botanical Gardens, Yunnan, China. Photos: Li liwei]

altitudinal movements. The exception is the Northern Long-tailed Tit, which is resident over most of its huge range, but in north-central Siberia undertakes regular migrations or wanderings from late August through the winter until May. The bulk of these movements is directed to the south, but there is some northward dispersal in autumn, when flocks of hundreds of individuals have been recorded in central Siberia. The species' breeding areas are not totally abandoned, however. Rather, the centre of gravity of the population moves southwards as numbers in south Siberia are augmented by immigrants; a few may penetrate farther south, into Central Asia, but some may also remain in the north of the breeding range, or even farther north. Similar movements take place in eastern Asia, where the Northern Long-tailed Tit is a somewhat irregular migrant at Beidaihe, on the coast of north-east China, from mid-October to mid-November, wintering south of the breeding range in China and Japan and, more irregularly, to southernmost South Korea. Where migratory movements take place, it is probable that siblings migrate together.

Northerly populations of Northern Long-tailed Tits also exhibit irregular irruptive movements associated with high population levels in northern and eastern parts of the range. In such irruptions, which are sometimes on a massive scale, large numbers may reach Finland, the Baltic countries and eastern Europe, much smaller numbers appearing in western Europe. These movements reach a peak in mid-October, and some individuals, at least, return to the natal area in the ensuing spring. The crossing of water, however, is very much avoided by this species, and Northern Long-tailed Tits of the white-headed north-east European populations are therefore very rarely recorded in the British Isles. Furthermore, within Britain, this species is only an irregular autumn wanderer to offshore islands such as Orkney, the Outer Hebrides, the Isle of May and the Isles of Scilly.

Montane populations of the Northern Long-tailed Tit presumably undertake some altitudinal movements, and such elevational shifts are recorded also for all of the Oriental members of the genus. *Aegithalos* species, however, are rather hardy and are frequently observed at high altitudes during the winter months. Their downslope movements appear to be opportunistic, rather than regular migrations, and are partly post-breeding dispersal and partly a direct response to adverse weather conditions at higher altitudes.

In America, the Bushtit is basically resident, but in mountainous areas it exhibits some seasonal altitudinal migration, both upslope and downslope, as well as some regular dispersal into adjacent lowland areas. This dispersal perhaps involves individuals from the natal flock. During the non-breeding season, flocks of Bushtits may become semi-nomadic, wandering into warmer desert areas during cold spells during the winter months.

The Pygmy Tit is confined to western Java, where it is presumed to be resident, but it may move altitudinally. Both tit-warbler species are essentially sedentary, but some populations, those of the White-browed Tit-warbler in Central Asia, for example, do undertake marked and regular altitudinal movements. Depending on the severity of the winter weather, they may move up to 100 km away from their breeding areas and out on to the plains.

Relationship with Man

All members of the Aegithalidae are usually very tame. Perhaps it would be better to say that they appear "uninterested" in the presence of humans. The Northern Long-tailed Tit is increasingly recorded as visiting birdfeeders in western Europe, and in North America the Bushtit is found in suburban areas and often visits birdbaths. Apart from the fact that these birds are generally well liked by members of the public, however, aegithalids seem to have had little, if any, impact on humans.

Status and Conservation

None of the 13 members of the family is currently regarded as being globally threatened; nor is any listed as Near-threatened. Several of the species do, however, have a very restricted range. Good examples are the Pygmy Tit, the White-cheeked Tit and the Sooty Tit, confined to, respectively, west Java, the western Himalayas and central China; these three species would appear to be vulnerable owing to their small global ranges. Probably the clearest case, however, is that of the Burmese Tit, which has a tiny global range, confined more or less to Mount Victoria, in south-west Myanmar. Since this species has hitherto been treated

Most long-tailed tits are sedentary, the main exception being certain populations of the **Northern Long-tailed Tit**.

There is considerable post-breeding dispersal from north-central Siberia, with most departing birds heading south. A similar pattern occurs in eastern Asia, where birds sometimes winter as far south as South Korea.

Northern populations sometimes irrupt, high numbers of the white-headed race *caudatus* flooding south through Fennoscandia and the Baltic. Occasional vagrants even cross water bodies, for example reaching the British Isles.

[*Aegithalos caudatus*
caudatus,
Finland.

Photo: Dick Forsman]



as conspecific with the Black-browed Tit (see Systematics), its conservation status has not been formally assessed. It is apparently not common, as some recent visitors to Mount Victoria have experienced difficulty in finding this species, and it should probably be classed as, at best, Vulnerable.

There are, unfortunately, very few data on populations away from Europe and North America. Nevertheless, even though most members of the family seem to be well adapted to edge habitats, and thus able to cope with some degradation and fragmentation of forest habitats, the southern Asian species must all have suffered some declines as a result of total habitat loss.



[*Aegithalos fuliginosus*,
Wanglang Nature
Reserve,
Sichuan, China.
Photo: John & Jemi
Holmes]

In Europe, where many bird species have been very well studied, the population of the Northern Long-tailed Tit has remained more or less stable in recent years. Some minor changes have been detected along the edges of its range, and there can be marked annual fluctuations caused by variable weather conditions during the winter months.

Ornithological study is well advanced also in North America, where the range of the Bushtit has been shown to be slowly expanding northwards and westwards. Owing to this species' social nature, its population densities are difficult to measure, but a density 19.8 pairs/100 ha has been reported in north Arizona. As with the Northern Long-tailed Tit in Europe, the total numbers of Bushtits vary from year to year, probably as a result of natural factors such as weather conditions and insect abundance. Especially wet winters can have an adverse effect on the overwinter survival of this species. The population in California increased in the first half of the twentieth century, perhaps the result of an increase in the amount of suitable habitat facilitated by the clearing of dense forest and the planting of smaller trees and shrubs. More recently, Bushtit populations have remained stable or have declined slightly. It is possible that such declines have been caused by the loss of open oak woodlands.

General Bibliography

- Ali & Ripley (1983), Alström *et al.* (2006), Anon. (2007h), Baker (1997), Balatsky (1999), Bent (1946), Berndt (1984a), Bock (1994), Bruce *et al.* (1996), Butchart & Stattersfield (2004), Cheng Tsohsin (1987), Cramp & Perrins (1993), Dickinson (2003), Dickinson *et al.* (2006a), Eck & Martens (2006), Gavrilov *et al.* (1968), Glen & Perrins (1988), Guo Guiyun *et al.* (2006), Harrap & Quinn (1996), Hatchwell, Ross, Chaline *et al.* (2002), Hatchwell, Ross, Fowle & McGowan (2001), Hatchwell, Russell *et al.* (2004), Hellmayr (1911), Hudde (1993), Jönsson & Fjeldså (2006a), Löhrl (1964), Lucas (1890), MacColl & Hatchwell (2003), Mayr & Amadon (1951), Mayr & Greenway (1956), McGowan, Hatchwell & Woodburn (2003), McGowan, Sharp & Hatchwell (2004), Neufeldt (1970), Pleske (1890), Rasmussen & Anderton (2005a, 2005b), Roberts (1992), Sheldon & Gill (1996), Sibley (1996), Sibley & Ahlquist (1990), Sibley & Monroe (1990, 1993), Sloane (1992, 1996, 2001), Snow (1967a), Stresemann (1921), Stresemann *et al.* (1937), Sturmbauer *et al.* (1998), Vaurie (1957a, 1957d, 1959), Voous (1977), Watson (1986), Wunderlich (1989a, 1989b, 1991a, 1991b).

While population data are regrettably incomplete for most aegithlids, none is listed as globally threatened at present. Several are, however, classified as restricted-range species. One example is the **Sooty Tit**, which occurs only in the Central Sichuan Mountains Endemic Bird Area in China, where it is uncommon for the most part. This species' range is thought to cover as little as 20,000 km², which certainly suggests that it could be susceptible to substantial further reduction in the local forest cover.

inches 2
cm 5



Genus *AEGITHALOS* Hermann, 1804

1. Northern Long-tailed Tit

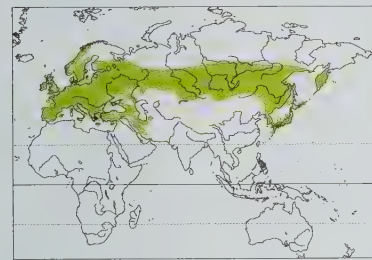
Aegithalos caudatus

French: Mésange à longue queue **German:** Schwanzmeise **Spanish:** Mito Común
Other common names: (Eurasian) Long-tailed Tit, Long-tailed Bushtit; Alpine Tit (*alpinus*)

Taxonomy. *Parus caudatus* Linnaeus, 1758, Sweden. Often treated as conspecific with *A. glaucogularis*, but plumage distinctive, and no reports of regular intergradation or hybridization with latter species in NE China (apparent “intergrades” recorded as migrants in coastal Hebei, but origin and status of these unknown). Marked geographical variation. Races fall into four groups: “n nominate group” in N Europe and Asia, “*europaeus* group” (including also *rosaceus*, *aremorius*, *taiti*, *macedonicus*, *tauricus*) in S & W Europe, “*alpinus* group” (including also *iribii*, *italiae*, *siculus*, *tephronotus*, *major*, *passekii*) in Mediterranean Europe and SW Asia, and “*trivirgatus* group” (incorporating *kiusiuensis*, *magnus*) in S Korea and Japan (“*europaeus* group” and “*trivirgatus* group” are morphologically similar and usually combined, but marked geographical separation strongly suggests different origins). Where groups meet there are extensive areas occupied by variable populations of apparent hybrids, these areas of hybridization considered to be zones of secondary intergradation (where populations have met relatively recently). Nominate race intergrades with *europaeus* in Denmark, E Germany, S Poland, S Ukraine and N Romania, and with *magnus* in Korea; *aremorius* intergrades with *taiti* in WC France; *taiti* intergrades with *iribii* in C Spain and Portugal; and *europaeus* intergrades with *aremorius* in W France, with *taiti* in SW France, with *italiae* on S slopes of Alps, and with *macedonicus* in S of former Yugoslavia and S Bulgaria. Birds of this species breeding in Iraq and Syria of uncertain racial identity, provisionally included in *tephronotus*. Other proposed races are *sibiricus* (C Siberia), *kamtschaticus* (Kamchatka, in E Russia) and *japonicus* (N Japan), all poorly differentiated and thus synonymized with nominate; and *pallidolumbo* (Shikoku, in S Japan) and *tarihoae* (Cheju I, off S Korea), both merged with *trivirgatus*. Seventeen subspecies recognized.

Subspecies and Distribution.

- A. c. caudatus* (Linnaeus, 1758) – breeds from Fennoscandia (N to c. 70° N in Norway, locally to 66° N in Finland) and NE Europe (Poland) E in broad band through Siberia to E Russia (Kamchatka), Sakhalin I, S Kuril Is and N Japan (Hokkaido, Rebun-to and Rishiri-to), extending S to N Kazakhstan, N Mongolia, NE China and N Korea; non-breeding also S to E China (Hebei) and C Japan (SC Honshu).
- A. c. rosaceus* Mathews, 1938 – Britain and Ireland.
- A. c. aremorius* Whistler, 1929 – NW France (E to Centre, S to Poitou area), I d’Yeu and Channel Is.
- A. c. taiti* Ingram, 1913 – SW & S France (including I d’Oléron) S to C Spain and Portugal (S to Tejo valley), also Mallorca.
- A. c. europaeus* (Hermann, 1804) – NE France E to Germany, S to N Italy, Serbia, W Romania, Bulgaria and NW Turkey (N Thrace).
- A. c. macedonicus* (Dresser, 1892) – Albania, Macedonia, mainland Greece, S Bulgaria and NW Turkey (SW Thrace).
- A. c. tauricus* (Menzies, 1903) – S Crimea.
- A. c. iribii* (Sharpe & Dresser, 1871) – S Portugal (S of Tejo valley), S Spain and Corsica.
- A. c. italiae* Jourdain, 1910 – mainland Italy and SW Slovenia.
- A. c. siculus* (Whitaker, 1901) – Sicily.
- A. c. tephronotus* (Günther, 1865) – Lesbos and Samos (E Greece), W & C Turkey (including extreme E Thrace), also Syria and extreme N Iraq.
- A. c. major* (Radde, 1884) – Caucasus (from N foothills of Great Caucasus), NE Turkey (E at least from Sebinkarahisar), Georgia, Armenia and N & C Azerbaijan.
- A. c. alpinus* (Hablitzl, 1783) – SE Azerbaijan (Talis Mts and Lenkoran lowlands), N Iran (E through Elburz and S Caspian districts to about Gorgan) and SW Turkmenistan (Kopet Dag).
- A. c. passekii* (Zarudny, 1904) – extreme SE Turkey and W Iran (Zagros Mts S to Fars).
- A. c. magnus* (A. H. Clark, 1907) – C & S Korea and Tsushima I.
- A. c. trivirgatus* (Temminck & Schlegel, 1848) – C Japan (Honshu, Awa-shima, Sado and Oki) and Cheju I (off S Korea).
- A. c. kiusiuensis* Nagamichi Kuroda, 1923 – S Japan (Shikoku, Kyushu and Yakushima).



greater coverts broadly tipped and fringed white; flight-feathers dark brown, tertials and secondaries broadly fringed whitish; iris dark hazel, eyelid yellow to red (yellow commonest, but colour probably also reflecting mood); bill black; legs blackish-brown. Sexes alike. Juvenile is darker overall than adult, rear lores to cheek and ear-coverts dusky (accentuating pale eyering), only centre of forehead and crown whitish, mantle and back brown, pinkish tone confined to distal half of scapulars, tail shorter and blackish-brown, white in outer tail reduced and sullied brownish, inner greater coverts more narrowly fringed and tipped buffish-white, flight-feathers paler and browner, underparts dirty white, belly with buff tinge. Races exhibit marked variation, mostly in plumage pattern and tones, “*europaeus* group” and “*trivirgatus* group” slightly duller than nominate and with broad blackish lateral crownstripe, but great individual variation, “*alpinus* group” also very variable, head pattern as “*europaeus* group” (although sides of head and neck streaked darker) but upperparts mainly grey with little or no pink, blackish confined to band across upper

mantle, often a blackish spot on throat, and has wing and especially tail shorter: *rosaceus* is smaller than nominate, has forehead to nape white, irregularly spotted dark brown, band from just in front of eye (occasionally from bill) to side of nape dull black, ear-coverts and side of neck finely streaked dark brown, pale areas above darker dull pink, less white in wing (edgings narrower), underparts off-white, flanks dull vinaceous pink, sometimes faint necklace of darker streaks across upper breast; *aremorius* has centre of crown and underparts whiter than previous, lateral crownstrokes broader and blacker; *taiti* is small and dark, with lateral crownstrokes even broader and blacker, upperparts (especially rump) blacker, with less pink; *macedonicus* resembles previous, but gorget better marked, and lateral crownstripe extends farther forward, often to bill; *europaeus* typically resembles *rosaceus* but is brighter and paler, with lateral crownstripe narrower, crown, cheek, ear-coverts and underparts clearer white, but very variable, lateral crownstripe sometimes broken or almost absent (thus resembling nominate, but always at least some indication of dark stripe) or very broad (leaving only small white patch in centre of crown); *tauricus* resembles last, but lateral crownstripe blacker and better defined, mantle blacker with reduced (and paler) pink, scapulars often greyish; *trivirgatus* also is similar to *europaeus*, but white areas purer white, black on upperparts restricted to upper mantle, lower mantle paler and with greater admixture of brighter pink; *kiusiuensis* is like previous but darker, with gorget less distinct or lacking; *magnus* is close to nominate, but with blackish lateral crownstripe and usually a well-marked gorget of blackish spots; *iribii* has narrow black band across upper mantle, rest of mantle and scapulars grey, scapulars sometimes tinged pink; *italiae* is similar to previous, but broader black band on upper mantle, slightly darker slate-grey lower mantle, and with scapulars more broadly tipped pink; *siculus* also is similar, but lateral crownstripe duller and browner, white centre of crown washed buff, dark band on upper mantle reduced and more brownish-black, rest of upperparts paler and greyer, virtually lacking pink, may show vague sooty-black spot on lower throat; *tephronotus* resembles previous, but lateral crownstripe black, dark upper-mantle band lacking or reduced to a small brown spot, underparts buffish with well-defined blackish throat spot; *major* is similar, but lateral crownstripe blackish-brown, centre of crown whiter (not buffish) with a few small brown streaks, band on upper mantle brown to black and varying in width, rump bright pink, breast white, lower belly and flanks brighter pink, dark spot on lower throat faint or absent, tail relatively long; *alpinus* is like *tephronotus*, but centre of crown brown-streaked buffish-white, upperparts darker, upper mantle grey with some admixed black, lower throat usually sooty, underparts washed buffy brown (pink flanks contrasting little); *passekii* resembles last, but overall rather paler, especially below, with only faint brown wash on belly, centre of crown white (not buff), and lacks gorget (although has dark throat spot). VOICE. Very vocal. Usual contact calls a high-pitched, pure, quiet but penetrating “see-see-see” (given especially in flight, particularly when flock in rapid movement, and by individuals isolated from main flock); fuller and flatter, clipped “tup”, usually interspersed with single high, thin “tset” notes; short, explosive, slurred, rattling trill, falling in pitch towards end, “tsirr” or “tsirrup”, given in alarm or excitement (frequently without apparent provocation); louder, harder, high-intensity versions given during conflicts between flocks. No territorial song, but occasionally utters quiet twittering and trilling, combining “tup” and “tsirrup” notes as well as scolds, sometimes in rather structured form (resembling song of an *Acrocephalus* warbler) and sometimes as a more jumbled collection of notes; this “song” given by both sexes, especially during aggressive encounters with conspecifics, during copulation and nest-building and when feeding young.

Habitat. Deciduous and mixed woodland with well-developed shrub layer, especially willows (*Salix*), favouring edge habitats. Also riverine woodland and, perhaps especially in W Europe, scrub, heathland with scattered trees, bushes and hedges in farmland, and well-wooded suburban parks, cemeteries and gardens. In Mediterranean region also in maquis and open pine (*Pinus*) forest. Otherwise, avoids pure stands of conifers in W of range, but noted in open forests of spruce (*Picea*), fir (*Abies*), larch (*Larix*) and Siberian stone pine (*Pinus sibirica*) in C Siberia (probably especially forest edge or riverside areas where an admixture of broadleaf trees). In Europe usually below 1000 m, although found at up to 1200 m in Hungary and very locally to 1800 m (rarely, to 2120 m) in the Alps, but more montane in SE, breeding to 2000 m in Greece (though commonest at 200–1000 m), 2000 m (mainly 100–1300 m) in Turkey and 1500 m in Caucasus; to at least 1830 m in Iran; in Japan mainly at 500–1600 m, wandering to lower levels in winter; primarily montane also in China, where noted at 780–1100 m (extremes 400–1800 m) in the Changbai Shan (Jilin).

Food and Feeding. Food throughout year largely invertebrates; occasionally also seeds, buds and even olives (*Olea*) and peanuts taken, especially in autumn and winter; recorded as drinking sap. Forages mostly in shrub layer and canopy, only occasionally on ground, delicately picking items from surface of twigs, leaves and buds. Can hover, and sometimes flycatches. When dealing with an insect too big to be swallowed immediately, will hang from a twig by one foot and hold the item in other foot in order to peck at it. Tame and very gregarious, for most of year forming stable flocks of c. 3–30 individuals based around parents and offspring of previous breeding season, together with any adult helpers that had been involved in raising brood. Periods of quiet feeding alternate with noisy rapid movement, in follow-my-leader fashion, to a new area; when traversing open areas, flock-members gather together, calling excitedly, before crossing over in single file. Flocks occasionally amalgamate temporarily, with groups of up to 300 individuals reported. May join mixed-species foraging flocks.

Breeding. Season mid-Mar to Jun in Europe and Japan (very exceptionally, fledged young recorded early Feb in England), from Mar onwards in Iran, and Mar–Apr in NE China; single-brooded. Co-operative breeding common; up to eight helpers recorded at single nest, these often adults from failed breeding attempts (male and female of failed pairs do not help at same nest, and, in cases where relationship established, helper is a sibling of male of breeding pair). In late winter or early spring flock breaks up, and unmated females move off to pair with males in adjacent flock. Display includes butterfly-like jerky flight, with presumed male flying up to height of 5–6 m above ground, alternately fanning and closing tail, then diving vertically down; 3–4 birds may display in quick succession or even simultaneously. Each pair sets up loosely defended territory within area occupied by male’s winter flock, but continues to roost with other flock-members until nest so far advanced that it can be used for roosting (usually when dome complete). Nest built by both sexes, over period of up to 33 days, a compact, domed, oval ball of moss, cobweb and hair, covered with up to c. 3000 flakes of lichen (which provide excellent camouflage), average size 160 mm high × 100 mm across, entrance hole at one side near top, lining composed of small feathers (often c. 1500, with maximum of 2680 recorded), adults may continue to add feathers during laying period; placed usually less than 3 m above ground in low thorny bush, but sizable minority sited 6–25 m up in tree fork or against trunk, or hanging among terminal twigs of conifer at up to 35 m above ground, and a few records of nests in hole in ground. Clutch 6–15 eggs, mostly 8–12, average clutch size largest at higher latitudes, eggs white, unmarked or with tiny reddish freckles, 14 × 10.9

mm (nominate race); incubation by female, fed on nest by male, period 12–18 days; chicks cared for by both sexes, assisted by variable number of helpers, presence of which significantly increases breeding success of pair; young leave nest after 14–18 days, fed by parents and helpers for at least a further 14 days, family-members then remaining together throughout winter.

Movements. Resident in temperate and Mediterranean regions, but partially migratory farther N. Birds from N Siberia undertake regular migration late Aug, returning in May, with some dispersal to N in autumn (when flocks of hundreds of individuals recorded in C Siberia), although bulk of movement in S direction; numbers in S Siberia swelled by immigrants in winter, when species may be numerous as far S as Zaysan depression, in NE Kazakhstan (migrants recorded also in R Ili valley). Some remain in N of range (or even farther N than breeding range). In NE China, an irregular migrant and winter visitor at Beidaihe (coastal Hebei), Sept–Feb, occurring in larger numbers during “irruptions”. White-headed birds (nominate race) occur in winter S of breeding range in China, Japan and irregularly S to extreme S Korea (Hong Kong records presumed to involve escapes from captivity). N populations also make irregular, sometimes large-scale irruptions in W, when large numbers may reach Finland, Baltic region and E Europe, and much smaller numbers appear in W Europe, such movements reaching peak in mid-Oct and at least some individuals returning to natal area in spring; birds from N & E sometimes penetrate farther W (e.g. flock of 200 white-headed birds in Netherlands in Dec 1971), but crossing of water avoided, thus nominate race very rarely recorded in Britain, and within British Is resident *rosaceus* only an irregular autumn wanderer to Is of Scilly, 1 of May. Outer Hebrides and Orkney, and very rarely to Shetland. Vagrant in Morocco (Apr 1967). Populations breeding in mountainous areas presumably undertake some altitudinal movement, spreading to adjacent foothills and plains in winter (e.g. in Hebei, in NE China).

Status and Conservation. Not globally threatened. Common to fairly common in W Europe and in Korea and Japan, but scarcer towards edge of range in N Scotland and W Ireland and more local and sometimes scarce in E Europe and Siberia, and rare in Kamchatka; in Iran, common in Caspian lowlands but rather scarce in Zagros Mts. Estimated European population more than 3,000,000 breeding pairs, of which c. 30% in Spain; highest recorded densities in Iberia, more than 5000 pairs/50-km square. No major changes in status apparent, although species has expanded N in Norway since c. 1970 and some expansion noted also in N Scotland; in contrast, marked decline in Sweden since 19th century, and similar decline in recent years in Finland, most probably a result of modern forestry practices and the replacement of old-growth habitats with commercial monocultures. Flocks require large winter territories (c. 20–24 ha), and habitat fragmentation and degradation can lead to local extinctions. Notably, very vulnerable to harsh winter weather, following which numbers may decline by up to 80%, can take several years to recover from these setbacks, perhaps owing to high loss of nests (sometimes over 50%) to predators. Success often low, e.g. fledging rate in various studies 16%–28%; main nest predators crows (Corvidae), weasels (*Mustela*) and snakes.

Bibliography. Ali & Ripley (1983), Alström *et al.* (2006), Anon. (2007h), Baker (1997), Balatsky (1999), Bent (1946), Berndt (1984a), Bock (1994), Bruce *et al.* (1996), Butchart & Stattersfield (2004), Cheng Tsohsin (1987), Cramp & Perrins (1993), Dickinson (2003), Dickinson *et al.* (2006a), Eck & Martens (2006), Gavrilov *et al.* (1968), Glen & Perrins (1988), Guo Guiyun *et al.* (2006), Harrap & Quinn (1996), Hatchwell, Ross, Chaline *et al.* (2002), Hatchwell, Ross, Fowle & McGowan (2001), Hatchwell, Russell *et al.* (2004), Hellmayr (1911), Hudde (1993), Jonsson & Fjeldså (2006a), Lohr (1964), Lucas (1890), MacColl & Hatchwell (2003), Mayr & Amadon (1951), Mayr & Greenway (1956), McGowan, Hatchwell & Woodburn (2003), McGowan, Sharp & Hatchwell (2004), Neufeldt (1970), Pleske (1890), Rasmussen & Anderton (2005a, 2005b), Roberts (1992), Sheldon & Gill (1996), Sibley (1996), Sibley & Ahlquist (1990), Sibley & Monroe (1990, 1993), Sloane (1992, 1996, 2001), Snow (1967a), Stresemann (1921), Stresemann *et al.* (1937), Sturmbauer *et al.* (1998), Vaurie (1957a, 1957d, 1959), Voous (1977), Watson (1986), Wunderlich (1989a, 1989b, 1991a, 1991b).

2. Silver-throated Tit

Aegithalos glaucogularis

French: Mésange à gorge argent **German:** Silberkehl-Schwanzmeise **Spanish:** Mito Gorjigris
Other common names: Silver-throated Bushtit

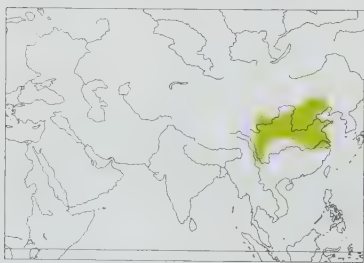
Taxonomy. *Orites (?) glaucogularis* F. Moore, 1855, Shanghai, China.

Often treated as conspecific with *A. caudatus*, but plumage is distinctive, and there are no reports of regular intergradation or hybridization with that species in NE China (apparent “intergrades” recorded as migrants in coastal Hebei, but origin and status of these unknown). Two subspecies recognized.

Subspecies and Distribution.

A. g. vinaceus (J. Verreaux, 1870) – C & NE China from E Qinghai and C Gansu E to C & SE Nei Mongol, S Liaoning, N Hebei and Shandong, and, in W, S to mountains of C Sichuan and NW Yunnan.

A. g. glaucogularis (F. Moore, 1855) – EC China in Yangtze valley from Hubei (possibly also lowlands of Sichuan), parts of S Shaanxi and Henan E to Jiangsu and N Zhejiang.



Descriptive notes. 13–16 cm, of which tail 6–10 cm; 6.5–9 g. A tiny, round-bodied passerine with short stubby bill and long, narrow tail. Nominant race has forehead buff, lateral crownstreaks glossy black, merging on forehead, central crownstreak and centre of nape pale buff with variable blackish streaking; upperparts medium to dark grey, narrow band of pink on rump, outer scapulars tipped blackish; tail blackish, outer feather mostly white on outer web, inner rectrices with grey fringes on outer webs; upperwing blackish-brown, lesser and median wing-coverts darker, greater coverts fringed black, tertials and secondaries

with slightly paler edgings; lores, cheek and ear-coverts pale drab grey obscurely streaked, chin, submoustachial stripe and side of neck off-white, throat sooty black with fine pale grey feather tips; breast pale drab grey to buffy grey, belly slightly paler and whiter, flanks, vent and undertail-coverts clean pale pink; iris hazel; bill and legs greyish-black. Sexes alike. Juvenile is similar to adult, but chin, throat and breast vinous-pink, contrasting with white submoustachial area and side of neck, remainder of underparts washed yellow-buff, also some pale edging on scapulars and upperwing-coverts. Race *vinaceus* differs from nominate in having side of head and throat slightly paler, underparts also slightly paler, breast less intensely washed buff, but often marked by gorget of marginally darker and browner streaks, tail longer. Voice. Calls include high-pitched, pure, quiet but penetrating “see-see-see” or “see-see-see-sit” and a louder, slurred “tsirrup”; similar to vocalizations of *A. caudatus*.

Habitat. Forest edge and scrub, primarily deciduous; recorded also from pine (*Pinus*) forest in Yunnan. In N of range breeds in lowlands and mountains, up to c. 1700 m in Shaanxi (Qin Ling Shan), 2925 m in Gansu and 3020 m in Qinghai; in S may be restricted to mountains, occurring at up to 2590 m in N Sichuan and at least 3050 m in Yunnan.

Food and Feeding. No specific information. Diet and behaviour probably as for *A. caudatus*.

Breeding. Season Mar–Apr in NE China. No other information.

Movements. Presumed largely sedentary, but some evidence of altitudinal movements (but still present at 2835–3050 m in Yunnan in Jan–Feb). Also some dispersal away from breeding areas, and in NE China occurs as irregular migrant at Beidaihe, in coastal Hebei, late Aug to at least Feb.

Status and Conservation. Not assessed. Widespread and fairly common, and thus considered not to be at any immediate risk. Extent of range of nominate race uncertain; possibly found in lowlands of Sichuan, but further study required. Status of race *vinaceus* in NW Shandong uncertain, and may be only a passage migrant.

Bibliography. Bangs (1932), Bangs & Peters (1928), Cheng Tsohsin (1987), Dickinson *et al.* (2006a), Eck & Martens (2006), Elchécopar & Hüe (1983), Harrap & Quinn (1996), Kleinschmidt *et al.* (1922), Liang Wei *et al.* (2000), Riley (1926, 1931), Vaurie (1959).

3. White-cheeked Tit

Aegithalos leucogenys

French: Mésange à joues blanches

Spanish: Mito Cariblanco

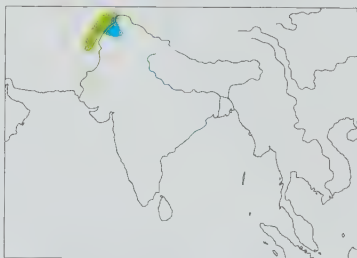
German: Weißwangen-Schwanzmeise

Other common names: White-cheeked Bushtit/Long-tailed Tit, Kashmir Tit

Taxonomy. *Orites leucogenys* F. Moore, 1854, Balu Chughur, Kunar River (near Jalalabad), eastern Afghanistan.

Affinities within genus not clear, although closest in overall appearance to *A. concinnus*. Monotypic.

Distribution. NE Afghanistan (Nuristan, S to Safed Koh), and N Pakistan from Chitral S to N Baluchistan (Shingar range and Ziarat), E to Gilgit, Baltistan, Hazara, Indus Kohistan (Palas Valley) and Margalla Hills near Islamabad.



Descriptive notes. 11 cm; 6–8 g. A typical long-tailed tit in shape, with medium-long tail, white cheek patch and blackish bib. Forehead and centre of crown are cinnamon-drab, washed olive-brown at rear; lores and narrow band backwards (barely encompassing eye) to side of nape black, poorly defined behind eye and grading to light greyish-drab on upper ear-coverts; cheek and lower ear-coverts white, extending onto side of neck as half-collar; upperparts and upperwing-coverts light greyish-olive; flight-feathers and tail medium to dark brown, remiges fringed paler (greyish-olive), outer two rectrices broadly tipped white;

chin and throat blackish, lower border tinged burgundy; upper breast light drab-grey, becoming duller and more ochre on lower breast and belly; flanks and vent pale pinkish-buff; iris straw-yellow or grey-yellow; bill black; legs pale orange-brown or pinkish-brown. Distinguished from *A. concinnus* mainly by duller crown, lack of white supercilium, narrower black band on side of head, black chin (bib therefore extending to bill), and paler and duller underparts; from *A. niveogularis* by dull forehead and forecrown and black bib. Sexes alike. Juvenile has crown slightly paler and more buffish, dark facial band slightly narrower, although better defined at rear, and upperparts slightly duller and browner, cheek patch and throat pale buff (thus lacks black bib, although may show hint of narrow dark bib on chin and centre of throat), side of breast dull cinnamon-brown, remainder of underparts pale pinkish-buff, variably streaked dark brown on upper breast. Voice. Contact call “si-si-si-si”, sometimes slightly slurred or lisping towards end (“si-si-si-si-sisip”); clipped, dry “tup” or “tep”, often interspersed with thinner “seeup” or “tsreet”; hard, explosive, slurred, rattling “trrrr” or “trrrp”. Also delivers a jumbled, rambling series of sweet, squeaky and warbling notes, but (as *A. caudatus*) probably lacks a true territorial song.

Habitat. Open dry scrubby forest of holly oak (*Quercus ilex*), juniper (*Juniperus*) and pine (*Pinus*), also almond (*Prunus dulcis*) scrub at higher altitudes; breeds at 1500–3660 m. In non-breeding season recorded at 500–2100 m, and may frequent edge of cultivation, thorn-scrub and riverine tamarisks (*Tamarix*).

Food and Feeding. Food insects and spiders (Araneae). Forages largely in shrub layer, also in crowns of holly oaks and well-grown junipers. Found in pairs; from late summer until about mid-Apr in parties of 6–12 individuals, often joining mixed-species foraging flocks.

Breeding. Season late Mar to May. Both sexes collect nest material; nest an upright oval ball c. 110 × 85 mm, entrance at side near top, woven from moss, grass, vegetable fibres and similar, bound with spider web and densely lined with feathers, 1–3.5 m above ground and usually placed in thorny bush, stunted holly oak or juniper. Clutch 5–8 eggs, white, sometimes faintly spotted pinkish-red at larger end, size c. 14.7 × 9.9 mm; no information on incubation and nestling periods; both sexes feed the fledged young, which remain dependent for at least 14 days after leaving nest.

Movements. Resident, with some seasonal altitudinal movement. Also some limited post-breeding dispersal; e.g. in Pakistan recorded from the Attock and Campbellpore region of NW Punjab.

Status and Conservation. Not globally threatened. Restricted-range species: present in Western Himalayas EBA. Common in Afghanistan; locally common in Pakistan, although rather scarcer in Gilgit. Recent reports of this species from S Himachal Pradesh, in N India, suggest some migratory movement or, more likely, an overlooked population; old reports of its occurrence in adjacent regions (Kashmir and Uttaranchal), however, unconfirmed and/or unreliable.

Bibliography. Ali & Ripley (1983), Dymond (2003), Eck & Martens (2006), Harrap & Quinn (1996), Paludan (1959), Raja *et al.* (1999), Rasmussen & Anderton (2005b), Roberts (1992), Stattersfield *et al.* (1998), Wunderlich (1989b).

4. Black-throated Tit

Aegithalos concinnus

French: Mésange à tête rousse

German: Schwarzkehl-Schwanzmeise

Spanish: Mito Gorjinegro

Other common names: Red-headed (Long-tailed) Tit, Black-throated Bushtit

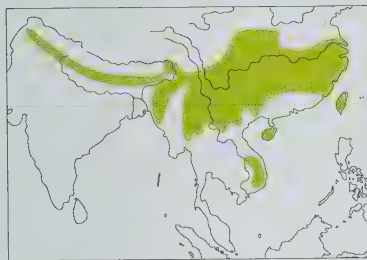
Taxonomy. *Psaltira concinna* Gould, 1855, Chusan, Zhejiang, eastern China.

Marked geographical variation, and very preliminary genetic studies suggest that this species may, in fact, represent an unresolved species swarm. Races divided into three groups, *iredalei* forming

one group, *annamensis* another, and remaining four races forming "n nominate group". Race *annamensis* is morphologically distinct, and its separation as a full species could well be justified on this basis alone. Some SE Asian populations of this species of uncertain racial affinity: thus, birds in NW Thailand presumed to belong with *pulchellus*, those in EC Laos (Nakay-Nam Theun) tentatively included with *talifuensis*, and those in NE Vietnam and on Hainan I presumed to be of nominate race. Race *talifuensis* perhaps better synonymized with nominate. Proposed race *taiwanensis* (Taiheisan, in Taiwan) inseparable from nominate. Six subspecies recognized.

Subspecies and Distribution.

A. c. iredalei (Stuart Baker, 1920) – N Pakistan (Swat) E in Himalayas to NE India (Mishmi Hills, in E Arunachal Pradesh), also SW China (Sun Kosi valley and Tsangpo bend area of S Xizang).
A. c. manipurensis (Hume, 1888) – NE India (from SE Arunachal Pradesh S to Lushai Hills of E Mizoram) and W Myanmar (Chin Hills).
A. c. talifuensis (Rippon, 1903) – NE Myanmar (E of R Irrawaddy), S China (C & SW Sichuan S from Emei Shan, S to Yunnan and SW Guizhou), N & EC Laos and NW Vietnam.
A. c. pulchellus (Rippon, 1900) – E Myanmar (S Shan States and Karenni District) and NW Thailand.
A. c. concinnus (Gould, 1855) – EC & SE China (S Shaanxi and Hubei E to S Jiangsu, S to N Guangxi and Fujian; has bred Hong Kong, but possibly birds of captive origin), also NE Vietnam (Cao Bang and Ha Giang Provinces), Hainan I and Taiwan.
A. c. annamensis (Robinson & Kloss, 1919) – S Laos (Boloven Plateau), Vietnam (C & S Annam) and adjacent Cambodia (Phumi Dak Dam).



Descriptive notes. 10–5 cm; 4–9 g. Small passerine with medium-long tail, white chin, black throat and black "bandit mask" around pale eye. Nominative race has crown cinnamon with slight rufous tinge, lores and broad band backwards through (and above and below) eye to side of nape black; upperparts blue-grey, rump tinged brownish-ochre; greater upwings coverts and flight-feathers dark brown, remiges broadly fringed grey; tail blackish-brown with grey edges to feathers, outer three pairs tipped white, outermost with white outer web; chin, submoustachial area and side of neck white, throat black, white band across lower throat,

below this a well-defined but fairly narrow cinnamon-rufous breastband (may be nearly broken in centre); flanks rufous-chestnut, remainder of underparts white (pale pinkish-buff feather bases on belly and vent visible when plumage worn); iris yellow-white; bill black; legs dull orange-brown or brownish-yellow. Sexes alike. Juvenile has cap slightly paler than adult, upperparts duller and browner, chin and throat off-white, variably prominent gorget of dark spots or streaks across uppermost breast, dull underparts washed buffish. Races differ mainly in plumage pattern and tone: *talifuensis* is similar to nominate but crown darker, some faint white flecks on rear side of crown, and breastband and flanks darker rufous-chestnut; *manipurensis* has crown more rufous-tinged cinnamon than nominate, a few white feather tips in superciliary area, and breast and flanks slightly paler rufous-cinnamon, also breastband somewhat broader and less well defined; *pulchellus* resembles previous, but forehead and crown light drab brown, no white (or just a few faint white flecks) in superciliary region, centre of lower breast and belly purer white; *iredalei* is distinctive, has forehead cinnamon-orange, crown and nape rufous, prominent white supercilium from above and behind eye to nape, white of chin, submoustachial area and side of neck tinged buff, narrow band on upper breast pale buffy white, grading to rufous-buff on breast and pinkish on flanks and side of vent; *annamensis* is also very distinctive, with forehead pale dull grey, centre of crown slightly darker, vague white-flecked supercilium from above eye back to nape side, whitish underparts with medium grey breastband and beige or light greyish-pink flanks. VOICE. Very vocal. Usual contact calls a high-pitched, sibilant "see-see-see"; fuller and flatter clipped "chet", usually interspersed with single high, sibilant "tset" or harsh "tsreet" notes; explosive, slurred, hard rattling trill falling in pitch towards end, "trrrret" (like short wind of a clockwork mechanism), which in agitation may be rather harsh and then taken up by every flock-member; short, full, squeaky "psiup"; delicate trilling "tsee-see-si-si'sisi", repeated every few seconds, reminiscent of song of Common Blue Tit (*Cyanistes caeruleus*).

Habitat. Primarily edge habitats in broadleaf forest, especially oak (*Quercus*), also mixed forest and sometimes cedar (*Cedrus*) and, especially in NE India (possibly also C Vietnam), pine (*Pinus*). In addition, found in wide variety of lightly wooded or bushy habitats, including rhododendron (*Rhododendron*) and bamboo. Generally at middle altitudes in subtropical and temperate zones. In Himalayas E to Myanmar and N parts of SE Asia breeds mostly at 1200–2700 m (1400–2500 m in W); in Vietnam found in N at c. 1000 m and in Annam at 600–1980 m, with breeding noted at 600 m, and in EC Laos at 1000–1800m; in China recorded at 75–3960 m (but probably breeds mainly 1500–2500 m), and in Taiwan recorded 1000–3000 m (probably breeds 1500–2400 m). During dispersal (apparently to both higher and lower elevations), recorded to 3000 m in W Himalayas and to 3600 m in E Himalayas, and down to 1200 m in Pakistan (900 m elsewhere in W Himalayas), 1065 m in Nepal, 400 m in Bhutan and NE India (Arunachal Pradesh) and 900 m Myanmar, but except in hardest weather does not usually descend below breeding zone.

Food and Feeding. Food insects; also small seeds and fruits, especially raspberries (*Rubus*). Forages mainly in middle and lower storeys. Very gregarious, and usually in flocks, sometimes containing as many as 40 individuals; small flocks found throughout breeding season (comprising failed breeders or non-breeders and, later, family parties from early broods). Often joins mixed-species foraging parties.

Breeding. Season relatively early, Mar–May (sometimes to Jun) in Himalayas, NE India and Myanmar, Apr in NW Thailand, and late Feb–May in China; single-brooded. Sometimes co-operative breeder, with helper. Nest built by both sexes, female taking dominant role, work over a protracted period, 10–11 days in C China (NE Sichuan), sometimes more than two weeks, an oval ball 100–150 mm tall × 95–140 mm wide, entrance hole at side near top, made from green moss, lichen, rootlets, bark scraps, hair, spider egg cases and vegetable down, bound together with spider webs, densely lined with feathers and sometimes also wool, fur or vegetable down; usually sited up to 3 m above ground in fork or woven around several twigs in low tree or bush, occasionally to 12 m up on horizontal bough of deodar (*Cedrus*) or at tip of a pine branch, rarely in rough grass or other low, tangled vegetation. Clutch 3–8 (generally 3–6) eggs in Himalayas, 3 in NE India and N Myanmar and 3–5 in W Myanmar (Chin Hills), white or pale pink, variably but usually finely spotted reddish, especially in a ring at larger end, occasionally unmarked, average size 13.9 × 10.6 mm; incubation by female or by both sexes (male roosts in nest), period c. 14–16 days; chicks fed by both sexes, duration of nestling period in C China 14 days; three nests in C China each had one helper present, latter assisting in both incubation of eggs and brood-feeding; young remain dependent on parents for at least ten days after fledging.

Movements. Mostly resident. Undertakes erratic and rather limited altitudinal movements. Sporadic presence in Hong Kong (where has bred), but these birds may be of captive origin.

Status and Conservation. Not globally threatened. Generally fairly common to common, and locally abundant; very rare on Mt Victoria (W Myanmar). Mean density of 1.4 breeding pairs/km has been recorded in Bhutan. Race *annamensis* recently recorded in E Cambodia, where presumed previously overlooked. Presence (race *manipurensis*) in Meghalaya and Cachar, in NE India, suspected, but confirmation required.

Bibliography. Ali & Ripley (1983), Duckworth & Hedges (1998), Eck & Martens (2006), Evans & Timmins (1998), Grimmett *et al.* (1998), Guo Guiyun *et al.* (2006), Harrap & Quinn (1996), Kalyakin (1996), Li Guiyuan *et al.* (1982), Löhrl (1985a), Martens & Eck (1995), Rasmussen & Anderton (2005b), Reichholf (1977), Robson (2000b), Spierenburg (2005), Vaurie (1950a, 1957a), Vogel *et al.* (2003), Whistler & Kinnear (1949), Yen Chungwei (1990), Zhou Lizhi *et al.* (2003).

5. White-throated Tit

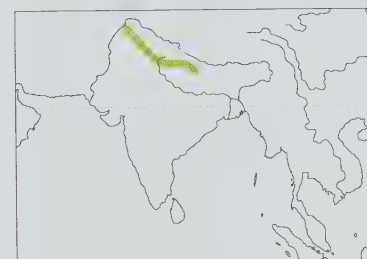
Aegithalos niveogularis

French: Mésange à gorge blanche **German:** Weißkehl-Schwanzmeise **Spanish:** Mito Gorjiblanco
Other common names: White-throated Bushit/Long-tailed Tit

Taxonomy. *Orites* (?) *niveogularis* F. Moore, 1855, northern Punjab, India.

Forms a superspecies with *A. iouschistos*, *A. bonvaloti* and *A. sharpei*; all four sometimes treated as conspecific, but they seem to be morphologically fairly distinct from one another and, while ranges overlap only minimally or not at all (e.g. range of present species does not quite meet that of *A. iouschistos* in C Nepal), there is no evidence of intergradation or hybridization between any of them. Monotypic.

Distribution. NE Pakistan (Palas and Kandia valleys, Kagan valley and Neelum valley) and Kashmir E to N India (Himachal Pradesh, N Uttarakhand Pradesh) and WC Nepal (E to Dolpo and NW flanks of Dhaulagiri massif, rarely to E flank of Kali Gandaki valley; single report from Gosainkund).



Descriptive notes. 11.5 cm; mean for three individuals 7.8 g. Typical long-tailed tit, with medium-long tail. Has forehead and broad crownstripe white, grading to cinnamon-brown on central hindcrown and nape; lores, cheek and side of crown black, becoming blackish-brown on rear crown and cinnamon-brown on rear ear-coverts, and merging into nape and upper mantle; upperparts light grey to medium grey (washed buffish when plumage fresh), narrow pinkish band on rump; greater upwings coverts and flight-feathers dark grey-brown, fringed light grey, tail dark grey-brown, feathers edged grey, outer three pairs tipped

white, outermost extensively white; chin and throat pale grey, submoustachial area and side of neck purer white, clearly demarcated from narrow cinnamon-brown breastband; remainder of underparts beige or pale pinkish-brown; iris pale brown to dark brown or reddish-brown; bill dark slate to black; legs flesh-yellow to brown. Differs from *A. leucogenys*, *A. concinnus* and *A. iouschistos* in white throat, half-collar, forehead and forecrown, and dark eye. Sexes alike. Juvenile has duller crownstripe, tinged buff on forecrown, browner upperparts, buff wash on side of neck and submoustachial, dull pinkish throat (sometimes mottled darker), and narrow, irregular and less contrasting breastband. VOICE. Calls include thin, high-pitched "tsi-tsi-tsi", soft clipped "pit", also a slurred high-pitched "tsreet", becoming in excitement a louder, hard, explosive descending rattle, "tsirrrrr". Apparent song a long and complicated series of phrases, not very loud or far-carrying, comprising rapid chattering "tweet-tweet" notes interspersed with rapid "tsi-tsi-tsi" phrases and short elided warbling phrases, more complex than (and superior to) equivalent vocalizations of *A. leucogenys* and *A. concinnus*; as *A. caudatus*, however, probably lacks a true territorial song.

Habitat. Scrub of barberry (*Berberis*), rose (*Rosa*), willow (*Salix*), rhododendron (*Rhododendron*) and the like, in and on margins of coniferous, mixed birch–spruce (*Betula–Picea*) and oak (*Quercus*) forest. In C Nepal breeds in drier trans-Himalayan zone, but in Pakistan found in moist coniferous forests and in N India (Kumaon) in oak forest. Breeds at high altitudes, towards tree-line, in Pakistan recorded at 2400–3400 m in spring, in Kashmir 2440 m to c. 3660 m (nests found at 2560 m), in Uttarakhand Pradesh at 2000–3700 m (nests at minimum of 3350 m, but recorded in summer also at 2000–2600 m) and in Nepal at 2750–3965 m; recorded in winter months at 1750–2200 m in Palas valley (Pakistan) and down to 1800 m in Kashmir.

Food and Feeding. Food largely insects, especially insect larvae and pupae, also spiders (Araneae); possibly also flower buds. Forages in shrub layer. Found in pairs in spring and early summer; otherwise usually in small parties, sometimes as many as 20 individuals together, and may join mixed-species foraging flocks.

Breeding. Carrying nest material on 24th May in Pakistan, and eggs recorded 26th Jun (possibly replacement clutch) and young in early to mid-Jun in N India (Uttarakhand); large young on 31st May in Kashmir. Nest an oval or pear-shaped ball of moss and cobwebs, covered with lichen and densely lined with feathers, entrance to one side near top, placed in fork 1–3 m above ground in tree or bush or suspended in tree branches up to 10 m up. One clutch of 4 eggs recorded (variation in clutch size unknown), eggs white, finely spotted pink at broader end, c. 14.2 × 11 mm. No other information.

Movements. Resident, with some seasonal altitudinal movements.

Status and Conservation. Not globally threatened. Restricted-range species: present in Western Himalayas EBA. Rare and local in Pakistan; uncommon to locally common in India; generally rare and local in Nepal, but locally common in Langu valley (W Nepal). Population density apparently low.

Bibliography. Ali & Ripley (1983), Dickinson *et al.* (2006a), Eck & Martens (2006), Fleming *et al.* (1984), Grimmett *et al.* (1998), Harrap & Quinn (1996), Inskipp & Inskipp (1991), Martens & Eck (1995), Raja *et al.* (1999), Rasmussen & Anderton (2005b), Roberts (1992), Stattersfield *et al.* (1998), Sultana & Khan (2000), Vaurie (1957a), Wunderlich (1989a).

6. Rufous-fronted Tit

Aegithalos iouschistos

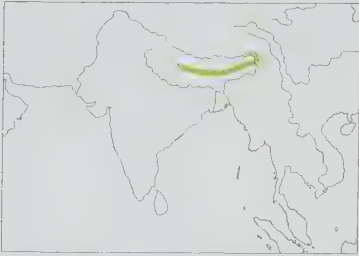
French: Mésange de Blyth **German:** Rostwangen-Schwanzmeise **Spanish:** Mito Frentirrufo
Other common names: Rufous-fronted Bushit, Blyth's (Long-tailed)/Himalayan/Black-headed Tit

Taxonomy. *Parus iouschistos* Blyth, 1845, Nepal.

Forms a superspecies with *A. niveogularis*, *A. bonvaloti* and *A. sharpei*; all four sometimes treated as conspecific, but they seem to be morphologically fairly distinct from one another and, while ranges overlap only minimally or not at all (e.g. range of present species does not quite meet that of

A. niveogularis in C Nepal, and marginally sympatric with *A. bonvaloti* in SW China), there is no evidence of intergradation or hybridization between any of them. Monotypic.

Distribution. C & E Nepal E in narrow band along S flank of Himalayas to at least Bhutan, extending N of main range into SW China (SE Xizang E to the Yi'ong Zangbo and Po Tsangpo).



Descriptive notes. 11 cm; 6–7.5g. Typical long-tailed tit in size and shape, with well-graduated long tail. Has forehead and centre of nape cinnamon, broad crownstripe paler cinnamon-buff, side of crown glossy black, grading to black on lores and upper ear-coverts; lower ear-coverts, cheek and side of neck cinnamon-buff, narrow rufous submoustachial stripe extending to side of breast; upperparts dull mid-grey, slightly pinker on rump; greater upwings-coverts and flight-feathers dark grey-brown, fringed medium grey, tail dark grey-brown, outer three feather pairs tipped paler; chin and side of throat black (forming

diffuse inverted “V”), centre of throat and breast silvery grey, remainder of underparts rufous-cinnamon; iris yellow-white to lemon-yellow; bill black; legs yellow-brown or flesh-brown to dark brown. Differs from *A. concinnus* in having much more extensive blackish on side of head, pale crownstripe, lack of white supercilium and lack of black bib; from *A. niveogularis* in cinnamon-buff (not white) crownstripe, extensive blackish on side of head, small silvery bib, and cinnamon-rufous underparts lacking darker breastband. Sexes alike. Juvenile has crownstripe paler, side of head duller black, submoustachial stripe and ear-coverts pale pinkish-buff, side of neck and entire underside (including throat) dirty pale buff, more cinnamon-buff on belly and vent, with dark grey blotching and spotting, especially on breast. VOICE. Calls include high “si-si-si”, single thin, high-pitched, insect-like “tsit”, full clipped “chip”, squeaky “ip, ip...”, and explosive, slurred, rattling trill, “ttrrrp”; all may be given more or less simultaneously by flock-members during foraging.

Habitat. Forest edges, clearings and scrubby growth in and around temperate forest of oak (*Quercus*), rhododendron (*Rhododendron*) and chestnut (*Castanopsis*), also mixed forest and stands of pine (*Pinus*), spruce (*Picea*) or hemlock (*Tsuga*) at higher altitudes and scrub above tree-line, especially riverine scrub; in SW China (SE Xizang) habitat occupied varies from scrubby, almost desert-like slopes to dense forest. Altitudinal range in Himalayas 2200–3770 m, and in SW China at least 2745–3505 m; some post-breeding dispersal downwards into subtropical evergreen forest, but only occasionally moves lower in winter except during heavy snowfalls, when may descend a few hundred metres; in Sikkim recorded in winter at 2745–3720 m, exceptionally down to 2440 m in severe weather, and in Bhutan regular upper altitudinal limit in summer 3400 m but descends below 3200 m mid-Nov to mid-Mar. Seldom, if ever, overlaps altitudinally with *A. concinnus*.

Food and Feeding. Food insects, including their eggs and larvae; also some vegetable matter. Forages in canopy, as well as in shrub layer. Occurs in parties of up to 40 individuals outside breeding season, sometimes joining mixed-species foraging flocks (but found in single-species flocks more frequently than are congeners).

Breeding. Flock breaks up into pairs Mar–Jul; noted as carrying nest material on 7th Apr and 4th May, female with oviduct egg on 24th May in Bhutan, young recorded in May and early Jun; nest-building in SW China 25th May. A nest in Nepal described as a ball, entrance hole to side, studded outside with lichens and lined with feathers, placed in oak tree; other nests have been recorded high in a fir tree (*Abies*) and near tip of a pine branch. Young in Nepal nest fed by both sexes. Gathers again into large flocks as soon as young able to fly. No other information.

Movements. Resident, with some limited seasonal altitudinal movement. Occasionally descends lower in winter, usually when heavy snowfall.

Status and Conservation. Not assessed. Frequent in Nepal, and fairly common to common in E Himalayas; extremely abundant in China (SE Xizang), and apparently commoner in drier areas N of main range of Himalayas than in denser forest to S. In Nepal, regular W to Langtang valley, rarely to Kali Gandaki valley and Dhaulagiri Massif (record farthest W in Dhorpatan); recorded very rarely in Kathmandu valley. Status in NE India uncertain: present in Darjeeling District, but possible distribution in Arunachal Pradesh requires clarification.

Bibliography. Ali & Ripley (1983), Cheng Tsohsin (1987), Dickinson *et al.* (2006a), Eck & Martens (2006), Fleming *et al.* (1984), Grimmer *et al.* (1998), Harrap & Quinn (1996), Inskipp & Inskipp (1991), Li Guiyuan *et al.* (1982), Ludlow & Kinneir (1944), Martens & Eck (1995), Rasmussen & Anderton (2005b), Spiereburg (2005), Vaurie (1957a), Wunderlich (1991a, 1991b), Zheng Zuoxin *et al.* (1983).

7. Black-browed Tit

Aegithalos bonvaloti

French: Mésange de Bonvalot **German:** Brauenschwanzmeise **Spanish:** Mito Cejinegro
Other common names: Black-headed/Bonvalot's Tit

Taxonomy. *Acredula Bonvaloti* Oustalet, 1892, Tatsienlu (= Kangding), Sichuan, China.

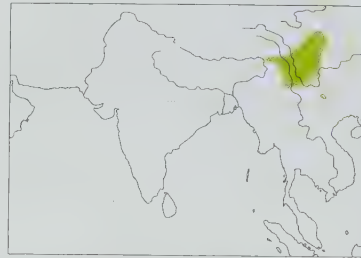
Forms a superspecies with *A. niveogularis*, *A. iouschistos* and *A. sharpei*; all four sometimes treated as conspecific, but they seem to be morphologically fairly distinct from one another and, while ranges overlap only minimally or not at all (e.g. range of present species meets or very marginally overlaps with that of *A. iouschistos* in SW China), there is no evidence of intergradation or hybridization between any of them. Races presumed to intergrade. Two subspecies recognized.

Subspecies and Distribution.

A. b. obscuratus (Mayr, 1940) – NC Sichuan (mountains NW of Red Basin, in region of Wenchuan), in C China.

A. b. bonvaloti (Oustalet, 1892) – SC China (W & C Sichuan S to SE Xizang, NW Yunnan and Weining region of W Guizhou) and extreme NE Myanmar (E of R Irrawaddy, S to Myitkyina).

Descriptive notes. 11 cm; 5–8.5 g. Typical long-tailed tit in size and shape, with well-graduated long tail. Nominant race has forehead whitish, crownstripe and centre of nape buffish, side of crown glossy black, grading to sooty black, on lores and upper ear-coverts; lower ear-coverts cinnamon-buff (well demarcated from dark colour above), submoustachial stripe off-white, sides of neck buffish; upper mantle dull cinnamon, remainder of upperparts dull mid-grey, slightly pinker on rump; greater upwings-coverts and flight-feathers dark grey-brown, fringed mid-grey, tail dark grey-brown, outer three feather pairs tipped white; chin and malar stripe sooty black (forming well-defined inverted “V”), centre of throat off-white (sooty black feather centres largely concealed), lower throat and upper breast white; side of breast, upper flanks and band across lower breast cinnamon, belly off-white, grading into pinkish or pinkish-cinnamon on lower flanks and vent; iris pale yellow to yellow-white; bill black; legs yellow-brown to dark brown. Differs from *A. concinnus* in having much more extensive blackish on side of head, narrower and paler crownstripe, and no black bib; from *A. fuliginosus* in blackish mask, inverted dark “V” on throat, and cinnamon



cheek patch. Sexes alike. Juvenile has side of head and markings on throat duller black, no cinnamon on upper border of mantle, paler and buffier ear-coverts contrasting less with submoustachial, throat and breast (which are washed buff), also underparts buff, spotted grey, especially on upper breast and centre of belly, forming irregular breastband of dark blotches. Races differ minimally: *obscuratus* is slightly duller and browner than nominate. VOICE. No specific information; vocalizations probably similar to those of congeners.

Habitat. Undergrowth and scrub in and around mixed forest, perhaps especially stands of willows (*Salix*) and poplars (*Populus*) along watercourses; less commonly in pines (*Pinus*) and subalpine forests of hemlock (*Tsuga*) and other conifers. In China recorded at c. 1500–4400 m (optimum zone probably 1500–3500 m), and in N Myanmar recorded from 1830 m to above 3100 m (not uncommon above 2135 m; some descend in winter to c. 1300 m, exceptionally to 700 m in subtropical evergreen forest (but observed above 3000 m in late Jan in Myanmar).

Food and Feeding. No information on diet. In non-breeding season forms foraging flocks.

Breeding. Recorded in May in S China (Guizhou); males coming into breeding condition in mid-Mar in N Myanmar. Nest c. 93 mm tall × 74 mm deep, external diameter 93 mm, entrance hole to side, a lichen-covered ball of moss and creepers, lined with feathers. Clutch 4–5 eggs, white, 14.4 × 10.6 mm; both sexes incubate eggs and feed young. No further information.

Movements. Resident; some seasonal altitudinal movements recorded.

Status and Conservation. Not assessed. Rather poorly known species. Sometimes considered uncommon in China, but reported as very common in SW Sichuan; common in NE Myanmar. Status in Kunming (Yunnan) uncertain, but perhaps only a non-breeding visitor.

Bibliography. Anon. (1980c), Cheng Tsohsin (1987), Eck & Martens (2006), Étiéhecopar & Hue (1983), Harrap & Quinn (1996), King (1989a), Li Guiyuan *et al.* (1976), Riley (1931), Rothschild (1921), Schäfer & Meyer de Schauensee (1938), Smythies (1986), Thayer & Bangs (1912), Vaurie (1957a), Wu Zhikang *et al.* (1986), Wunderlich (1991a, 1991b), Zheng Zuoxin *et al.* (1983).

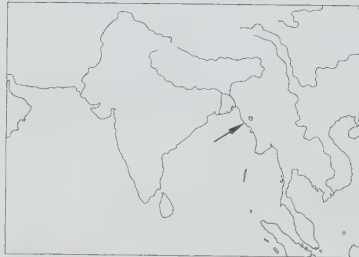
8. Burmese Tit

Aegithalos sharpei

French: Mésange de Sharpe **German:** Burmaschwanzmeise **Spanish:** Mito Birmano
Other common names: Myanmar Tit

Taxonomy. *Aegithaliscus sharpei* Rippon, 1904, Mount Victoria, southern Chin Hills, Myanmar. Forms a superspecies with *A. niveogularis*, *A. iouschistos* and *A. bonvaloti*; all four sometimes treated as conspecific, but they seem to be morphologically fairly distinct from one another and, while ranges overlap only minimally or not at all, there is no evidence of intergradation or hybridization between any of them. Present species usually treated as conspecific with *A. bonvaloti* (sometimes with both *A. bonvaloti* and *A. iouschistos* when these are combined), but distinctive appearance (closer to that of *A. niveogularis*) and geographically remote distribution justify its treatment as a distinct species. Monotypic.

Distribution. Mt Victoria and Mindat, in S Chin Hills of SW Myanmar.



Descriptive notes. 11 cm. A typical long-tailed tit in size and shape, with well-graduated tail. Forehead and centre of crown are whitish, grading to cinnamon-brown on rear crown and nape; side of crown, lores and cheek black (black bands on side of head relatively narrow, especially at rear), ear-coverts cinnamon-brown; upper mantle cinnamon-brown, remainder of upperparts dull medium grey, slightly pinker on rump; greater upwings-coverts and flight-feathers dark grey-brown, fringed mid-grey, tail dark grey-brown, outer three feather pairs tipped white; chin and side of throat blackish (forming dull, relatively poorly defined inverted “V”), centre of throat, submoustachial area, side of neck and upper breast white, well-defined cinnamon-brown breastband; centre of lower breast and belly dirty pinkish-cinnamon, remainder of underparts cinnamon or cinnamon-buff; iris yellow; bill dark; no information on leg colour, probably brownish-horn. Differs from *A. concinnus* (of local race *manipurensis*) in having more extensive black on side of head, narrower crownstripe, whitish throat, and duller and browner breastband. Sexes alike. Juvenile undescribed. VOICE. Calls include thin, high-pitched “tsi-si-si-si”, more rolling “tscep”, soft “tsup”, and slurred, hard rattling “tsirrup”.

Habitat. More or less open forest of pines (*Pinus*) at 2500–3000 m (pine forest occupies drier slopes at these altitudes), and above this in open evergreen moss forest of oak (*Quercus*) and rhododendron (*Rhododendron*) up to the summit at 3053 m. Recorded in winter down to 2100 m.

Food and Feeding. No information. Behaviour reminiscent of that of *A. caudatus*.

Breeding. Adult carrying nest material on 3rd Apr, mating on 13th Apr and fledged young seen in May; male with enlarged testes in mid-Apr and two females with enlarged ovaries in late Apr. No other information.

Movements. Resident, with some seasonal altitudinal movement.

Status and Conservation. Not assessed. Poorly known; apparently not common, as some recent visitors to Mt Victoria have had difficulty in finding this species. Forest on Mt Victoria has been almost completely cleared below 2000 m and is degraded up to 2500 m; although the mountain lies within Natmataung National Park, forest destruction, especially by fires, is a continuing problem. Although this species has no conservation designation (as hitherto treated as conspecific with *A. iouschistos*), White-browed Nuthatch (*Sitta victorae*), similarly confined to forests of S Chin Hills, is classified as Endangered.

Bibliography. Eck & Martens (2006), Harrap & Quinn (1996), Rasmussen & Anderton (2005b), Robson (2000b), Robson *et al.* (1998), Stresemann & Heinrich (1940a).

9. Sooty Tit

Aegithalos fuliginosus

French: Mésange à col blanc **German:** Rußschwanzmeise **Spanish:** Mito Cuelliblanco

Food and Feeding. Bulk of food consists of small insects and spiders (Araneae); also small amounts of vegetable matter, including small galls (probably for the contents), olives (*Olea*), and tiny seeds such as those of willow (*Salix*). In study in California, scale insects (Coccidae) were most abundant food item taken (19%), but lepidopteran larvae may be far more important in terms of biomass. May be entirely carnivorous in summer. Gregarious, in flocks of up to c. 40 individuals during most of year, flock's foraging home range c. 100 ha, adults retain membership of same flock from year to year; may participate in mixed-species foraging flocks throughout year. Very agile and active, forages among thinner branches, slender stems and leaf stalks, mostly in outer portion of

tree or bush, even finest peripheral branches, but rarely on ground. Foliage-gleaning specialist. Frequently hangs upside-down (in manner of *Poecile* and *Parus* tits), and regularly uses a foot to bend back leaves in order to expose central portion of a clump of foliage. Usually simply swallows food items, but larger caterpillars (more than 1 cm long) repeatedly beaten on a branch; very rarely, holds prey in one foot (with tarsus resting on a branch) and tears it with bill before eating.

Breeding. Throughout range most clutches started in Apr, with extremes late Feb and mid-Jul, annual variations due to weather probably outweighing geographical variation; normally double-brooded (although rarely so in coastal California). Social system complex and not fully understood, also varies considerably both geographically and from year to year; breeding individuals continue to associate with all members of flock and roam freely through flock's foraging home range, although nests of all flock-members lie within smaller "nesting home range"; pairs within flock establish weakly defended, non-exclusive areas around nest during early part of breeding season, but do not defend this area after eggs laid (other flock-members may enter nest or steal nesting material). In some areas (e.g. SE Arizona), c. 30–35% of nests involve co-operative breeding, pairs showing high tolerance of conspecifics and allowing them to take part in lining of nest, incubation of eggs and feeding of young, and sometimes even to roost in nest (occasionally, one or both of pair are driven from an active nest by others); these helpers (often known as "supernumeraries") can be male or female, juvenile or adult, although majority are adult males that either are unmated or have lost a nest; in others regions (e.g. coastal California), co-operative breeding rare. Paired male and female determine nest-site by attaching and reattaching spider web in various places until enough has accumulated in one place; nest built by both sexes, taking 13–51 days (period depending on degree of reuse of material from failed nests), gourd-shaped, 165–300 mm tall × 65–100 mm in diameter, small circular entrance hole usually at one side near top, constructed from twigs, rootlets, moss, lichen, leaves, plant down, cocoons, grass, wool, feathers and flowers, all bound together with spider webs, interior lined with plant down, hair and feathers, placed 1–30 m above ground in tree or shrub, suspended from end of single twig or branch or woven around and supported by several twigs, and ranging from being completely hidden (e.g. in thick upper branches of a pine) to being completely exposed (oaks used in Arizona lose their leaves early in breeding season); if disturbed during nest-building, egg-laying or incubation, often deserts and builds new nest (pair may make up to five nesting attempts in a single season), old nests often dismantled and recycled in same season by same pair or by other pairs, allowing later nests to be constructed more rapidly than initial nests. Clutch 4–8 eggs (clutches of 9–15 eggs presumed result of more than one female laying in same nest), probably some geographical variation in clutch size, with smaller clutches commoner in S of range, eggs white, c. 13.7 × 10 mm; incubation by both sexes, period 12–13 days (15–16 days recorded in Guatemala), sometimes assisted by helpers if present; both parents and any helpers brood and feed young, which fledge after 18 days (will leave nest earlier, from 14 days, if nest disturbed), and all continue to add material until young leave nest; fledglings fed by parents and any helpers for at least 2 weeks; second clutch laid in same nest a few days after first brood leaves, even though these fledglings still dependent (occasionally, a new clutch laid in nest before first brood fledges).

Movements. Mainly resident, but some altitudinal movements. Birds of SW mountains move to higher altitudes in late summer or disperse in period Jul–Apr into suitable habitat in surrounding desert lowlands, e.g. to E watershed of Sierra Nevada (in California), to Colorado valley (in SW Arizona) and into N Sonora (Mexico) and W Texas (including N Texan Panhandle). In addition, some post-breeding wanderings, e.g. to SE Wyoming, and N & E in Colorado to Larimer County, and in Kansas several autumn–winter records from Morton County and recorded also in counties Ellis and Hamilton. Vagrant on Anacapa I, in SW California (Aug 1976).

Status and Conservation. Not globally threatened. Fairly common in small range in Canada; in USA, commonest in W coast states and in SW, fairly common in Nevada, Utah, Oklahoma and Texas, and uncommon in Idaho, Wyoming and Colorado; in Mexico, apparently commonest in N, in Baja California and Sonora, and rather sparser in S (although fairly common in Oaxaca); common in Guatemala. Population densities difficult to assess because of occurrence of widely ranging flocks and pairs. Probably vulnerable to exceptionally cold or wet winter weather. Has disappeared from some areas, e.g. in California from Santa Catalina I and the more cultivated portions of San Joaquin Valley (but may be recolonizing some areas where exotic vegetation has replaced native shrubs). Otherwise, range slowly expanding N & W in Oregon, N Washington and British Columbia. In British Columbia probably confined to R Fraser delta and nearby towns until mid-1930s, but has since spread to SE Vancouver I (where first confirmed breeding in 1937, at Victoria) and to gulf islands and throughout Fraser Lowlands, this linked to milder winters and probably also to habitat creation following forest clearance. Similarly, in Washington, originally found only in coastal areas around Puget Sound, but has expanded range inland and to some islands in Puget Sound as conifer forests of region have been replaced by suburban residential areas and shrubby second growth.

Bibliography. Adicott (1938), Bent (1946), Bruce *et al.* (1996), Chaplin (1982), Ervin (1974, 1975, 1977a, 1977b, 1978), Grinnell (1903), Gubanich & Panik (1990), Harrap & Quinn (1996), Hertz *et al.* (1976), Laudenslayer & Balda (1976), Phillips (1959, 1986), Phillips *et al.* (1964), Pyle (1997), Raitt (1967), Ridgway (1904), van Rossem (1935), Skutch (1987), Sloane (1992, 1996, 2001).

Genus *PSALTRIA* Temminck, 1836

11. Pygmy Tit

Psaltria exilis

French: Mésange pygmée **German:** Zwergschwanzmeise **Spanish:** Mito Pigmeo
Other common names: Pygmy Bushtit

Taxonomy. *Psaltria exilis* Temminck, 1836, Java. Relationship with other members of family obscure. Nevertheless, behaviour and vocalizations are very similar to those of the Palearctic species, such as *Aegithalos caudatus*. Monotypic.

Distribution. Mountains of W & C Java.
Descriptive notes. 8.5–8.7 cm. A tiny, long-tailed, nondescript aegithalid with short, stubby, broad-based bill. Head is drab greyish-brown, tinged cinnamon on forehead; upperparts, including upperwing, medium grey with brownish tinge, rump purer grey; tail dull grey-brown; chin and throat light grey, mottled and bordered below with pale pinkish-buff; side of breast, upper flanks and faint narrow breastband dull greyish-brown, rest of underparts very pale dull pinkish-buff; iris yellowish-white to whitish, sometimes brown or grey (perhaps age-related); bill greyish-horn, dark brown or black; legs flesh-yellow or yellow. Sexes alike. Juvenile remains undescribed, but thought to be very similar to adult. **Voice.** Calls include thin but penetrating, high-pitched "tsi-tsi-tsi-si-



si-si" (slowing and falling in intensity), fuller clipped "chut" and abrupt rattled "trrrt". Strongly reminiscent of voice of genus *Aegithalos*.

Habitat. Montane forest and plantations above 1000 m, occasionally down to 830 m; frequents conifers and other open trees, often on forest edge.

Food and Feeding. Food insects, including aphids (Aphidoidea) and caterpillars, also small spiders (Araneae). Active, travelling in small flocks. Often forages at low levels.

Breeding. Season Mar–May and Aug–Nov. Nest a suspended pouch of leaves and grass,

8–17 cm tall and 6–8.5 cm in diameter, lined with moss, small entrance hole (2–3 cm) near top, internal nest-chamber 3–5.5 cm deep, generally similar to nest of flowerpeckers (Dicaeidae), suspended 3–8 m above ground, concealed in foliage. Clutch 2–3 eggs, white with fine red spots, dimensions 11.8–13.4 × 9.3–10.6 mm. No other information.

Movements. Resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in Java and Bali Forests EBA. Locally common, e.g. at Cibodas. Records from Gonoarjo (near Mt Unguran) and above Pancoran Tujuh (Mt Slamet) may be the farthest E for the species. On densely populated island of Java, even this species of montane forest should be considered potentially at long-term risk from deforestation. Occurs in Gunung Gede-Pangrango National Park (Cibodas Biosphere Reserve)

Bibliography. Gould (1855), Harrap & Quinn (1996), Hellebrekers & Hoogerwerf (1967), Hoogerwerf (1948, 1949, 1950), Kuroda (1933a), MacKinnon (1988), Robson (1994b), Stattersfield *et al.* (1998), Vorderman (1886).

Genus *LEPTOPOECILE* Severtsov, 1873

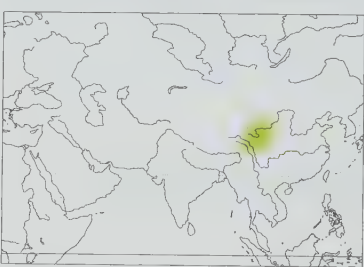
12. Crested Tit-warbler

Leptopoecile elegans

French: Mésange mitrée **German:** Schopfhähnchen **Spanish:** Carbonerito Elegante

Taxonomy. *Leptopoecile elegans* Przevalski, 1887, upper Huang Ho, south-east Qinghai, China. Relationships of genus uncertain; formerly placed in family Sylviidae, and recent studies based on mitochondrial DNA indicate that it groups with members of present family within a sylvidium assemblage that includes tits and chickadees (Paridae). Further research required. Birds from Malashi country, S of Litang (SE Xizang–W Sichuan), described as race *meissneri*, but probably inseparable from those elsewhere in species' range. Treated as monotypic.

Distribution. C & E Qinghai, S Nei Mongol (Alashan and Helan Shan), Ningxia (Helan Shan) and S Gansu (S Qilian Shan) S to SE Xizang and W & C Sichuan, in C China.



Descriptive notes. 10 cm; one male 8 g. Tiny, crested passerine with relatively long, graduated tail; male exquisite in coloration. Male has forehead greyish-white, crown pale ash-grey, feathers of rear crown elongated to form short, pointed, silky white-tipped crest (usually held flattened to nape); nape, sides of neck and sides of breast, as well as cheeks and ear-coverts, rich rufous, mantle and back blue-black or indigo, scapulars olive-grey, feathers of lower back, rump and uppertail-coverts broadly tipped turquoise; tail dark grey, feathers fringed iridescent dark turquoise; upperwing-coverts and flight-feathers drab olive-brown, outer

greater coverts diffusely fringed dull pale blue, primaries P3–P10, secondaries and tertials fringed iridescent sky-blue at base (inwards of emarginations on primaries); base of bill and lores blackish, chin and throat rufous-cinnamon, breast and undertail-coverts cinnamon, belly and vent pale buff, flanks (especially lower flanks) extensively washed dark mauve; in worn plumage paler and less intensely coloured, especially on underparts; iris ruby-red; bill black; legs brown, toes dark brown. Female is much duller than male, forehead and very narrow supercilium in front of eye dirty buff-white, crown and nape medium to dark grey with dull lilac wash, feathers of rear crown elongated into short whitish-tipped crest; lores and eyestripe blackish-grey, extending broadly onto and around nape; mantle cinnamon-brown, scapulars more cinnamon-buff, back medium to dark grey, washed dull slate-blue, rump sky-blue, uppertail-coverts buffy; tail dark drab brown, feathers finely fringed dull blue; upperwing-coverts and flight-feathers dark drab brown, outer greater coverts and primary coverts finely fringed dull blue, primaries P3–P10, secondaries and tertials finely fringed iridescent sky-blue (as male); cheek, ear-coverts, lower side of neck, throat and breast off-white to pale grey, lightly washed buff, lower belly, rear flanks, vent and thighs drab brown, lightly washed lilac, undertail-coverts cinnamon; bare parts as male. Juvenile male is like female, but crest longer and with pale feather tips broader and whiter, wing and tail feathers slightly paler, sky-blue of rump duller and more restricted, cheek, ear-coverts, throat and breast cleaner and whiter, flanks more distinctly lilac, iris dull olive-brown or red; juvenile female even duller. **Voice.** Calls include very thin, plaintive, descending "psee", similar to call of *L. sophiae*, and softish "dep", also a shrill single note similar to contact call of Northern Wren (*Troglodytes troglodytes*); other calls reminiscent of those of Goldcrest (*Regulus regulus*).

Habitat. Conifer forest, especially spruce (*Picea*), outside breeding season sometimes found in scrub, such as juniper (*Juniperus*) and rhododendron (*Rhododendron*) scrub. In summer occurs at c. 3400–4300 m, descending in winter to 2600–3900 m.

Food and Feeding. Food insects. Forages high in trees in manner of kinglets and firecrests (*Regulus*), and frequently along small branches in manner of a nuthatch (*Sitta*). In non-breeding season, not uncommonly joins mixed-species foraging flocks, which can include *L. sophiae*, Goldcrest and Willow Tit (*Poecile montanus*), and may forage in scrub.

Breeding. Very poorly known. A nest seen c. 15 m up in a conifer; once both partners observed in late Apr while collecting nest material, including feathers of Blue Eared-pheasant (*Crossoptilon auritum*), probably for lining of nest. No other information.

Movements. Poorly known. Usually presumed to be resident, but possible that the populations in extreme N of range largely migratory. Undertakes some seasonal altitudinal movements.

Status and Conservation. Not globally threatened. Generally rather uncommon. Possible occurrence in extreme NW India (NW Arunachal Pradesh) requires investigation.

Bibliography. Baker (1997), Bangs & Peters (1928), Cheng Tsohsin (1987), Deditius (1887), Hartert (1907a), Ludlow & Kinnear (1944), Pleske (1890), Rasmussen & Anderton (2005b), Sturmhuber *et al.* (1998), Vaurie (1957d, 1959), Zheng Zuoxin *et al.* (1983).

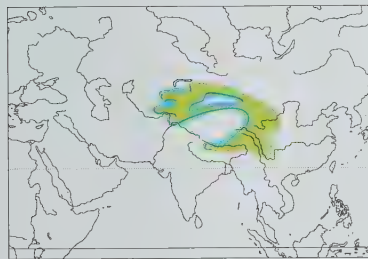
13. White-browed Tit-warbler

Leptopoecile sophiae

French: Mésange de Sophie **German:** Purpurhähnchen **Spanish:** Carbonerito de Sophie
Other common names: Severtsov's Tit-warbler; Stoliczka's Tit-warbler ("stoliczkae group")

Taxonomy. *Leptopoecile Sophiae* Severtsov, 1873, Lake Issyk-Kul', Tien Shan, Kyrgyzstan. Relationships of genus uncertain; formerly placed in family Sylviidae, and recent studies based on mitochondrial DNA indicate that it groups with members of present family within a sylvioid assemblage that includes tits and chickadees (Paridae). Further research required. Precise geographical boundaries of races not well known, and review needed. Races divisible into two groups, one with relatively dark plumage (nominate and *obscurus*) and the other pale (*major* and *stoliczkae*); combined ranges of dark races form a ring that almost entirely encircles those of pale races, and has been suggested that groups are separated ecologically, with darker "nominate group" at higher elevations in relatively moist subalpine scrub and adjoining forest and paler "*stoliczkae* group" confined to well-wooded arid montane terrain at lower altitudes (at least where the groups overlap); if this ecological separation were confirmed, the two groups would be best treated as separate species. Nominant race intergrades with *obscurus* in the NE Qinghai and adjacent Gansu region of C China. Four subspecies recognized.

Subspecies and Distribution.
L. s. sophiae Severtsov, 1873 – mountains in SE Kazakhstan, Kyrgyzstan and Tajikistan, NW China (W Xinjiang, N Gansu, E Qinghai) and, in S, N Pakistan (S to Baltistan) and NW India (Ladakh).
L. s. obscurus Przevalski, 1887 – S & E fringes of Tibetan Plateau from trans-Himalayan region of C Nepal (Dolpo), S & SE Xizang (Lhasa, Tsangpo Bend area) and S & E Qinghai E to S Gansu and NW Sichuan (S to Kangding).
L. s. major Menzbier, 1885 – W China in W Xinjiang (upper Tarim) and N Qinghai.
L. s. stoliczkae (Hume, 1874) – W China in S Xinjiang, W Qinghai and extreme W Xizang (upper R Indus).



Descriptive notes. 8.5–10 cm; 6–8 g. Tiny passerine with relatively long, graduated tail, males startlingly coloured, with patches of violet-blue and mauve. Male nominate race has lower forehead and broad supercilium pale buffy white (whitest immediately above eye), well defined on lower border but slightly ragged on side of crown; crown rufous with lilac-washed medium grey feather tips (partly obscuring ground colour), nape, side of neck, mantle, upper back and scapulars light drab grey, washed violet-blue on side of neck; rump and uppertail-coverts violet-blue, rufous feather bases (fully concealed); tail blackish,

outer webs of outermost feather off-white, outer webs of remaining rectrices diffusely fringed slate-blue at base; upperwing-coverts and flight-feathers dark brownish-grey, narrowly fringed slightly paler, fringes more cinnamon-buff on tertials, and a little paler and better defined with slight blue cast on basal half of primaries; lores and short eyestripe medium grey to dark grey, cheek and ear-coverts tinged medium grey (rufous feather bases concealed); chin and throat rufous, feathers tipped greyish (as crown), feathers of lateral and lower parts of throat broadly tipped violet-blue (together with sides of neck forming diffuse blue collar); side of breast and flanks rufous or vinous, feathers with broad mauve subterminal area and finer violet-blue tips (latter especially vivid and extensive on lower flanks and side of belly), centre of lower breast and belly dull white, washed buff, undertail-coverts rufous, thighs dull cinnamon-buff; iris reddish; bill black; legs brownish-black to black. Female is much duller than male, broad light brownish-grey supercilia meeting on forehead (palest and purest immediately over and behind eye), crown dull cinnamon-brown, upperparts and wing as male, rump and uppertail-coverts with narrower and less richly coloured mauve tips (not fully concealing rufous bases); lores and short eyestripe medium grey, cheek and ear-coverts mottled light greyish-brown, underparts pale brownish-grey with rufous area restricted to lower flanks, where feathers tipped mauve; thighs and undertail-coverts greyish-buff; iris reddish-brown. Juvenile is very like adult but plumage slightly softer and duller, male as adult female but crown brighter and more rufous (lacking lilac-grey tips, thus more vivid than adult male), rump and uppertail-coverts cinnamon with more restricted and less conspicuous mauve tips, pale fringes on outer rectrices duller and more restricted, underparts duller and greyer, washed mauve on throat and with more extensive cinnamon on side of breast and flanks, where feathers tipped mauve, bill paler; juvenile female similar, but rump cinnamon-brownish without mauve or lilac, underparts dull buff-washed white, with very restricted cinnamon-brown on flanks and no lilac or mauve tones, iris probably dull olive-brown (confirmation required). Races differ mainly in tone of plumage: *obscurus* is overall rather darker than nominate, male crown more rufous (greyish feather tips reduced, cap more clearly defined at rear), upperparts and face darker, medium to dark grey, rump more intensely violet-blue, supercilium shorter and narrower, throat and side of neck darker and more purplish-blue, underparts much darker and more uniformly dark mauve (feathers rufous with broad mauve tips, giving slightly mottled effect), thighs dark grey; *major* is distinctly paler and duller than nominate, buff of underparts paler and more extensive, reaching on to upper breast; *stoliczkae* is even paler than previous, buff of underparts extending to base of throat. Voice. Contact call a sibilant, trilling "sirrrrr" (or "tszirr-tszirrpsirrr"), by both sexes throughout year, function depending on intonation and delivery rate (when given calmly, with long pauses, is usual contact between members of pair or flock; when louder, lower-pitched and with slightly faster delivery, serves as warning call; coarser variant with very fast delivery rate expresses alarm). Other

calls include thin, plaintive (almost hissing) "psee" or more drawn-out "pseee", not unlike that of Western Penduline-tit (*Remiz pendulinus*), also short, full, abrupt, slightly rough or buzzing "psrit" (or "zip"), often paired or repeated in irregular series, e.g. "psrit-psrit, psrit-psrit-psrit, psrit...", and delivered both in flight and at rest; juvenile gives thin "si-si". No territorial song, but male occasionally gives quiet and subdued but vigorous murmuring and melodious whispering, mixed with similarly quiet (mechanical) creaking sound; this "song" given in later stages of nest-building and in laying period during courtship, when sexes meet and prior to copulation.

Habitat. Montane forest, scrub and thickets. In Kazakhstan, breeds from upper margins of spruce (*Picea schrenkiana*) forest zone to upper limit of juniper (*Juniperus*) scrub at c. 2200–3200 m, but optimally in fairly narrow altitudinal band where juniper scrub best developed (c. 2500–2900 m); scrub mainly prostrate form of *Juniperus turkestanica*, in scattered clumps on steep (up to 45°) slopes, or (mainly on S-facing slopes) in impenetrable thickets. In non-breeding season found below spruce zone and into foothills, where frequents thickets of rose (*Rosa*), *Prunus*, *Elaeagnus* and willow (*Salix*) and occasionally tall herbaceous vegetation, often on S-facing slopes and in scrub by water; sporadically in gardens, parks and roadside trees. In W Tien Shan, winters in thickets of sea-buckthorn (*Hippophae rhamnoides*), *Elaeagnus*, tamarisk (*Tamarix*) and *Ephedrum* in river valleys, sometimes (when much snow in valleys) on plains at 400–450 m. Elsewhere in range, breeds in dwarf scrub (perhaps especially *Juniperus*, *Berberis* and *Caragana*) above tree-line in dry mountainous areas (e.g. in Himalayas found in more arid, rain-shadow regions and may have preference for drier S-facing slopes). In N Indian Subcontinent breeds at 3000–3900 m in Pakistan and India and recorded at 2700–4575 m (probably breeding mostly above 3500 m) in Nepal; in winter down to c. 1800 m (seldom lower), and favouring, where available, valley-bottom thickets (especially *Hippophae rhamnoides*, *Astragalus* and *Phragmites*). In China recorded at 2700–5000 m, in Nan Shan (Gansu) common throughout subalpine belt at 3000–3600 m from upper limit of forest through *Caragana jubata* zone to uppermost juniper scrub; in Xining region (Qinghai) breeds down to 2700–2600 m, where *Berberis* predominant; in Xizang found at 3500–5000 m.

Food and Feeding. Diet small insects and spiders (Araneae); also, mainly in autumn and winter, small quantities of seeds and berries, e.g. one individual in Jun had stomach filled with juniper scales. Nestlings probably fed entirely with insects and spiders. Forages among herbs and shrubs, where very active and agile; sometimes forages on ground, investigating root tangles and lichen-covered rocks. Sometimes catches insects by aerial flycatching. In family parties after breeding season, these sometimes amalgamating to form flocks of up to 25 or more individuals; in winter months may join mixed-species foraging flocks.

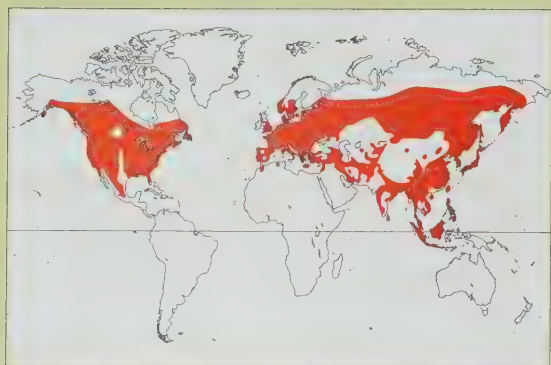
Breeding. Data mostly from Tien Shan. Laying about mid-May to mid-Jun, with replacement clutches possible until late Jul (early nests, complete in Apr, may remain empty for nearly a month); single-brooded. May form permanent pair-bonds or pair in autumn (usually seen in pairs in winter and early spring). Records of several nests in close proximity (sometimes two or three side by side), leading to suggestions of possible colonial breeding, but extra nests may be used as overnight roosts. Nest built by both sexes, work divided equally (although male may take main part in provisioning material, female in building), taking 6–8 days for framework and almost as long for lining; an oval ball c. 130–155 mm × 90–120 mm, walls up to 30 mm thick, floor up to 35–40 mm deep, circular entrance 28–35 mm in diameter on one side towards top, outer layer of coarse material such as large pieces of moss, thin stalks, spider cocoons, lichen and plant bast, inner layer of same material as well as plant hair, wool, dead leaves, feathers and the like, and lining mainly of feathers, in Tien Shan downy feathers from Himalayan Snowcock (*Tetraogallus himalayensis*) and Chukar (*Alectoris chukar*) favoured, in other parts of range (including China) those of Blue Eared-pheasant (*Crossoptilon auritum*), shape of feathers makes them stick up in nest and they thus form "elastic funnel" at entrance (when adult enters, entrance closes behind it); some nests have very few feathers and are lined instead with sheep's wool, or with plant down and marmot (*Marmota*) hair mixed with small amount of wool and feathers; nest usually very well concealed in scrub (in Gansu typically *Caragana jubata*), in Tien Shan 55–56% of nests were 0.5–1.9 m up in *Juniperus turkestanica*, usually in upper part of bush, supported by small branches at sides and base, with walls woven around larger branches, 33–36% were 2.5–15 m up in *Picea schrenkiana*, placed close to trunk on horizontal branch or 1.5–2 m from trunk and woven together with thin hanging twigs/branches (thus suspended like nest of *Regulus*); spruce may be preferred if available, and honeysuckle (*Lonicera*) occasionally used but only for replacements. Clutch 4–8 eggs, white, spotted and flecked light brown and reddish-brown, c. 15.5 × 11.7 mm (nominate race); incubation by both sexes, period 14–17 days (usually 14–15 days); both sexes brood chicks for first c. 7–8 days, and roost in nest with them; young leave nest at 18–20 days (sometimes to 23 days), but remain close to nest and roost there for 7–12 days after fledging.

Movements. In some areas mainly resident, e.g. in China reported as remaining on territory in Gansu even in bitter cold of mid-winter. Some winter dispersal reported, limited in N Pakistan (e.g. to Besham, in Indus valley), but more widely Sept/Oct to Mar/Apr in C Asia and W China. In Tien Shan of S Kazakhstan descends to foothills from early Sept/Oct, birds from Zailiyskiy Alatau occurring sporadically in Almaty, and in bad winters in Ili Depression, while those from Kungey and Terskey Alatau probably move mostly to Issyk-Kul Depression, where regular near Karakol (i.e. Przheval'sk, in Kyrgyzstan) in Oct; in W Tien Shan birds from Turkestan and Zerav'shanskiy ranges winter in Zeravshan valley, but in hard winters (with much snow) they move on to plains, reaching Samarkand in late Nov or early Dec and extreme W outposts of range, in E Uzbekistan (Payshanba and Kattakurgan), in Jan or Feb. Those reaching plains may have moved up to 100 km from breeding grounds (e.g. to Iliysk, in Ili valley, and L Sorbulak, in Almaty province). Return movements late Jan to mid-Mar. In W China recorded in winter at Golmud, in WC Qinghai.

Status and Conservation. Not globally threatened. Locally common, but absent from some apparently suitable areas (e.g. Talasskiy Alatau). Possible occurrence (presumably of race *obscurus*) in NE India, where reported sightings in NW Arunachal Pradesh, merits further study. Marked fluctuations in numbers noted in C Asia, e.g. in Almaty area of Kazakhstan very common in 1960s but almost none in 1970s, perhaps owing to high mortality in hard winter of 1968/69; densities of c. 1 pair/1–2 ha of habitat have been reported in same region. There is good evidence for a decline in Kazakhstan, where now listed as rare. Throughout range, species is vulnerable to degradation or destruction of breeding habitat by overgrazing.

Bibliography. Ali & Ripley (1983), Baker (1997), Bangs & Peters (1928), Cheng Tsohsin (1987), Dementiev *et al.* (1954a, 1970), Dolgushin *et al.* (1972), Dzhanbaev (1991), Gavrilov *et al.* (1968), Hartert (1907a), Inskipp & Inskipp (1991), King (1984a), King & Peng Jitai (1991), Knystautas (1993), Kovshar (1977, 1978, 1991), Kovshar *et al.* (1982), Ludlow & Kinnear (1933, 1944), Mallon (1987), Martens & Eck (1995), Neufeldt (1970), Rasmussen & Anderton (2005b), Roberts (1992), Robson (1986), Stepanyan (1956, 1959, 2003), Sudilovskaya (1935), Thaler (1997), Vaurie (1957d, 1959), Wassink & Orel (2007), Zheng Zuoxin *et al.* (1983).

Class AVES
Order PASSERIFORMES
Suborder OSCINES
Family SITTIDAE (NUTHATCHES)



- Small to medium-sized arboreal passerines with short tail, short rounded wings, and medium-long dagger-like bill; plumage grey or bluish above, with blackish eyestripe, and whitish with variable buff, chestnut or lilac below.
- 10.5–19.5 cm.



- Palearctic and Oriental Regions, with four species in Nearctic Region.
- Forest, woodland, parks and gardens; two species in bare rocky areas, cliffs, ravines and gorges.
- 1 genus, 27 species, 92 taxa.
- 4 species threatened; none extinct since 1600.

Systematics

The family Sittidae comprises a single genus, *Sitta*, which was established by Linnaeus in 1758. The members of this genus are clearly closely related and have not diverged greatly in morphology (see Morphological Aspects). Nevertheless, H. E. Wolters, in the 1979 issue of his checklist of the world's birds, divided the species among four genera, namely *Callisitta*, *Poecilositta*, *Oenositta* and *Sitta*. He placed the Beautiful Nuthatch (*Sitta formosa*) in the first of those and the Blue Nuthatch (*Sitta azurea*) in the second, while *Oenositta* contained the group formed by the Velvet-fronted Nuthatch (*Sitta frontalis*) and its close relatives the Yellow-billed (*Sitta solangiae*) and Sulphur-billed Nuthatches (*Sitta oenochlamys*); all other species he retained in the genus *Sitta*. Wolters's arrangement, however, has not been followed by other authors. As presently conceived, *Sitta* is a homogenous and well-defined genus, although the Blue Nuthatch is subtly aberrant and confirmatory evidence for its placement in *Sitta* is desirable.

The six small nuthatches of the "*Sitta canadensis* group", which usually excavate their own nest-holes, are sometimes considered to be the most primitive in the genus, but the relationships among the 27 species currently recognized have not yet been studied comprehensively by means of genetic techniques, and any such conclusions are purely speculative. The one study of nuthatches based on molecular genetics that has hitherto been published, that by E. Pasquet in 1998, included material from only ten species. Nevertheless, a tentative arrangement can be put forward, and the following is adapted from E. Matthysen's 1998 suggested relationships within the Sittidae. Wolters's genera *Callisitta*, *Poecilositta* and *Oenositta* can be retained with the same constitution but treated as subgenera, and the genus *Sitta* may then be divided into four additional subgenera. These four are subgenus *Mesositta*, with the White-tailed (*Sitta himalayensis*), White-browed (*Sitta victoriae*), Pygmy (*Sitta pygmaea*) and Brown-headed Nuthatches (*Sitta pusilla*); subgenus *Micrositta*, containing the six small hole-excavators, namely the Red-breasted (*Sitta canadensis*), Corsican (*Sitta whiteheadi*), Chinese (*Sitta villosa*), Yunnan (*Sitta yunnanensis*), Krüper's (*Sitta krueperi*) and Algerian Nuthatches (*Sitta ledanti*); subgenus *Leptositta*, with the White-cheeked Nuthatch (*Sitta leucopsis*), Przewalski's Nuthatch (*Sitta przewalskii*) and the White-breasted Nuthatch (*Sitta carolinensis*); and, finally, subgenus *Sitta*, in which the remaining nine species are placed.

While some species are distinctively different, examples being the Beautiful Nuthatch and the Blue Nuthatch, others are much less so, to the extent that the various far-flung members of the "*S. canadensis* group", particularly the Red-breasted, Corsican and Chinese Nuthatches, were often treated as conspecific, despite their massively disjunct distributions. More recently, it has become apparent that the tropical "*S. frontalis* group" comprises three species, and that the "*S. europaea*–*S. castanea* group", treated as a single species as recently as 1953, is better separated into six species. These six are the Eurasian Nuthatch (*Sitta europaea*) and Chestnut-vented Nuthatch (*Sitta nagaensis*) on the one hand, and, on the other, the Indian Nuthatch (*Sitta castanea*), the Chestnut-bellied Nuthatch (*Sitta cinnamoventris*)



The family Sittidae comprises 27 species in a single genus, *Sitta*. The nuthatches are fairly homogeneous and distinctive in their morphology. All are small to medium-sized and stocky, with a long, straight, deep-based, pointed bill, designed to help the bird open seeds. The typical nuthatch plumage pattern comprises blue-grey upperparts and whitish underparts becoming buff or cinnamon towards the vent. **Przewalski's Nuthatch** differs slightly from the norm, being one of three species that have a white face and dark crown.

[*Sitta przewalskii*, Wanglang Nature Reserve, Sichuan, China.
Photo: Wong Choi-On]

Nuthatches in the tropics tend to be more colourful than those inhabiting temperate zones. Three species sometimes separated in the subgenus *Oenositta* differ from other family members in that they possess a yellow iris and eyering and, in adults, a brightly coloured bill, the latter being red in the case of the **Velvet-fronted Nuthatch**. The tone of the upperparts in this group, a bright violet-blue, is also quite different from the steely blue-grey of most nuthatches. This group is also exceptional in showing a velvety-black forecrown.

[*Sitta frontalis frontalis*,
Goa, India.
Photo: Greg & Yvonne
Dean/World Wildlife
Images]



and the Neglected Nuthatch (*Sitta neglecta*), with the Kashmir Nuthatch (*Sitta cashmirensis*), a taxon that had been shuffled between these two basic groups, possibly not closely related to either. The resolution of these “cryptic” species has probably not yet finished, and the Eurasian Nuthatch, even as now restricted, may well prove to be polyphyletic or paraphyletic, with the north-east Siberian subspecies *arctica*, at least, poised to be accorded the rank of a full species.

A second, independent factor has also inflated the number of nuthatches, this being the discovery of new species. The Corsican Nuthatch was described from the French island of Corsica in 1884, and at the time it must have seemed incredible that such a distinctive species of bird could have lurked undetected for so long in France. Even more astounding was the discovery of the Algerian Nuthatch in Algeria in 1975. The upshot is that 21 species of nuthatch were listed in J. L. Peters’s *Check-list of Birds of the World* in 1967, whereas the current total is 27. Indeed, this process may not have stopped, with reports in 2006 of a black-capped nuthatch in the Altai of southern Siberia; this could refer to an undescribed species or perhaps even to an astonishing range extension by the Chinese Nuthatch, but further study is required.

Two questions have puzzled taxonomists over the years. Which other “nuthatch-like” species should be placed with *Sitta* in the family Sittidae, and what are the relationships of Sittidae to other passerine genera? Among birds, as with other animals, form is often dictated by function. Several avian groups have evolved to fill a niche similar to that occupied by the nuthatches, foraging on the surface of the trunk and branches of trees or on rocks, and have thus become rather similar to the Sittidae in outward appearance. In many of the older systems of classification, a number of groups of taxa, owing to their tree-climbing habits and/or a similarity on the museum bench to the nuthatches, have been associated with the Sittidae, but does this reflect a close relationship or simply a process of convergent evolution? These groups have included the rock-climbing Wallcreeper (*Tichodroma muraria*) of the Palearctic, the treecreepers (*Certhia*) of the Holarctic, the Spotted Creeper (*Salpornis spilonotus*) of India and the Afrotropics, the Philippine rhabdornis (*Rhabdornis*), the Australasian treecreepers of the genera *Cormobates* and *Climacteris*, the Australo-Papuan sittellas (*Daphoenositta*), and the Nuthatch Vanga (*Hypositta corallirostris*) of Madagascar, the last once known by the name of “Coral-billed Nuthatch”. All of these taxa were placed either within the Sittidae or next to it in the taxonomic order, so much so that E. Mayr and D. Amadon, in 1951, described the family Sittidae as “something of a scrap-

basket”. Morphological investigations and, latterly, molecular-genetic studies have slowly untangled this complex, and the various taxa have been separated more or less definitively from Sittidae, as follows. The Wallcreeper is now accorded its own monotypic family (Tichodromidae), although some authors prefer to treat it as a subfamily, Tichodrominae, of the Sittidae. The Holarctic treecreepers form the family Certhiidae, with the Spotted Creeper as a subfamily, Salpornithinae, while the three rhabdornis species form the family Rhabdornithidae. The Australasian treecreepers are treated in the family Climacteridae, and the sittellas in Neosittidae. Finally, the Nuthatch Vanga is placed in the vanga family Vangidae.

Having established the apparent taxonomic rank of the various nuthatch-like groups, one is prompted to consider whether any of them are, in fact, closely related to nuthatches. Further, in a broader context, Sittidae has traditionally been placed close to the tits and chickadees (Paridae) and the long-tailed tits (Aegithalidae), despite differing from both of these families in many aspects of structure, plumage and behaviour. Are these implied relationships tenable? Genetic studies are now beginning to throw light on these questions in a more or less definitive manner. In 2006, K. A. Jönsson and J. Fjeldså, in an attempt to construct a tentative “supertree” of relationships among all passerine birds, reviewed 99 studies which had been based on molecular genetics. From this, they devised a new arrangement in which the oscine passerines are divided into two “parvorders”, named the Corvida and the Passerida, the former being further divided into “Basal” and “Crown” sections; the Passerida is then subdivided into three superfamilies, namely the Muscicapoidae, the Passeroidea and the Sylvioidea. The available evidence appears to support this arrangement and all of the major branches within it.

Within this scheme, the Climacteridae belong to the “Basal Corvida” and the sittellas and the Nuthatch Vanga to the “Crown Corvida”. They are, therefore, members of ancient radiations, not particularly closely related to each other and certainly not at all related to Sittidae, and they will not be considered further here. The families Sittidae, Tichodromidae, Certhiidae and Rhabdornithidae, together with the Paridae and the Aegithalidae, are members of the parvorder Passerida. Within this extensive grouping, however, the nuthatches and the certhiids belong in the Muscicapoidae, a huge superfamily other members of which include the Old World flycatchers (Muscicapidae), the thrushes (Turdidae) and the starlings (Sturnidae), but the Paridae and the Aegithalidae are members of the superfamily Sylvioidea and thus only distantly related.

Finally, within the Muscipoidea, the nuthatches are placed in the same clade as the Certhiidae, the gnatcatchers (Polioptilidae) and the wrens (Troglodytidae), while the Rhabornithidae lie in a different clade within the same superfamily. Suitable DNA data for the Wallcreeper were not available for further analysis, but data on DNA-DNA hybridization indicate that the genus *Tichodroma* is closer to *Sitta* than it is to *Certhia*, and the Wallcreeper is, indeed, as mentioned in the preceding paragraphs, still treated by some taxonomists as representing a subfamily of the Sittidae.

In conclusion, the Wallcreeper is probably the nuthatches' closest relative, with the Certhiidae also closely affiliated, whereas the Rhabornithidae are more distant, and the Paridae and the Aegithalidae much more distant still. The Australasian families Climacteridae and Neosittidae and the Madagascan Nuthatch *Vanga*, the last now in the family Vangidae, would appear to be separated from the nuthatches by many millions of years of evolution.

The genus *Sitta* seems not to be ancient. As well as dating techniques involving DNA, based upon the assumption of a relatively steady rate of change, there is the fossil record to be considered. Not surprisingly, however, fossils of nuthatches are rare. They have been found in Italy, where the fossil *Sitta senogalliensis* was discovered and was dated to the lower Miocene, about 20 million years before the present; and at La Grive St Alban, in France, where nuthatch fossil material dating from the middle to late Miocene was unearthed. Of the modern species, remains of both the Pygmy Nuthatch and the Red-breasted Nuthatch have been reported from late Pleistocene deposits at Carpinteria, in California.

Morphological Aspects

The members of the genus *Sitta* are rather homogenous and are well characterized morphologically, all having a dumpy, compact body, a short tail, rounded wings, a strong skull and bill,

short legs, and large feet with strong claws. The specialized niche that the genus occupies, that of gleaning small invertebrates, seeds and nuts from the trunks, branches and fruiting bodies of trees (see Food and Feeding), appears to have offered limited options for divergence, even when these foraging strategies are transferred to rock surfaces, as is the case especially with the Western Rock Nuthatch (*Sitta neumayer*) and the Eastern Rock Nuthatch (*Sitta tephronota*).

With regard to size, females tend to be slightly smaller on average than males, and, in general terms, species inhabiting coniferous forest are smaller than those in deciduous forest. Thus, in the "*S. canadensis* group", or the subgenus *Mesositta* (see Systematics), the sole representative in broadleaf forest, the Algerian Nuthatch, is the largest member, and in the "*S. carolinensis* group", or the subgenus *Leptositta* (see Systematics), the deciduous-forest White-breasted Nuthatch is significantly bigger than the two other species, both of which are found in coniferous forest. On the other hand, while the smallest nuthatches of all, the Pygmy and Brown-headed Nuthatches, are closely associated with pine (*Pinus*), so also is the largest, the Giant Nuthatch (*Sitta magna*). The last-mentioned species is among the heaviest of the family, at 36–47 g, but the large subspecies *dresseri* of the Eastern Rock Nuthatch is the heaviest of all, weighing up to 55 g. The smallest sittids weigh no more than 7–8 g, but most members of the family fall within the approximate range 12–20 g.

All nuthatches have a bill that is rather long, being roughly as long as the head, and robust, straight and pointed. It is well suited for the opening of large seeds such as acorns and hazelnuts (*Corylus*), although smaller seeds, such as those of pine and beech (*Fagus*), are taken more frequently. The nostrils, positioned near the base of the bill, are rounded and partly covered with feathers, and the rictal bristles are short and soft. The legs are short, with the tarsus distinctly scutellate, and with strong feet and large, laterally compressed claws; the feet of the two rock nuthatches are proportionally slightly longer and the toes, especially the hind toe, relatively short. Nuthatches are agile climbers, placing one foot above the other and progressing with a series

The Eastern Rock Nuthatch is the heaviest member of the family, with one race weighing seven times that of the smallest sittid. In some characteristics, this species is typical of its family; in others, it is definitely atypical. Like its congeners, it has a short tail, long but rounded wings, short legs and strong feet. In common with the closely related Western Rock Nuthatch (*Sitta neumayer*), however, the Eastern Rock Nuthatch has relatively longer feet but shorter toes than a typical sittid. These morphological differences are adaptations to a life spent on rock surfaces, a habitat preference that distinguishes this pair within the otherwise arboreal family.

[*Sitta tephronota*
tephronota,
Tien Shan, Kyrgyzstan.
Photo: Sylvestre Popinet
& Christel Freidel/Bios]





The morphological homogeneity of Sittidae is no doubt related to its confused taxonomic history.

While the **Eurasian Nuthatch** is now generally considered to form a superspecies with five other forms, all six were normally treated as conspecific until 1953. Even within the revised limits of the Eurasian Nuthatch, there is much geographical complexity. Twenty-two subspecies, differing externally in plumage coloration and size, are currently recognized, and are normally divided into four groups, but morphological research and (admittedly incomplete) assessments of mitochondrial DNA point towards a more subtle treatment, although even this may not be evolutionarily accurate.

The ranges of the "nominate group" and the "asiatica group" overlap without hybridization, suggesting that they may represent distinct species.

On the basis of genetic material, race arctica of north-east Asia may also merit separate species status. Meanwhile, several subspecies pairs intergrade. Such is the case with the two European forms seen here: nominate europaea (above), broadly of the north and east of the continent; and caesia (below), of the south and west.

[Above: *Sitta europaea europaea*, Hanko, Finland. Photo: Markus Varesvuo.]

Below: *Sitta europaea caesia*, Herrenhäuser Gärten, Hannover, Germany. Photo: Stefan Pfützke]



Most members of Sittidae are dependent on trees and thus principally inhabit forests or woodland.

The **Eurasian Nuthatch** prefers mature, old-growth forest with large trees and an extensive canopy, habitat that provides its needs for nesting cavities and arboreal foraging grounds. Within these broad requirements, the large range of the Eurasian Nuthatch means that it inhabits a variety of woodland types. In much of Europe and the Far East, it prefers deciduous and mixed forest, particularly oak (*Quercus*) or beech (*Fagus*), but it inhabits coniferous forests elsewhere.

[*Sitta europaea caesia*, Fageda de la Grevolosa, Sant Pere de Torelló, Spain.

Photo: Eudald Solà]

of jerky hops. They are able to move along the underside of branches, hanging upside-down, and they descend trunks head first with ease, but they do not use the tail as a prop when climbing. Thus, despite their close relationship with the treecreepers, and their often similar arboreal micro-habitats, the mode of progression is very different. A further difference from the treecreepers is that nuthatches are at home also on the ground, where they typically progress with a series of hops. Unlike the

parid tits and the babblers (Timaliidae), nuthatches do not use their feet to hold down large or awkward food items in order to break them up, but, rather, they wedge nuts and similar items into crevices and hammer them with the bill, using the power of the whole body.

Nuthatches have rather short, bluntly pointed wings consisting of nine secondaries and ten primaries, the outermost primary being significantly reduced, with a length no more than about

Across its large distribution in North and Central America, the **White-breasted Nuthatch** inhabits a variety of forest types. The key ingredients are mature or dead trees with potential nesting cavities. In the east of its range, this species favours open deciduous forest, often with oak (*Quercus*) and beech (*Fagus*). Here, as in the boreal north, it shuns coniferous forests, yet it breeds in pine (*Pinus*) and oak-pine to the south and west. Interestingly, the two fellow members of the subgenus *Leptositta*, the **White-cheeked Nuthatch** (*Sitta leucopsis*) and **Przewalski's Nuthatch** (*S. przewalskii*) are confirmed coniferous forest specialists.

[*Sitta carolinensis*, Washington, USA.

Photo: Dave Maslowski/Maslowski Productions]



While their congeners are inextricably linked to trees, two species of nuthatch have evolved to deploy the classic sittid foraging strategy on a different substrate: rock surfaces. They comprise a species pair, the **Western Rock Nuthatch** and the **Eastern Rock Nuthatch** (*Sitta tephronota*). Both species are tied to bare rock in its many forms—from rocky slopes and cliffs to ravines and gorges. Limestone is a particular favourite, its numerous cracks and crevices offering abundant nesting possibilities. Both species also frequent artificial alternatives to rocks, such as buildings.

[*Sitta neumayer zarudnyi*,
Lesvos, Greece.
Photo: George McCarthy/
Nature Picture Library]



40% of that of the longest primary. Their flight is fairly strong, and over short distances direct, but on longer flights the wings are periodically closed, producing an undulating flight pattern. The tail is distinctively short, broad, square or slightly rounded, and straight, with twelve feathers.

For the most part, the members of this family are remarkably conservative in the coloration of the plumage and bare parts. A typical nuthatch has the bill greyish to blackish with a darker tip; the upperparts are blue-grey, with a contrastingly blackish eyestripe, the tail has subterminal white spots, and the underparts are whitish, grading to buff, chestnut or lilac on the flanks and vent, with the undertail-coverts sometimes spotted paler. Some species have a pale nape spot, but this, when present, is often fully concealed; its purpose is obscure. Variations on this theme are few. A black forehead or cap is exhibited by the “*S. canadensis* group” and the “*S. frontalis* group”, a white face and a dark cap characterize the White-breasted, White-cheeked and Przewalski’s Nuthatches, white in the central tail feathers is a feature of the White-tailed, White-browed and Pygmy Nuthatches and, marginally, the Brown-headed Nuthatch, and well-marked upperparts distinguish the Beautiful Nuthatch. In addition, the members of the “*S. frontalis* group” possess a yellow eyering and a red or yellow bill. The Blue Nuthatch is the most anomalous in having the upperparts and the belly and vent almost blackish; moreover, the structure of its plumage differs in that the greater upperwing-coverts are slightly elongated and drooping, and the feathers of the nape are thick and velvety.

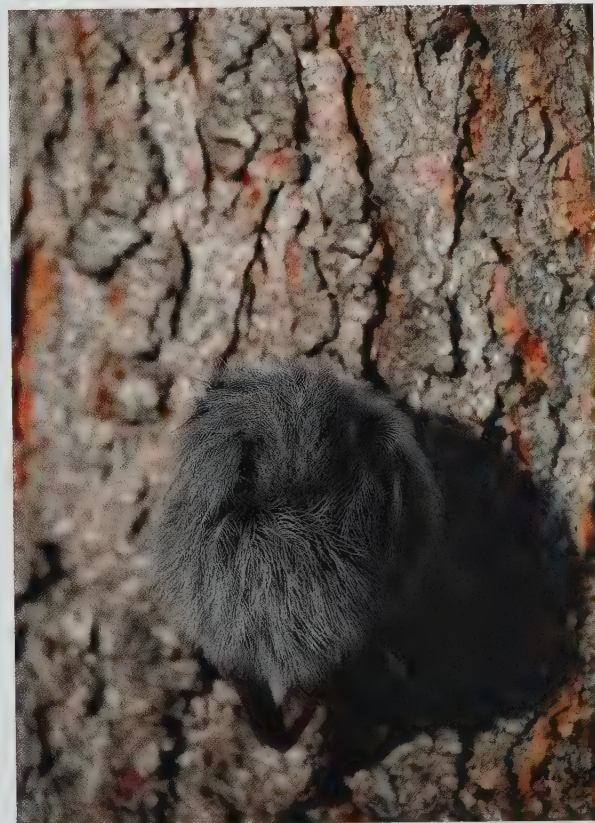
The sexes of *Sitta* species differ only from each other slightly, typically in the intensity of buff or chestnut pigment on the underparts and, in the case of dark-capped species, in the extent of blackish on the crown. Juveniles are very similar to adults, and are usually distinguished, with difficulty, by the fact that they have slightly duller coloration, “looser” plumage, and moult contrasts in the greater coverts and fresh remiges and rectrices at a time when the adults have worn and abraded plumage. With the Eurasian Nuthatch, and probably other species, too, skull pneumatization is of limited use, as adult nuthatches never attain the state of a fully pneumatized skull, and only scores of 1–2 can be used to indicate first-year individuals.

Adults undergo a complete post-breeding moult, which, in the Eurasian Nuthatch, commences about a week before the young

fledge and lasts for around 88 days. Juveniles acquire first-winter plumage by means of a partial moult involving some wing-coverts and, for some species, also some of the tertials and central tail feathers. There is some evidence that early-fledged juveniles of the Eastern Rock Nuthatch also replace the outer six primaries. The adults of some members of the family have, in addition, a partial pre-breeding moult in which they renew variable amounts of the body plumage, usually on the underparts, and especially

The strong legs and feet of sittids equip them well for a life spent largely on tree trunks. In addition to the **Spotted Creeper** (*Salpornis spilonotus*) of the Afrotropics and India, nuthatches are the only other birds able to descend trees head first. In contrast to treecreepers (*Certhiidae*) and woodpeckers (*Picidae*), amongst others, nuthatches do not use the tail as a support when ascending. Sturdy toes and laterally compressed claws also enable sittids such as this **Eurasian Nuthatch** to sleep while clinging firmly to the vertical bark surface. Roosting in the open is commoner in summer, when heat loss is not a significant problem.

[*Sitta europaea*,
Russia.
Photo: Roland Seitre]





In general, nuthatches are easy to identify, but the "S. europaea group" and the two rock nuthatches can present significant challenges, and the lack of distinctive stereotyped songs means that voice is of only limited use in their separation. In most cases, the species in question is the only member of its family throughout most of its range, the major exception being in the Himalayas and south-west China, where several species may be present, albeit often separated altitudinally. Elsewhere, the ranges of the two rock nuthatches overlap in the Middle East. The Western Rock Nuthatch and the Eastern Rock Nuthatch are clearly closely related, and have come to be regarded as the classic example of what is termed "character displacement". In the regions where just one of these two species is present, they are very similar to each other in appearance. Where their ranges overlap, however, they differ markedly in size, in bill length and in the prominence of the dark eyestripe, and it is suggested that competition between them has intensified the differences in the area of range overlap, thus allowing the two species to co-exist.

A detailed analysis by P. R. Grant, in 1975, showed that the situation was not so clear-cut as had been proposed, and that variation in some characters, such as bill size, rather than being "displaced", could be merely a continuation of trends exhibited outside the zones of overlap. Grant concluded, however, that, in areas where the two rock nuthatches overlapped geographically, the body size and, especially, the size of the eyestripe had undergone mutually divergent character displacement. The exaggerated differences in body size may result in different food resources being utilized, and, although bill size has not been "displaced", the two species exploit seeds of different sizes in areas where they overlap, thus reducing competition between them. Importantly, the differences in the eyestripe help in species recognition. Thus, in many displays, the eyestripe, made more conspicuous by the raising of the feathers, conveys information on the bird's species identity; the act of bobbing is thought to give information on the bird's size; and the type of display gives information on the bird's sex, the male adopting a vertical posture and the female a crouching position. In areas where the two species differ markedly in the prominence of the eyestripe, therefore, they are able to co-exist, to have overlapping home ranges and to feed within a few metres of each other without conflict. In fact, song, too, may be important in species recognition, as the songs of the two species, although similar, are given at differing frequencies, that of the Western Rock Nuthatch being higher-pitched than that of its relative, although the distinctions are far from clear-cut, at any rate to the human ear.

Like many passerines, nuthatches are wary when they bathe, remaining alert for predators and other potential threats. This **Pygmy Nuthatch** is standing in the still, shallow water of a birdbath. *Sittids* are thought to foliage-bathe after rain and rain-bathe during drizzle. Birds indulge in two forms of bathing. In one, the feathers are moistened but not soaked; this approach appears to assist preening by making the feathers more pliable or by evenly distributing uropygial oil. In the second form of bathing, the feathers are completely soaked; the aim here is to clean the feathers and skin thoroughly.

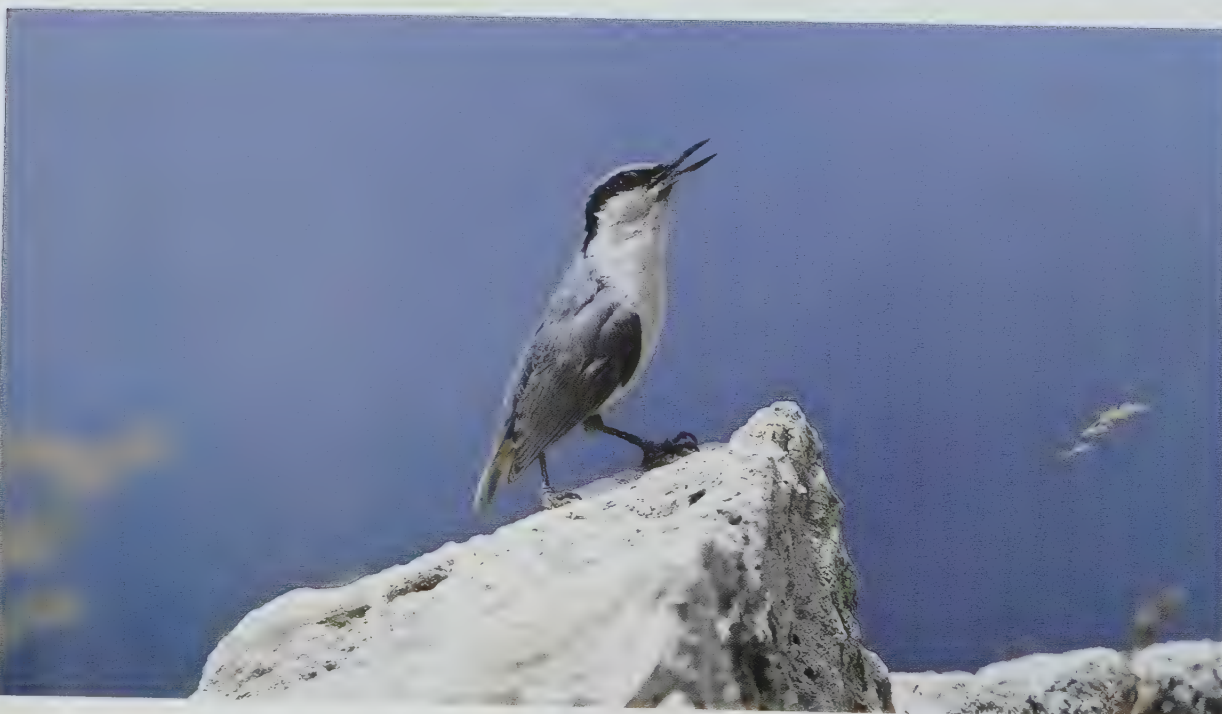
[*Sitta pygmaea melanotis*, Kaleden, British Columbia, Canada.

Photo: Laure Wilson Neish]

the throat and breast feathers, but including also the cheeks and sometimes the nape and mantle. It seems, however, that this moult is very limited in extent and that many or most individuals, even of those species for which the phenomenon has been recorded, do not moult prior to breeding, although it is hard to draw definite conclusions as signs of this moult are difficult to detect in museum specimens. Given that only a proportion of nuthatches have a pre-breeding moult, it is interesting to speculate on the purpose of this moult. If its function is to replace worn and abraded plumage, why would only a proportion of individuals moult, and what would trigger the process? One suggestion is that is possibly the last vestige of a moult into a distinct breeding plumage, one which no longer exists.

Sittids are highly vocal birds, although the vocalizations tend to attract attention more for their volume than eloquence. Most are variations on a simple theme, being repetitions of notes at various speeds. In some species, the song appears simply to be a louder and longer version of the call. This is perhaps less the case with the **Western Rock Nuthatch**, however. The male's song, usually given from the top of a rock or other conspicuous perch, is a complex, loud whistling trill; males have a repertoire of four song types. Females may also sing, and, in some areas, pairs duet.

[*Sitta neumayer syriaca*, Alahan Monastery, Turkey. Photo: Hanne & Jens Eriksen]



Like most other species of *Sitta*, the **Brown-headed Nuthatch** is a vocal bird.

Members of foraging groups keep in contact with a soft call which is uttered up to 90 times per minute, thus sounding like twittering. Should an individual become detached from the group or become otherwise excited, it may give a loud, bisyllabic squeaky call that has been likened to the noise made by a toy rubber duck being squeezed and then released. A series of double notes in a similar tone is what passes for the male Brown-headed Nuthatch's song. The Pygmy Nuthatch (*Sitta pygmaea*), formerly treated as conspecific, has similar vocalizations.

[*Sitta pusilla pusilla*, near Marumscoc, Maryland, USA.

Photo: George M. Jett]

These mechanisms of character displacement nevertheless appear not to be fully developed in every region where the two species overlap in range. In northern Iran, in particular, the differences in the eyestripe dimensions are reduced and the two species appear unable to co-exist, the Western Rock Nuthatch being found at higher elevations than those occupied by the Eastern Rock Nuthatch, despite the fact that there are marked differences between them in bill size. Here, the possibility of "reproductive confusion" seems to keep the two species apart, despite a lack of ecological competition.

Habitat

All except two members of the family Sittidae are closely tied to forest or woodland and forage almost exclusively in trees, the exceptions being the aptly named rock nuthatches. Although some species will forage in the shrub layer or on the forest floor, such behaviour is relatively infrequent. Both coniferous and deciduous broadleaf forests are utilized by nuthatches, but many species are rather specialized and closely tied to either deciduous stands or coniferous forest. The six members of the "*S. canadensis* group" (see Systematics) are closely tied to conifers, as also are the Pygmy and Brown-headed Nuthatches, whereas the six species in the "*S. europaea* complex" are associated with broadleaf woodland, although many individuals of the latter group will also use conifer forest. The White-breasted, White-cheeked and Przewalski's Nuthatches are apparently closely related to one another (see Systematics), but while the White-cheeked and Przewalski's are very closely tied to coniferous forest, the White-breasted is a denizen of deciduous forest in the eastern USA, although it will exploit conifers, especially pines, in the south and west of its range.

Parks and gardens with old trees attract nuthatches, which in some parts of their ranges also visit garden feeders. In Europe, for example, the Eurasian Nuthatch is a frequent visitor to birdtables and suspended birdfeeders, and it will even breed in large gardens if these contain suitable nesting sites.

All forest-dwelling nuthatches are cavity-nesters, and the availability of suitable nest-sites may be an important factor in habitat quality. Older trees, and especially standing dead wood, can provide many suitable sites, both for those species which excavate their own cavities and for those which take over existing holes. Modern forestry practices frequently involve the removal of such trees, and this may limit the suitability of intensively managed forests (see Status and Conservation).

The two rock nuthatches are aberrant in their choice of habitat. They favour areas of bare rock, such as rocky slopes, cliffs, ravines and gorges, frequently on limestone. The structure of limestone, with many fissures, cracks and cavities, may provide more potential nest-sites than do harder igneous rocks. These two species take readily to man-made structures, especially old buildings and ancient ruins. Both are found in arid regions. The Western Rock Nuthatch is very much a bird of open country, although it will enter open rocky woodland, but the Eastern Rock Nuthatch is more often found in wooded country, albeit usually with areas of exposed bare rock, and it will nest in tree cavities.

General Habits

The nuthatches are a family of small but conspicuous birds, most of which remain throughout the year in the same general area. They would seem to be ideal subjects for study and, indeed, the Eurasian Nuthatch in Europe and the four Nearctic species have received a good deal of attention, as a result of which some aspects of their behaviour are well known. The same cannot be said for the Asian species, for which data are severely limited. In discussion of the habits of the Sittidae, therefore, most of the information derives from a limited set of five species, and only by inference can it be extended to the other 22. This lack of information is probably especially true in respect of those species resident in tropical and subtropical regions.



Nuthatches are almost unique in the ability to climb head first down a tree trunk, the Spotted Creeper being the only other avian species to have been recorded as climbing thus. They walk up and down, always holding one foot firmly on the bark while the other is moved. When climbing upwards they typically move in a zigzag pattern, maintaining the centre of gravity directly above the lower foot. Some species, especially the smaller nuthatches, can hang upside-down below a horizontal branch, but the larger members of the family seem to find this difficult; the latter will move from side to side on the upperside of a branch, presumably in order to maximize their reach on to the sides and lower surface without actually clinging below it. While moving along such horizontal surfaces, as well as on the ground, nut-

Nuthatches are primarily arboreal foragers. They move about trees actively, hanging upside-down, descending trunks head first and scouring the underside of branches with acrobatic ease. This is true of the **Velvet-fronted Nuthatch**, which mainly searches for food on tree trunks, particularly in the middle and upper storeys. Less frequently, it forages on branches and, occasionally, in the undergrowth or on fallen logs. The bulk of the nuthatch diet comprises insects and other small invertebrates such as spiders (*Araneae*).

[*Sitta frontalis saturator*, Pantu Forest, Johor, Malaysia.

Photo: Morten Strange]





Nuthatches make wide use of the food supplies offered by their environment. In addition to invertebrates, they consume seeds, which, in the **Red-breasted Nuthatch**, are mainly taken in the non-breeding season. This species is strongly associated with coniferous and mixed forests, so it is not surprising that conifer seeds are a staple, but it also readily eats seeds from other plants such as sedges (Cyperaceae). In autumn, particularly, Red-breasted Nuthatches descend from the canopy to the ground in search of fallen seeds. Individuals accustomed to the presence of humans also enter gardens to take seeds from feeders.

[*Sitta canadensis*,
Lac St-Charles, Quebec,
Canada.
Photo: Daniel Houx]

nuthatches hop, rather than walk. The rock nuthatches, being essentially terrestrial, rarely climb downwards head first, and they hop, rather than climb, upwards.

Behaviour associated with maintenance and comfort is as would be expected for a passerine group. Head-scratching is usually achieved by the indirect method, the leg being brought up over the top of the outstretched wing, but the Corsican Nuthatch has been recorded as scratching directly, and some, especially the smaller species, head-scratch while hanging upside-down. Allopreening has been recorded repeatedly for the Brown-headed Nuthatch and may help to maintain the pair-bond, and there is an observation of reciprocal preening between an adult male and the

helper male of a neighbouring pair. Allopreening has been recorded also among flocking Pygmy Nuthatches, one individual gently nudging the head of another with its bill. Nuthatches will bathe in shallow standing water or in snow, but only rarely, and they are very wary when doing so. They probably favour foliage-bathing after rain and rain-bathing in drizzle; indeed, the latter habit is thought to be normal practice for the White-breasted Nuthatch. Two sunning postures have been recorded for the Eurasian Nuthatch, but sun-bathing must be uncommon. No members of the Sittidae have been observed to indulge in anting behaviour.

All nuthatches are assumed to be territorial during the breeding season, and adults of most or all species probably hold a ter-



In large parts of its range, the **Eurasian Nuthatch** inhabits oak (*Quercus*) forests, where acorns form part of its diet. Likewise, hazel (*Corylus*) nuts and beech (*Fagus*) mast are common foodstuffs in some areas. To gain access to the edible material in such large seeds and nuts, the nuthatch has to use its robust bill for manipulating, opening and extracting. During the winter cold, this species may need to spend nine-tenths of the day foraging in order to satisfy its energy requirements.

[*Sitta europaea caesia*,
Sant Nazari, Barcelona,
Spain.
Photo: Eudald Solà]

When foraging, nuthatches locate their food by sight or by touch. The arboreal species use their long bill to probe crevices in tree trunks or branches, and, as in the case of this **Giant Nuthatch**, to remove small pieces of bark that might conceal small invertebrates. This species, the largest sittid, principally forages in the canopy of mature pines (Pinus), only descending to the trunk on occasion. As befits its size and bulk, the Giant Nuthatch is less active than its congeners, moving rather sedately around and between trees. It is also less gregarious than other nuthatches, usually feeding alone or in pairs.

[*Sitta magna ligea*,
Zixishan Mountain,
Chuxiong, Yunnan, China.
Photo: Li liwei]

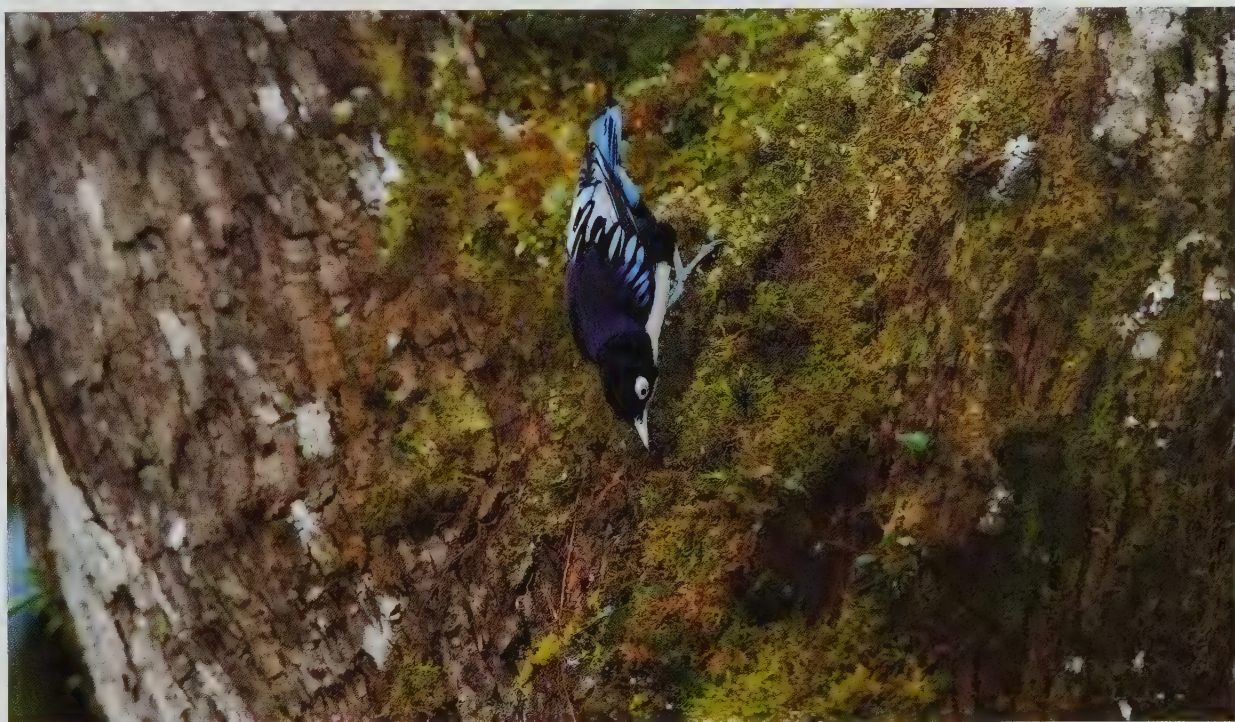


ritory throughout the year, the exceptions being the irruptive or migratory populations of the Eurasian and Red-breasted Nuthatches. Individuals of the latter species which do not move south in winter maintain a year-round territory, whereas migrants, naturally, do not. The maintaining of permanent year-round territories is, however, a relatively rare phenomenon among small passerines in temperate latitudes, being commoner among larger birds and among passerines in tropical areas, and the year-round occupation of a territory by nuthatches may be linked to the habit of caching food. In fact, a well-resourced winter territory may be essential to survival, especially if large quantities of food have been cached during the summer and autumn periods. Some nut-

hatches, however, are more sociable than others. The Eurasian Nuthatch appears to be the least so, while the Pygmy Nuthatch and the Brown-headed Nuthatch, being co-operative breeders (see Breeding) and, in the case of the Pygmy Nuthatch, roosting for much of the year in flocks, are the most sociable and least territorial of the family; for different reasons, the Red-breasted and Pygmy Nuthatches form single-species flocks outside the breeding season. The various Oriental nuthatches are very poorly known, but members of the "*S. frontalis* group", namely the Velvet-fronted, Yellow-billed and Sulphur-billed Nuthatches, and the Blue Nuthatch are regularly seen in small groups as members of mixed-species flocks, while the Beautiful Nuthatch has been

For such a restless species, constantly on the move in small, vocal groups or as part of mixed-species flocks, the **Blue Nuthatch** is a rather diligent and patient forager. In contrast with other nuthatches, which actively probe or glean for food, this species spends long periods simply scanning for its insect prey. Only when it notices movement does the bird launch a rapid attack. This species' morphological idiosyncrasies, such as elongated, drooping greater upperwing-coverts and thick, plush nape feathers have led to speculation that the Blue Nuthatch might be better placed outwith Sitta.

[*Sitta azurea expectata*,
Fraser's Hill, Malaysia.
Photo: Jimmy Chew]





found in relatively large flocks, once an amazing 21 together, but the extent to which these groups are linked to any territory is completely unknown. Nuthatches are very often members of mixed-species foraging flocks, but they do not wander with the flock; rather, they join a flock as it enters their territory and leave it as it moves out.

In the case of the well-studied Eurasian Nuthatch, the members of a territorial pair tend to stay in close contact, often forag-

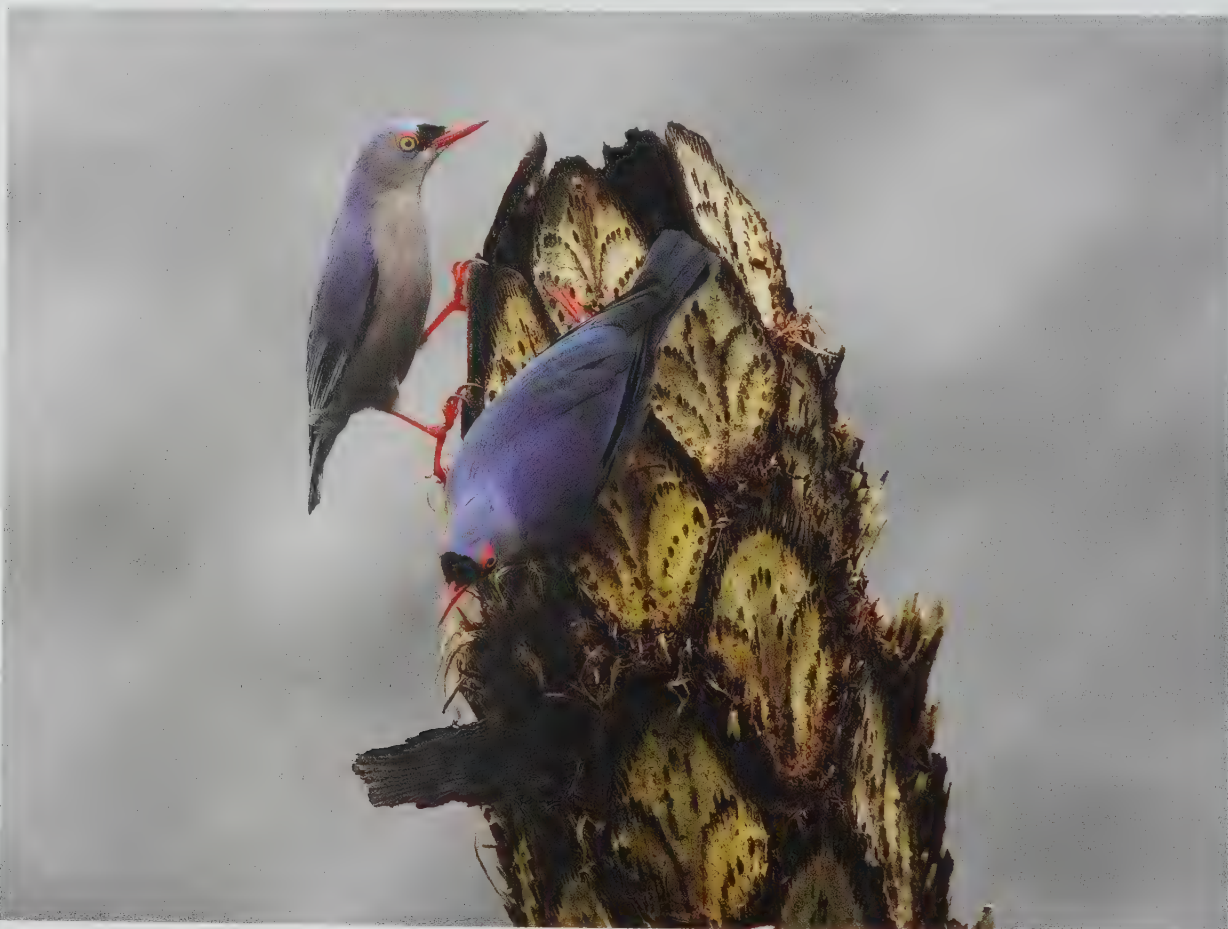
ing in the same tree or a neighbouring one, and calling frequently. If they lose contact with each other, the volume and intensity of the calling increase. For most of the year males are dominant over females, but this is reversed during the nest-building period. Young birds frequently switch mates and territories, but adults are much more faithful. It seems, however, that they are probably faithful to the territory, rather than to the mate, and that both male and female have a long-term interest in defending the same territory.

The territory is defended to a variable extent, depending on the time of year. Adult Eurasian Nuthatches tolerate wandering juveniles to some extent in late summer, but in September–October they defend the territory vigorously, and the pair is again especially vigilant in the early spring. Disputes with other nuthatches on the borders take the form of calling, display and short chases, in which both sexes participate. Territory-owners respond most strongly to intruders of the same sex, and in general male–male conflicts are more intense. Disputes can be prolonged, but they seldom result in changes to the territory boundaries. In mild threat display, the nuthatch raises and spreads the tail, points the bill upwards and holds the wings half-opened and drooped. In the more intense display, the body feathers are sleeked and the tail and wings opened more widely, and in great excitement the wings are beaten. Short but intense fights have been reported as being not uncommon in some studies but were found to be rare in others. In these conflicts, the combatants grapple with their feet while pecking, and often fall to the ground together; injury and even the death of one individual may result. A strange facet of territorial behaviour of the Eurasian Nuthatch is the occurrence of trios, when a single individual occupies two different territories, having a different mate in each territory. Such arrangements, however, are transitory and occur only outside the breeding season.

Most or all pairs of the White-breasted Nuthatch also maintain a territory throughout the year, although some individuals may have separate summer and winter territories, and they may temporarily leave their territory to visit a rich food source, such

The diet of the **Chestnut-vented Nuthatch** is not documented, perhaps largely because until recently the species was considered conspecific with the Eurasian Nuthatch (*Sitta europaea*). However, it is unlikely to differ greatly from other sittids, probably comprising small arthropods and seeds. This individual is using its long, pointed bill to probe between the scales of a pine cone. Somewhat unusually, among the mainly arboreal members of the Sittidae, the Chestnut-vented Nuthatch forages on the ground, even on rocks, as well as on trees.

[*Sitta nagaensis montium*, Laifeng Shan, Yunnan, China. Photo: John & Jemi Holmes]



As might be expected for a species with a fairly large range, the breeding seasonality of the **Velvet-fronted Nuthatch** varies with location. It can start as early in the year as January in south India and finish as late as August in Java. Unlike many tropical passerines, however, it does have a tightly defined breeding season at each locality and does not breed throughout the year. Like almost all congeners, the Velvet-fronted Nuthatch places its nest in an existing hole, often one abandoned by a woodpecker (Picidae) or barbet (Capitonidae), rather than excavating one afresh. The chosen hole may be too small, in which case the birds enlarge it to a suitable diameter.

[*Sitta frontalis corallipes*, Kinabalu Park, Sabah, Borneo. Photo: John & Jemi Holmes]

as a garden feeder. The territories of this species are relatively large, and encounters with neighbours are infrequent. Once independent, all juveniles leave the territory in which they were raised, and then either establish their own territory, often after pairing, or become what are known as "floaters". Floaters are probably all wandering immatures without territories, and they will replace any member of an established pair that dies or otherwise disappears.

Among Brown-headed Nuthatches, males probably maintain permanent territories around the nest-hole, singing and chasing away other males. Those pairs with helper males hold larger territories than simple pairs, but these larger territories, and those of non-breeding pairs, may overlap more extensively with those of their neighbours. Family-members of this species tend to remain together through the autumn and winter, and forage beyond the territorial boundaries. These small parties sometimes amalgamate to form single-species flocks, up to 24 individuals having been recorded together, or they join mixed-species foraging flocks.

The Pygmy Nuthatch also tends to form permanent pair-bonds. Each pair maintains an all-year territory, selected by the male and comprising the nesting and roosting sites and the foraging areas. As with the Brown-headed Nuthatch, territories of pairs with helpers are, on average, larger than those of pairs without helpers. Territories sometimes overlap, but they are actively defended only in the breeding season, defence usually being limited to the vicinity of the nest-site; possession of a territory is announced with song. The adult pair of Pygmy Nuthatches and its fledged brood tend to stay together in the autumn, sooner or later forming stable winter groups with other families. These groups roam over an area formerly occupied by several territories, and occasionally wander more widely. In some areas this species tends to form single-species groups, usually containing 5–16 and occasionally up to 100 individuals, but in montane habitats it joins mixed-species foraging flocks. Flocks break up in the spring, at which time the surplus young are usually driven off, exclusion from the roost-site being perhaps an important factor

in this process. Young males, however, may be allowed to remain as helpers, and some may remain as floaters, neither breeding nor helping.

One obvious question is that of how young nuthatches establish a territory. Upon fledging, juveniles usually spend a relatively short period of time with their parents, and then disperse, the exception to this general rule being the Pygmy Nuthatch, in which the family group goes on to form a winter flock. The immediate task for a juvenile nuthatch upon dispersal is to acquire a territory and a mate. Four major studies of the Eurasian Nuthatch, one in each of the countries of Belgium, Germany and Sweden and one in Siberia, have revealed four different patterns of behaviour, probably reflecting the interacting effects of habitat structure and quality, survival rates and variation in food supplies. In the summer season, territories may "saturate" a habitat, with well-defined territorial borders and leaving no "empty" space. In the winter months, they may be less densely packed, with less clear-cut borders. There are conflicting data on seasonal changes in territory size, but a tendency exists for territories to be smaller in summer. At the highest population densities, Eurasian Nuthatch territories can occupy only 1 ha, but at more typical densities they cover 2–3 ha of forest, and in poor-quality coniferous habitat in Siberia a territory can span as much as 30 ha. Clearly, for a bird that communicates by sight and sound, behaviour appropriate to a territory of 1 ha may be very different from that in a 30-ha territory.

Matthysen, in his study of the Eurasian Nuthatch in Belgium, found that juveniles typically set up territory rather quickly, within 2–4 weeks of fledging, and the earlier a territory is established, the more likely it is to be in good-quality habitat. This clearly favours nuthatches that breed early, and it could also help to explain why second broods are rare, as late-fledging juveniles would acquire poor territories. The acquisition of a territory, probably by an individual of either sex, appears to be followed almost immediately by the acquisition of a mate. There is little evidence that juveniles evict existing pairs, but, rather, they take over vacant territories, and there may be numerous disputes along the

Sittids are almost exclusively cavity-nesters.

The **Eurasian Nuthatch** breeds in pre-existing tree holes that may either be natural or excavated by another species, usually a woodpecker (*Picidae*).

Holes tend to be 2–20 m above ground. On occasion it is inventive in its choice of nest location, some pairs using nestboxes, holes in walls or rocks, or crevices between tree roots. More outlandish nest-sites recorded include a haystack and an old nest of a Eurasian Magpie (*Pica pica*). The female is thought to have the final say on the choice of nest-site, and she has ample time to reach a decision, as pairs stay in contact and within their territory throughout the year.

[*Sitta europaea hispaniensis*,
Sevilla, Spain.

Photo: José María
Fernández Díaz-Formentí]





Early in the breeding season, nuthatches can sometimes be seen on the ground in areas of wet, bare soil. The birds are not foraging, but collecting mud. The mud forms the basis of a plaster-like substance that they use to reduce the size of the entrance to the nest hole. In this respect, the two rock nuthatches (here the **Western Rock Nuthatch**) are somewhat anomalous. While occasional individuals follow the usual *Sitta* practice of nesting in a pre-existing cavity, which they seal with mud, for these two species the mud's primary use for the substance is as the main building material for the entire nest. The nest takes the male 10–18 days to build: the final construction is large and flask-shaped.

[*Sitta neumayer*
neumayer,
Delphi, Greece.
Photo: Manfred Pfefferle]

boundaries as they do so. Fairly quickly, it appears, all suitable territories have been occupied, and the remaining juveniles, still lacking a territory, can acquire one only by filling vacancies within the established pattern of territories. There seem to be different tactics employed in order to achieve this. In the late summer, especially, some individuals occupy a "home range" which may overlap with established territories but which they do not attempt to defend; such juveniles are quiet and inconspicuous, and subordinate to the local territorial pairs, but they are "on the spot" and ready to fill vacancies as they arise. Other birds continue to wander, and males in this itinerant subpopulation, as well as stepping into the shoes of the deceased, probably actively usurp other males from existing territories.

Surviving adult pairs almost always remain on the same territory from year to year, but juveniles do not usually breed on the first territory that they occupy. The death of one partner or, less often, the splitting-up of a pair, prompts periodic reshuffles or territory "shifts", and offers those nuthatches still without a territory the chance to acquire one. Not all territories are of the same quality, of course, and some are abandoned as the breeding season approaches, perhaps because they are not of a sufficiently high quality to support a breeding attempt and, moreover, their occupants have the opportunity to shift to a higher-quality territory that has fallen vacant.

The Belgian study is not representative of the behaviour of the Eurasian Nuthatch throughout its vast range. In studies in Germany in the 1950s, H. Löhrl found that some juveniles established new territories by squeezing into gaps, behaviour unknown in Belgium, or by aggressive takeovers, which were rare in Belgium. Juveniles wandered or associated with the adults until August, when they began to form pairs. As there were few vacant territories, they squeezed into gaps between existing territories. Juvenile pairs gradually expanded these territories, at first without experiencing conflicts with neighbours, but in September–October they initiated conflicts and expanded the territory at the expense of neighbouring ones, and territory

boundaries thus varied over time. Conflicts began again in the spring, lone males or pairs aggressively taking over territories. In several more recent studies, in Sweden, B. Enoksson and S. G. Nilsson showed that territory size was related to the food supply, and that in years of plenty large territories were subdivided. In Siberia, V. V. Pravosudov found that juveniles remained as non-territorial individuals, sometimes in pairs, within adult territories; several juveniles could have home ranges within the territory of an adult pair, but they did not associate with each other or with the adult pair. These non-territorial birds could remain for prolonged periods, sometimes for more than a year but without breeding, until the death of a territory-holder provided a vacancy. There was no evidence of aggressive takeovers, and no "squeezing-in".

All the Sittidae of temperate regions are relatively small and have therefore to cope with substantial energy losses overnight, especially during the winter months. Of the well-studied species, the Eurasian Nuthatch almost always roosts singly and only occasionally are two individuals found sleeping together. It roosts in cavities, including nestboxes, and less often behind loose bark, and it sometimes roosts in the open, especially during the summer; less usual sites include chimneys. When the nest is complete, the female regularly uses it as a roost, continuing to do so for up to 16 days after the eggs hatch. The White-breasted Nuthatch is ecologically close to the Eurasian Nuthatch and, as the latter, roosts singly in tree holes and also behind loose bark. In very cold weather, however, several White-breasted Nuthatches may roost together, and there is a record of 29 individuals packed into a single roost-site. Notably, roosting White-breasted Nuthatches remove their faeces from the hole when emerging in the morning, and this behaviour has been reported also for the Eurasian Nuthatch. The roosting behaviour of the Red-breasted Nuthatch is not well studied. It is known that both members of the pair roost together in the nest-hole during the incubation stage and that the female roosts with the nestlings until they fledge. Red-breasted Nuthatches that are resident may use cavities as

Upon choosing a nest cavity, most sittids reduce the size of the entrance, apparently so that only they can pass through it.

This they do by "plastering" up the hole. The main substrate in the "plaster" is mud, but animal faeces, rootlets and moss are common additional components.

This **Eurasian Nuthatch** is at the start of such a plastering process, with a bill full of wet mud. The female takes almost exclusive responsibility for this task, the male providing only occasional help. The plastering is thought to deter predators from raiding the nest and to reduce competition for the cavity from larger species, such as, for the Eurasian Nuthatch, Great Spotted Woodpeckers (*Dendrocopos major*) and Common Starlings (*Sturnus vulgaris*).

A secure nest-site is thus a precious commodity that is often used in successive years. In addition to plastering the nest entrance, the female Eurasian Nuthatch gathers material to construct the nest inside the cavity. With natural protection offered by the tree, nuthatches have little need for an elaborate nest. Wood chips provide the foundation, and these are covered with a layer of bark flakes, perhaps chosen for their anti-parasitic properties, and occasionally lined with a few dry leaves or strips of lichen.

[*Sitta europaea caesia*,
Bavaria, Germany.
Photo: Konrad Wothe]





The "plaster" applied by this **Eurasian Nuthatch** to the entrance of its nest dries rapidly to become very hard. Only a bird with special morphological adaptations, such as a **Great Spotted Woodpecker** (*Dendrocopos major*), stands a chance of hammering through this defence to take over the cavity. Despite the **Eurasian Nuthatch's** wide range, its breeding seasonality is fairly homogeneous, latitude and altitude accounting for the limited variation. Females usually lay eggs in April or May, very occasionally as early as February. Pairs are almost exclusively single-brooded.

[*Sitta europaea caesia*, Álava, Spain.
Photo: José Luis Gómez de Francisco]

roost-sites during the non-breeding season, but this has not been well documented, and little is known of the roosting habits of migratory individuals of this species.

Of course, it is the smallest nuthatches, the **Pygmy** and **Brown-headed Nuthatches**, that would be expected to suffer the most stress during cold nights, and fairly extensive investigation of the roosting behaviour of these species has revealed some astonishing behaviour. The **Pygmy Nuthatch** roosts throughout the year exclusively in tree cavities, and always socially; so far as is known, there are no records of **Pygmy Nuthatches** roosting alone. In the breeding season the pair and, if present, the helper roost in the nest-hole, and, once the young fledge, the family party may for a few days return to the nest to sleep, but then switch to a summer roosting cavity, sometimes shared with other family groups. In autumn and winter social roosting is normal, and, exceptionally, over 100 individuals have been recorded as using a single large cavity; in one case, a total exceeding 160 was counted in the same dead stub, the roosting individuals belonging to 5–10 distinct social groups. The birds either cling to the wall of the cavity, typically in wedge formations, in close body contact, the heads all pointing in the same direction, or lie stacked at the bottom of the cavity, with as many as five layers of nuthatches. Two conflicting factors affect the birds' behaviour in these roosts, one being the thermal advantage provided by close body contact and the higher ambient temperature in a sheltered cavity, and the other the need to have a sufficient through-flow of air to prevent suffocation. The importance of the latter is illustrated by the gruesome discovery in one cavity of the remains of up to 13 mummified nuthatches, which may have been suffocated. As the night progresses, the birds may change formation in order to match the changing conditions. Not surprisingly, there are clear seasonal patterns in the selection of roost-sites. Winter roosts have a smaller entrance and thicker walls than do those used during the rest of the year, and in the winter months the nuthatches select cavities in trunks in preference to those in branches, the former being large enough to hold more individual birds. On warm summer nights, cavities with a large entrance hole, often with additional cracks and openings, are chosen. This species has been recorded as roosting also in nestboxes. Communal roosting is an adaptation designed to enable this small species to survive very cold nights. The tempera-

ture and the presence of snow influence both the timing of roosting and the size of the roost flock; nuthatches go to roost earlier as the temperature drops and, the colder it is, the larger the number of individuals that sleep together. Roosting **Pygmy Nuthatches** may also enter a state of hypothermia, lowering the body temperature by at least 10°C in order to minimize energy expenditure and becoming extremely lethargic. Indeed, in periods of heavy snowfall, when conifer-needle clusters, the usual forag-



White-breasted Nuthatch pairs divide parental roles during their lifelong association. The female constructs the nest from material collected by the male, pictured here. The basic nest structure is formed from wood chips, bark strips, mud, grass and leaves. Soft material such as fur is used both as a nest lining and to fill the cavity. Females of this species and the **White-cheeked Nuthatch** (*Sitta leucopsis*) perform an unusual display, sweeping the bill over the bark inside and outside the nest-hole. During this activity, the bill usually contains an insect, leading to speculation that the action might release an odour that deters predators.

[*Sitta carolinensis carolinensis*, near Waldorf, Maryland, USA.
Photo: George M. Jett]

The female **Eurasian Nuthatch** performs the bulk of the parental duties. She makes the final choice of nest-site, plasters the entrance hole and, with a modicum of help from her partner, builds the nest inside the cavity. Once she has laid the eggs, normally one per day, the female covers them with nest material—a form of behaviour that is rather rare among passerines. The female alone incubates the eggs for 13–18 days and broods the nestlings for three or four weeks. Both parents, however, feed the chicks, which means that the nest tree is usually the scene of constant activity, with adults coming and going.

[*Sitta europaea europaea*,
Estonia.
Photo: Markus Varesvuo]



ing site, are inaccessible, they may not leave the roost at all, spending over 40 hours in the cavity without food.

The behaviour of the Brown-headed Nuthatch, confined to the warmer south-east USA, contrasts markedly with that of its close relative. Either the female alone or both sexes of the Brown-headed Nuthatch may roost in the nest-cavity during the breeding season, but in the late summer, after the young have fledged, they either sleep in the open in the crowns of trees or return to sleep in cavities as a family party. This species has been found to roost communally in a nestbox, but only in very small numbers, just four individuals. The regular communal roosting of the Pygmy Nuthatch, which has to contend with winter temperatures of –40°C or lower, has not been recorded for this species.

One intriguing type of behaviour is exhibited by several species of nuthatch. This involves an individual suddenly falling silent and sitting motionless for several minutes, as if napping. At present, there is no explanation for this behaviour, the function of which remains entirely unknown.

Voice

Nuthatches are very vocal, but almost all of their vocalizations are simple and repetitive. These consist of a single note, or uncommonly two-note or three-note combinations, repeated at various speeds and for varying periods. Importantly, the distinction between calls and songs is not clear, and for many members of the family the utterance that equates to song is merely a louder and longer repetition of the call. In the case of the Eurasian Nuthatch only the males “sing”, usually while sitting upright and with the bill directed upwards. In Europe, this “song” is given from December to June, reaching a peak in April, at the start of laying, and thus has little or no role in the maintenance of territories, as these are established in summer and autumn, the period when song is most infrequent. The same matter of timing rules out the possibility that this vocalization has a major role in the pair-formation process, although males that lose a mate do sing more often. In short, the definition and role of song among nuthatches is far from clear.

A variety of calls is emitted by nuthatches, and detailed studies of the Eurasian Nuthatch and also of the North American

Sittidae have identified several context-specific vocalizations. For practical purposes, most calls can be categorized as relatively low-pitched, mellow whistles, often easily imitated by humans, and frequently given in series, sometimes as a trill and grading into “songs”. Higher and thinner vocalizations are often given as contact calls, and harsh calls are uttered in excitement. Some harsh calls are reminiscent of the warning scream made by a Eurasian Jay (*Garrulus glandarius*) and are often transliterated as “schraa”; on a sonagram they appear as broad, near-structureless smudges. Taxonomic significance has been accorded to the presence or absence of these jay-like alarm calls in a species’ vocabulary, especially in the “*S. canadensis* group”.

Pygmy Nuthatches, White-tailed Nuthatches and the two rock nuthatches have been recorded as duetting, but the degree to which this is widespread within the family has not been investigated. Nor has the significance of this behaviour been analysed in detail.

Food and Feeding

All nuthatches feed predominantly on insects and other small invertebrates, including snails (Gastropoda), but seeds and nuts can also be important in the diet, especially during the winter months. The stomach often contains grit, presumably taken as an aid to the digesting of hard-shelled seeds. As already mentioned (see Morphological Aspects), the typical nuthatch bill is well designed for the opening of acorns and hazelnuts, and these and other large seeds are eaten when available, but smaller seeds, such as those of beech and pine, are consumed more frequently.

With the exception of the two rock nuthatches, all members of the family forage on the trunk and larger branches of trees, although some, especially the smaller species, will also work through smaller twigs, clusters of conifer needles and cones. They find their food by sight or by probing with the bill, and will scale off pieces of flaky bark in order to examine the area beneath. Nuthatches are flexible, and will generally take anything edible that they come across; they usually break up large food items by wedging them into cracks or crevices and hammering them with the bill, but, unlike the woodpeckers (Picidae), they rarely hack into wood as a means of obtaining access to prey. They obtain

most of their food, at least animal items, by gleaning from the bark surface or probing among conifer needles and cones; they will also capture small invertebrates by aerial flycatching, although this is a less common strategy. Both techniques are used also by the rock nuthatches, which simply transfer the gleaning method to rock surfaces. Together with the tits and chickadees, the woodpeckers, the treecreepers and a few others, the nuthatches are members of the bark-foraging guild, sometimes known also by the term the pariform guild. Owing to their varied diet and their foraging methods, however, they are not so specialized as are other members of the guild, such as the woodpeckers and the treecreepers.

Outside the breeding season, nuthatches of all species appear to spend most of their time with mixed-species foraging flocks. Various studies have demonstrated that the foraging success of Eurasian Nuthatches is higher when these birds are members of a flock, probably because they benefit from having to spend less time in looking for predators and devoting more time to foraging.

Most species of nuthatch store food items, often covering them with lichen. They are "scatter hoarders", hiding items singly, as opposed to "larder hoarders", which store more than one item in a single cache. Cached items are mostly seeds and nuts, but insects, too, are sometimes stored for later retrieval. The behaviour of hoarding of food items reaches a peak early in the day, and slowly decreases as time goes on.



Three species of nuthatch, all North American, have been recorded as using tools. The Brown-headed Nuthatch has been observed to make use of a piece of bark as an extension of the bill, helping it to prise off other bark flakes. It usually drops its "tool" after removing a scale, but it may remove several scales before dropping it, or it may carry its tool from one tree to the next. The use of such foraging aids is most frequent in occurrence during years with a poor seed crop, and it has been suggested that the behaviour developed from the nuthatch's habit of wedging pine seeds into cracks in the bark while it hammers them open. There is a single record of tool use by the Pygmy Nuthatch, an individual of which worked along a branch while holding a 3-cm twig and probing the bark; when it found something, it dropped the twig and pecked at the object that it had located. Finally, and although not in connection with foraging, the Red-breasted Nuthatch sometimes uses a small piece of bark as a "spatula" with which to apply tree resin to its nest-hole entrance.

Breeding

The Eurasian Nuthatch and probably most other members of the family are monogamous, and the partners of each pair remain together on territory throughout the year. New pairs can be formed at any time, but especially in early summer, and thus "song" (see Voice), which in the case of this species reaches a peak in April, does not play a major role in pair formation. Breeding activity starts in early spring, both sexes prospecting for suitable nest-sites.

All nuthatches are cavity-nesters. Most species use holes in trees, either excavating their own or using pre-existing holes. The latter include both natural holes and those excavated by another species, usually a woodpecker, thereby making the nuthatches "secondary cavity-nesters". Nests are placed at various heights above ground, and it seems that, although the availability of suitable holes clearly affects the selection, higher nests are less likely to be preyed on and are preferred. An exception to this general rule is provided by the Brown-headed Nuthatch, which usually excavates its own nest-hole, typically 1–2 m above the ground. As a comparison, the closely related Pygmy Nuthatch likewise excavates its own hole in about 40% of cases, but usually more than 5 m from the ground.

The smaller nuthatches, both those in the "*S. canadensis* group" and the "dwarf nuthatch" superspecies formed by the Pygmy and Brown-headed Nuthatches, usually excavate their own nesting holes in soft, decayed wood, although they will take over an existing hole. This has its advantages, in that they are able to dig out a hole that is exactly the right size. As a consequence, they do not use "plaster" to reduce the size of the hole; the only suggestion that any member of these two groups do so is in the form of circumstantial evidence relating to the nest of the Algerian Nuthatch. Indeed, these groups do not use mud in the nest at all, with the possible exception, again in the form of circumstantial evidence, of the Algerian Nuthatch and, in this instance, also for the Chinese Nuthatch. The male of the latter species brings mud to the female during the incubation phase, and she then utilizes this as a means with which to "repair" the interior wall of the nest-hole. In an interesting parallel, the Pygmy and Brown-headed Nuthatches use ordinary nest material when repairing such cracks.

So far as is known, no other nuthatches excavate their own nest-holes, although the data are insufficient to rule out this behaviour completely, particularly for many of the Oriental nuthatches. Again so far as is known, most of these species reduce the size of the entrance by applying a plaster-like substance made from mud. This plaster is often described as setting to a "terracotta hardness", and that made by some species includes other ingredients, such as dung, rootlets, moss, berries, saliva and, in the Indian Nuthatch, notably, tree resin. The use of such plaster is surely an anti-predator device, as well as reducing nest-hole competition by making the cavity unsuitable for larger birds that may otherwise usurp it. In Europe, both the Common Starling (*Sturnus vulgaris*) and the Great Spotted Woodpecker (*Dendrocopos ma-*

Once **Western Rock Nuthatches** have chosen a rock face or similar artificial structure as the location for their nest, the male sets about building what, for a sittid, is an astonishing construction. The male gathers material such as mud, animal dung and hair, and moulds it all into the shape of a flask, which hardens as it dries. The entrance tunnel may be as much as 10 cm long, and the diameter is just sufficient for the adults to squeeze in and out—but too narrow for most predators to do so. Such security measures give the Western Rock Nuthatch the confidence to locate its nest lower than those of arboreal sittids, sometimes as little as 2 m above the ground. This species sometimes adds decorative objects to the exterior of its nest, inserting them in nearby rock crevices. Nests are sufficiently sturdy to last from one year to the next, and indeed may be used by pairs for several successive breeding seasons. In line with the close relationship between the two species, the nest of the Eastern Rock Nuthatch (*Sitta tephronota*) is similar. However, the Eastern sometimes excavates its own hole or uses the old nest hole of a bee-eater (*Meropidae*), roller (*Coraciidae*) or woodpecker (*Picidae*).

[*Sitta neumayer zarudnyi*, Skala Kalloni, Lesvos, Greece.
Photo: C. Knights/Ardea]

This adult **Krüper's Nuthatch** has returned to the nest-site with a single caterpillar. Breeding in the summer enables temperate species of nuthatch to feed their young with invertebrates. Indeed, Krüper's Nuthatch is one of many sittids that provisions its nestlings solely with such animal matter. This is slightly surprising, given that this small nuthatch is closely tied to Turkish pine (*Pinus brutia*), and that several such sittids specializing in coniferous forests also feed their offspring with pine seeds. Krüper's Nuthatch chicks are brooded by the female, but fed by both parents.

[*Sitta krueperi*,
Lesvos, Greece.
Photo: Richard Brooks]



for) are important nest predators, although the woodpecker is capable of smashing its way into a plastered hole.

When disturbed while sitting on the nest, females of the Eurasian Nuthatch have no specific anti-predator display, but otherwise can be vigorous in defence of the nest, even attacking a woodpecker. In the face of predators, the White-breasted Nuthatch performs a distraction display in which it assumes a moth-like pose, with the body and bill held upright and the wings and

tail fully spread; in this posture, the bird sways slowly from side to side, at the same time fluffing out the white ear-coverts, which, when the nuthatch is viewed from behind, look like huge eyes. A very similar display has been recorded for the Eurasian Nuthatch, when presented with a stuffed woodpecker, and for the Red-breasted Nuthatch. In response to the climbing of the nest tree by American red squirrels (*Tamiasciurus hudsonicus*), the incubating female Pygmy Nuthatch sometimes jumps out of the cavity and perches at the entrance, facing down towards the squirrel, and, with the wings spread, holds her body in a fixed position and sways slowly from side to side in a rhythmic movement. This seems to have the desired effect, as the squirrel freezes, fixated on the nuthatch for up to 10 seconds, before retreating.

The Eurasian Nuthatch, the best-studied member of the family, is probably typical of many nuthatches in its nesting behaviour. The final choice of nest-site is probably made by the female, and she also undertakes the work of plastering the hole and building the nest, tasks which are carried out over a period of 2–4 weeks, plastering continuing even after the eggs have hatched. At the beginning the male takes little part, merely providing some nest material, but his share of provisioning increases once laying has commenced, and in the later stages he may even participate in the plastering work. Mud and clay are brought in pellets and hammered into shape around the entrance, the bill being used for this work. The nest of the Eurasian Nuthatch consists of a foundation of wood chips, sufficient to fill over-large cavities, which is surmounted by bark flakes, usually of pine, rarely incorporating dry leaves, lichen, conifer needles and the like. It has been suggested that a preference for bark flakes reflects the anti-parasite properties of such material, and the birds may have to travel some distance in order to obtain them. The nest of the Brown-headed Nuthatch, a pine specialist, is sometimes made largely of pine-seed wings, but that of the Pygmy Nuthatch, another pine specialist but living in cooler climes, includes a greater amount of insulating material.

Among the numerous tree-nesting species, the Kashmir Nuthatch produces what may be the most elaborately plastered nests. In up to 33% of these the plaster forms a short cone, occasionally extending also for some distance around the hole. This process is taken even further by the rock nuthatches. The Eastern Rock Nuthatch's nest is a flask-shaped structure, usually built over a crack,

Clutch size in the **Eurasian Nuthatch** is within the range 4–13, but is normally towards the lower end of this scale.

Even having just a few chicks places a significant responsibility on the adults to provide sufficient food.

Adults must also avoid unwittingly revealing the nest location to potential predators. It follows that there are advantages for an adult in returning to the nest with as much food as it can carry in its bill, rather than making more journeys with fewer items. The species mainly feeds its young with beetles (Coleoptera) and caterpillars (Lepidoptera).

[*Sitta europaea europaea*,
Estonia.
Photo: Markus Varesvuo]





Although female nuthatches lay their eggs each a day apart, the brood hatches within a more condensed timeframe, normally just 24 hours. This roughly equal starting time increases the likelihood of the chicks growing at a similar rate, which, in itself, increases the chances of the entire brood fledging. Nestling **Eurasian Nuthatches** grow somewhat more slowly than most other passerines, perhaps because the secure nest-hole reduces the necessity of rapidly acquiring the ability to fly. Nestlings are hatched naked, and feathers do not appear for three days. The chicks' eyes remain closed until they are nine days old, and the remiges do not emerge until a fortnight has passed. By this time, the brooding stint has declined to five minutes per hour, compared with 25 minutes per hour around hatching time. Thereafter, development is more rapid, and the offspring may leave the nest after 4–11 further days. The fledglings remain dependent on their parents for one or two additional weeks. In those sittids for which data are available, breeding success tends to be high. Two-thirds of Eurasian Nuthatch eggs laid lead to successful fledging, while the average number of fledglings can be as high as 5.5 per pair. Nest failures are usually due to the incumbent sittids being ousted by a larger cavity-nester, or due to nest predation. In both instances, squirrels (*Sciuridae*) and woodpeckers (*Picidae*) are often responsible.

[*Sitta europaea caesia*,
Pyrenees, France.
Photo: Dave Watts]

Nest sanitation is an essential part of sittid parental responsibilities.

Like other passerines, nuthatch nestlings excrete their faeces inside white, gelatinous sacs. This adult **Eastern Rock Nuthatch** is transporting a faecal sac a safe distance from the nest. In the well-studied *Eurasian Nuthatch* (*Sitta europaea*) and *Pygmy Nuthatch* (*S. pygmaea*) at least, adults tend to smear faecal sacs on branches, thereby destroying rather than merely discarding them. When the chicks are very young, the adults swallow the faecal sacs, as they retain significant quantities of nutrients because of the chicks' inefficient digestion.

[*Sitta tephronota*
tephronota,
Tien Shan, Kyrgyzstan.
Photo: Sylvestre Popinet
& Christel Freidel/Bios]



cavity or hole in a rock face, a tree or even a building. The hole may be natural, or the abandoned hole of a bee-eater (*Meropidae*), roller (*Coraciidae*) or woodpecker, or it may have been excavated by the birds themselves. The entrance is walled up with plaster, leaving just a small hole or a short conical entrance tunnel 45–150 mm long. The “plaster” is a mixture of mud, saliva, excrement, resin, feathers, hair, cloth, insect fragments, and even such artefacts as sweet-wrappers, and, when a tree hollow is used,

the interior of this is often lined with mud. Nests of the Western Rock Nuthatch are almost always placed on a rock face or building, and they have a longer entrance tunnel than those of Eastern Rock Nuthatches. Both rock nuthatches will often decorate the vicinity of the nest with a variety of objects, both natural and man-made.

An anti-predator tactic employed by the White-breasted Nuthatch, and reported also for the White-cheeked Nuthatch, is a bill-sweeping display. In this, the bill is swept backwards and forwards in an arc over bark near the nest-hole, sometimes for several minutes. The inside of the nest-cavity may also be “swept” in this way, and during the sweeping process an insect is usually held in the bill, although sometimes fur or vegetation is used, and sometimes the bill alone is used. The presence of squirrels may precipitate sweeping, and the purpose of this action may be to use the odours from the objects being swept as a means of confusing squirrels, which are potential predators and competitors for holes.

The Red-breasted Nuthatch employs a different technique to deter predators. It smears the entrance to its hole with the sticky resin, often known as “pitch”, that is exuded by conifers. Both male and female bring globules of resin on the tip of the bill throughout the incubation and nestling stages, sometimes at a rate of 5–10 applications per hour. The species has even been recorded as using a small piece of bark with which to apply the substance, this being the only known example of the use of a “tool” by this species. There are clearly risks attached to this strategy, as nuthatches have on rare occasions been found dead, trapped in this gum. Red-breasted Nuthatches have developed several ways of minimizing the risk. A notable example is that they avoid the pitch by flying straight into the nest at high speed, sometimes after hovering in front of the entrance, and the nestlings, after having fed, turn around to deliver their faecal sacs at a point where the adult can reach them without needing to enter the cavity. When the young are about to leave the nest, the entrance floor is covered with litter or fur, presumably to neutralize the pitch and ensure safe passage for the young.

Copulation is seldom observed, even for the well-studied *Eurasian Nuthatch*. The female of this species solicits by crouching, shivering her wings and moving her head from side to side in what is known as the “pendulum display”. This is matched by

Sittid parental care continues after the young have fledged. In the **White-breasted Nuthatch**, adults continue to feed the chicks for a full fortnight, during which family parties wander around their territory. These forays risk bringing the uninitiated fledglings into contact with avian predators such as raptors; mortality rates can be high. Should an adult White-breasted Nuthatch spot a predator, it may perform a distraction display. Adopting an erect, moth-like pose, it sways from side-to-side and extends its white ear-coverts outwards, in such a way that they resemble huge eyes when viewed from the rear.

[*Sitta carolinensis*
carolinensis,
St-Jean-sur-Richelieu,
Quebec, Canada.
Photo: Francis Bossé]





the male, but in an upright posture, facing away from the female, and after up to 30 seconds the male turns, with the bill still pointed upwards, and mounts the female. This process may be repeated several times. Similar pendulum displays are described for several nuthatches, one such being the Pygmy Nuthatch. Courtship feeding by the Eurasian Nuthatch starts a few days before laying commences.

Eggs are laid in the early morning, normally one per day, clutches typically varying from four eggs to eight eggs. The eggs

of the Sittidae are white, variably marked with reddish, brown and lilac spots, these normally being concentrated at the broader end. Mean egg weights vary with body size, even within a species, those of the Eurasian Nuthatch varying from about 1.8 g in the subspecies *asiatica* to 2.2 g in the somewhat larger nominate race; the mean weight of eggs of the tiny Pygmy Nuthatch in California is 1.2 g. The Eurasian Nuthatch covers the eggs with nest material throughout the laying and incubation stages. This is an unusual habit among passerines, but the nuthatch's nest usually fills the cavity, with its top almost at the same level as the entrance tunnel, and the eggs and, later, the nestlings are therefore clearly visible through the hole. The Pygmy Nuthatch similarly covers the eggs, and this behaviour may be common in the family. Incubation usually starts after the last egg is laid, but it may be delayed, especially in bad weather. It appears that, for all members of the family for which the relevant information is available, only the female incubates, although she is fed on and off the nest by the male. The female Eurasian Nuthatch spends 20–30 minutes on the nest, followed by a break of about 10 minutes; thus, she sits for two-thirds to three-quarters of her time during the incubation stage. On returning to the nest, she turns in half-circles until all of the covering nest material has been moved aside.

Rather few data are available on the duration of the incubation period, and for the majority of the family there is no information at all on this aspect of the breeding biology. The Eurasian Nuthatch incubates for 13–18 days, and this range seems to be fairly typical for the family, as a period of 12–17 days has been recorded for the much smaller Pygmy Nuthatch. All the eggs hatch usually within a period of 24 hours. At nests of the Eurasian Nuthatch the female breaks the remains of the eggshells and eats them, but in the case of the Pygmy Nuthatch the two parents remove shells from the nest and deposit them more than 30 m away. After the eggs have hatched, the female spends up to a third of her time in brooding the nestlings, but this decreases to a few minutes per hour in the days immediately before the chicks fledge. The young are fed by both sexes, often entirely with animal matter, but some of the small conifer specialists provision the young with seeds, too. Large food items are not broken up, and the White-breasted Nuthatch has been recorded as feeding its nestlings with dragonflies that have the wings still attached.

Six nuthatches officially qualify as restricted-range species, with a distribution of 50,000 km² or less, and a few taxa recently elevated to species level may join them once they have been formally assessed. One restricted-range species is the **Kashmir Nuthatch**, which occurs only in the Western Himalayas Endemic Bird Area. This species inhabits coniferous, mixed and deciduous forest at altitudes of 1800–3500 m. The species is generally quite common throughout its range so, despite forest loss, degradation and fragmentation in the region, it is not considered to be globally threatened.

[*Sitta cashmirensis*, Chitral Gol National Park, North West Frontier Province, Pakistan. Photo: Menno Hornman]



The **Corsican Nuthatch**, **Red-breasted Nuthatch** (*Sitta canadensis*) and **Chinese Nuthatch** (*S. villosa*) are three superficially similar species that have often been considered to form a single species, despite occurring huge distances from each other. Such treatment is all the more remarkable given that the Corsican Nuthatch is endemic to a single Mediterranean island. A restricted-range species, endemic to the Corsican Mountains Secondary Area, it favours old-growth Corsican pine (*Pinus nigra*) forests with plentiful dead wood. Populations are stable, so the species is thought not to be at risk of extinction.

[*Sitta whiteheadi*, Gorges de la Restonica, Corsica. Photo: Mike Read]

Being almost entirely dependent on forests and often having small ranges, it is perhaps predictable that a quarter of sittids are under some threat of global extinction. Four species are globally threatened and three Near-threatened, the latter including the **Yunnan Nuthatch**. This restricted-range species occurs only in the Yunnan Mountains Endemic Bird Area. Although still locally common, a continuing population decline has resulted in several local extinctions. If, as feared, the Yunnan Nuthatch needs mature pines (*Pinus*) for nesting, the security offered by its toleration of degraded forest would be reduced.

[*Sitta yunnanensis*,
Zixishan Mountain,
Chuxiong, Yunnan, China.
Photo: Li liwei]

The adult Eurasian Nuthatches swallow the chicks' faecal sacs for the first four days, and thereafter carry away the larger sacs and also soiled nest material, often smearing it on branches, rather than dropping it at random. Similarly, the Pygmy Nuthatch parents initially consume the faecal sacs but, from 2–3 days after the hatch, both they and, when present, the helper remove the sacs and deposit them on a high limb, wipe the bill, and rap it vigorously on the branch, frequently using the same limb for this purpose.

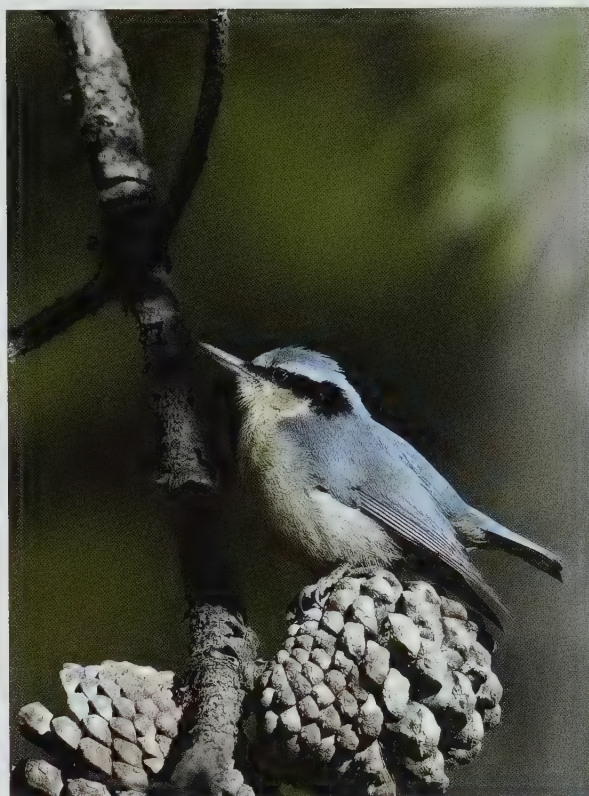
Nestlings have long, scanty down; the interior of the mouth is fleshy-coloured or yellowish, and there are no tongue spots. Nestlings of the Eurasian Nuthatch develop rather slowly compared with those of many similarly sized passerines. The nuthatch chick exhibits the first traces of feathers on day 3, the eyes open on day 9, the first feathers emerge on day 9, and the first flight-feathers emerge from their sheaths on day 14; the chicks leave the nest after 18–25 days. In the Brown-headed and Pygmy Nuthatches, rather smaller species with a slightly shorter fledging period, the sheaths for all the feather tracts appear on days 6–9 and the eyes begin to open on about day 7, while the primary sheaths of the nestling Pygmy Nuthatch begin to break at 8–10 days. The security of a hole nest may facilitate this slow development. Indeed, for the few species for which good data are available, nesting success is fairly high; in studies of Eurasian Nuthatches, for example, the number of fledged young produced per pair varied from 2.9 to 5.5, at least 66% of eggs laid being successful. The commonest causes of nest failure are probably takeovers by other cavity-nesters or predation, with squirrels and woodpeckers the main culprits; for the poorly known tropical species of nuthatch, snakes may also be significant nest predators. In the face of failure, nuthatches will sometimes lay repeat clutches, but true second broods appear to be rather rare.

At nests of Pygmy Nuthatches, some nestlings, one or two days before fledging, may creep 15–20 cm out from the nest entrance, but they remain outside the cavity for less than one minute. This exploratory behaviour has not been recorded for any other members of the Sittidae. For the first few days after leaving the nest, juvenile nuthatches spend much time in sitting in a well-concealed position in the canopy, waiting to be fed. As they mature, the family party roams more widely, sometimes beyond the



Conservationists are keeping a close eye on the **Yellow-billed Nuthatch**, which is listed as Near-threatened. The distribution of this restricted-range species extends over parts of the Endemic Bird Areas of Hainan and Da Lat Plateau, as well as the Fan Si-Pan and Northern Laos Secondary Area. The population on Hainan (*race chianfengensis*) was discovered as recently as 1963 and is endemic to the island. Its survival here is far from assured, as the island's forest cover declined by 72% between 1949 and 1981, when just 7% of the total land area remained forested.

[*Sitta solangiae*
chianfengensis,
Jianfengling,
Hainan, China.
Photo: John & Jemi
Holmes]



territory boundaries. Mortality at this stage is high, many young falling victim to avian predators. Young Eurasian Nuthatches cease being fed about 10–11 days after fledging, and they probably disperse quickly.

Nuthatches usually attempt to breed when one year old, although some year-old males of the Pygmy Nuthatch and the Brown-headed Nuthatch are merely helpers at nests of other pairs. These two species, incidentally, appear to be unique among the Sittidae in being co-operative breeders. Approximately 10–60% of breeding pairs of Brown-headed Nuthatches have helpers, most of which are year-old individuals; these helpers are almost always males and all are related to the breeding pair, usually to the male partner. In studies of two colour-marked populations of Brown-headed Nuthatches in Florida, however, one case of a female assisting with the incubation of the eggs was recorded. Helpers may assist in chasing intruders from the territory, in excavating cavities, in providing nest material, in the task of nest sanitation and in feeding the female on the nest, as well as in provisioning the young, both as nestlings and as fledglings. They do not, however, roost with the breeding pair. In Pygmy Nuthatches, about 20–40% of nests have helpers, usually one but sometimes as many as three. Again, these assist with nest construction, nest sanitation, the feeding of the female on the nest during incubation and brooding and the feeding of the young, although the helper is sometimes driven away by the male of the pair during the laying period. Some helpers participate throughout the breeding cycle, whereas others arrive part-way through after their own breeding attempts have failed. Most help for a single year, although a few may assist the same breeding pair for a second year. Unlike the situation with the Brown-headed Nuthatch, helpers at Pygmy Nuthatch nests roost with the parents in the nest-cavity at all stages of the breeding cycle.

Notably, the presence of helpers does not increase the rate at which the young are fed but, rather, it reduces the number of feeding visits made by the parents and thus, presumably, reduces the stress placed upon them. This is thought to aid the adults' winter survival. For both Brown-headed and Pygmy Nuthatches helpers are clearly beneficial, and pairs with helpers are significantly more successful in fledging young than are those without. In the case of Pygmy Nuthatches, the presence of one or more helpers has the effect of reducing the number of nest failures, rather than increasing the number of young produced.

Movements

Almost all members of the family are resident, and juveniles, although they do disperse, seem to do so over short distances. Among Eurasian Nuthatches, for instance, most of the juveniles reared in good habitat move less than 1 km from where they hatched, with no difference between males and females, although in more fragmented habitats young may move 3–10 km before establishing their first territory or home range. A small minority go farther, but in Europe there are very few ringing recoveries made beyond 100 km. There is a rapid initial dispersal from the natal territory soon after fledging, in June and July, followed for a small minority of individuals by longer-distance movements, which reach a peak in August–September. Among Eurasian Nuthatches, long-distance dispersals are orientated mainly towards the south-west and are sometimes considered to be “irruptions”, with higher numbers and extralimital records more frequent in some years than in others. Those involving European populations appear to peak in years with high population densities but seem to reflect rather local conditions. In contrast, those of the “*asiatica* group” of subspecies from Siberia undertake similarly irregular movements, but involving populations from much larger areas and making longer journeys, variable numbers of individuals reaching Finland, often the Baltic countries and north Sweden, and sometimes Norway, too. These irruptions are probably due to the nuthatches’ dependence on the crop of cones of Siberian stone pine (*Pinus sibirica*), and, in years when the cone crop fails, thousands of Eurasian Nuthatches have been seen on the move in Siberia. In eastern Asia, the subspecies *amurensis* makes similar but less frequent irruptions, large numbers passing along the coast of Ussuriland. Even in such circumstances, however, the Eurasian Nuthatch, as all nuthatches, shuns water crossings, and there are very few records of vagrants from offshore islands. In western Europe, nuthatches may again disperse, presumably over short distances, in the early spring, and there is limited evidence that some Eurasian Nuthatches winter in areas where they do not breed, this perhaps reflecting the seasonal availability of food.

The Red-breasted Nuthatch of North America is also an irregular irruptive migrant, but its irruptions are much more frequent and more regular than are those of its Eurasian relative. The most northerly breeders, and those at the highest altitudes,

may fly south or move downslope every year. For the bulk of the populations, however, movements are dependent on the crop of conifer seeds, and they generally have a two-year cycle. In years with a good cone crop, the centre of gravity of the population moves only slightly southwards. In years of cone-crop failure, in contrast, there is a variable exodus from the breeding areas, and Red-breasted Nuthatches may reach southernmost California, the Gulf Coast and northern Florida.

In the Himalayas and south-west China, nuthatches breeding at higher elevations will undertake seasonal altitudinal movements, moving downslope in the colder months. In most cases, however, the extent of these movements is poorly known.

Relationship with Man

The name *Sitta* originates from the ancient Greek σιττη, transliterated as “*sitte*”, which was first used by Aristotle in his *Historiae Animalium* to refer to a bird that pecks at the bark of a tree. The word may possibly be onomatopoeic, and relate to the call of the Eurasian Nuthatch or, perhaps, the highly vocal Western Rock Nuthatch, the latter still a familiar and noisy bird at the sites of Greek antiquities. Whatever the truth may be, the word *Sitta* was chosen by Linnaeus, in his *Systema Naturae* of 1758, for the nuthatch genus. “Nuthack”, corrupted to “nuthatch”, describes the typical feeding action of the family.

Nuthatches are easily attracted to garden birdfeeders, where they readily take sunflower and other seeds, suet, bread and other items of food. Their lively, perky character makes them popular visitors. In some places, they become accustomed to the presence of humans and can be very approachable, soon becoming tame. In parks and cemeteries in parts of Europe, for example, nuthatches will readily take food from the hand, and it is possible for human beings to “call up” the birds by whistling and then to hand-feed them with seeds and similar items. In North America, the White-breasted Nuthatch likewise may become quite tame and fearless, taking food from people’s outstretched hands. Even some of the smaller nuthatch species in southern Asia will often allow a close approach.

From the point of view of conservation, the nuthatch provides positive associations in Europe with woodlands. In Ger-



Although the distribution of the **Giant Nuthatch** extends over a large area in south-west China, central and east Myanmar and north-west Thailand, its population is becoming increasingly fragmented. Fewer than 10,000 individuals are thought to remain, and the species is listed as *Vulnerable*. The pine (*Pinus*) forests inhabited by the Giant Nuthatch are being destroyed or degraded by commercial logging and exploitation for firewood. In addition, clearance for shifting cultivation has removed large areas of habitat, and uncontrolled burning is a further threat.

[*Sitta magna ligea*, Zixishan mountain, Chuxiong, Yunnan, China. Photo: Li liwei]

many, the Eurasian Nuthatch was selected as the "Bird of the Year" in 2006, awarded this title by the BirdLife partners in order to awaken among people an awareness of the conservation needs of natural woodlands with old trees.

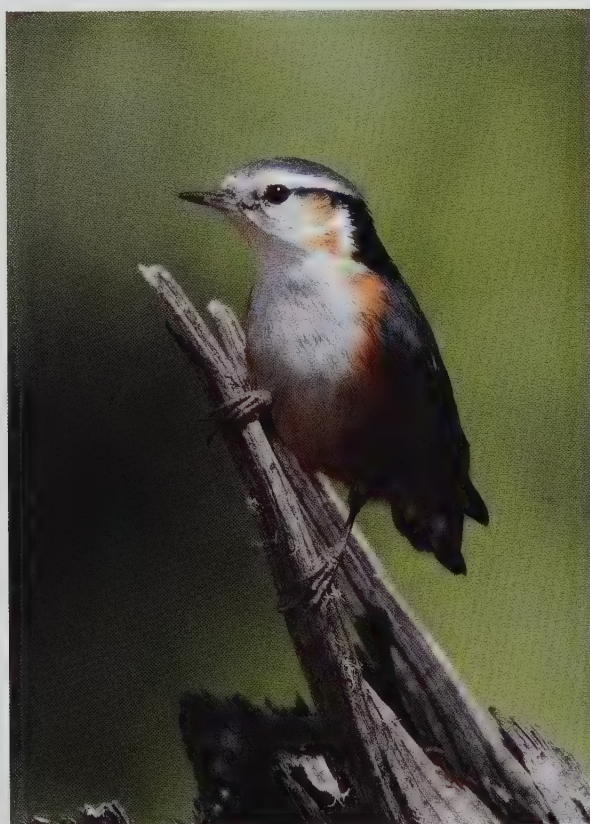
Status and Conservation

Nuthatches are specialists, in that all except two species are closely tied to forest, both for feeding and for breeding. Furthermore, while several species are widespread and have vast, continent-wide ranges, as illustrated by the Eurasian and Red-breasted Nuthatches, a significant number have relatively small, even tiny ranges, indicating that in some way, as yet poorly understood, they are extreme specialists. Not surprisingly, a good proportion of the Sittidae, seven of the 27 species, have conservation designations. Four species are globally threatened and three are Near-threatened.

Two species, both having an extremely limited range, are categorized as Endangered. These are the Algerian Nuthatch, confined to the mountains of north-east Algeria, and the White-browed Nuthatch, restricted to Mount Victoria and surrounding mountains in west Myanmar. The Corsican Nuthatch has a similarly circumscribed range and a small population in Corsica, but its numbers are thought to be stable and it is therefore classified as of Least Concern.

Several other species have a limited distribution, although not with so tiny a global range as those of the aforementioned species, and many of these, too, are of conservation concern. The Giant Nuthatch and the Beautiful Nuthatch both have relatively small ranges centred around South-east Asia, and both are listed as Vulnerable, while Krüper's Nuthatch of Asia Minor, the Yunnan Nuthatch of south China and the Yellow-billed Nuthatch of Indochina and Hainan are currently considered Near-threatened.

The remaining species having a more or less restricted range are the Chinese Nuthatch of north China, the Kashmir and White-cheeked Nuthatches of the western Himalayas, the Sulphur-billed Nuthatch of the Philippines and the Blue Nuthatch of the Sunda Region. Although none of these five species is presently considered to be at any immediate risk, one or more of them could easily move into the Near-threatened category as their habitats continue to shrink.



[*Sitta formosa*,
Eaglenest Wildlife
Sanctuary, Arunachal
Pradesh, India.
Photo: Jimmy Chew]

The White-browed Nuthatch is endemic to a tiny area of just 820 km² in the southern Chin Hills of Myanmar. Some observers have found it to be fairly common, but others consider it sparsely distributed. Either way, its total global population appears to be under 10,000, and is probably declining. Within its range, no forest remains below 2000 m, and that at 2000–2500 m is heavily degraded. The combination of a small range, major threats and low population have led to the White-browed Nuthatch being classed as Endangered.

[*Sitta victoriae*,
Mount Victoria, Myanmar.
Photo: John & Jemi
Holmes]



With the exception of the two rock nuthatches, all members of the family are dependent on forest, with optimal conditions for all species likely to be primary forest with abundant large trees and standing dead wood. Throughout the world, these forests have declined sharply. This process started many centuries ago in Europe and eastern Asia, but habitat destruction has taken place much more rapidly in the Americas over the last 200 years and began in the Himalayas and western China even more recently.

In Europe and North America, populations of nuthatches have more or less stabilized and little recent change in their numbers is evident, although both the Brown-headed and the White-breasted Nuthatches appear to be in slow decline in the eastern USA. Insidious changes such as habitat fragmentation and degradation reduce the suitability of the remaining forests. As mentioned previously (see Habitat, Breeding), nuthatches nest in cavities and most of the species require older trees, and especially standing dead wood, in which many suitable holes exist or can be excavated. Modern forestry practices, however, generally do not take account of the needs of wildlife, and the removal of such trees is commonplace. This and other processes, which include the thinning of dense stands and selective felling, may now be having as much of an effect on the avifauna as does total forest clearance. In southern Asia, the main centre of diversity for the family, the situation is much more grave, and it seems likely that nuthatches will share the fate of most forest birds in that part of the world.

General Bibliography

Ali & Ripley (1983), Banks (1978), Bent (1948), Berndt (1984b), Bock (1994), Cramp & Perrins (1993), Dickinson (2003), Dunajewski (1934), Enoksson (1990a, 1990b), Enoksson & Nilsson (1983), Fry *et al.* (2000), Ghalambor & Martin (1999), Grant (1975), Greenway (1967a), Haffer (1993a), Harrap & Quinn (1996), Hellmayr (1903, 1934), Jönsson & Fjeldså (2006a), Kingery & Ghalambor (2001), Knorr (1957), Löhri (1958, 1958b, 1988, 1993a), Manegold (2008), Matthysen (1998), Mayr & Amadon (1951), Momiyama (1931), Neufeldt & Wunderlich (1984), Norris (1958), Pasquet (1998), Pravosudov (1993a, 1993b), Pravosudov & Grubb (1993), Rasmussen & Anderton (2005a, 2005b), Red'kin & Konovalova (2006), Sibley (1996), Sibley & Ahlquist (1990), Sibley & Monroe (1990, 1993), Smit *et al.* (2007), Vaurie (1950b, 1957b), Voous & van Marle (1953), Wetmore (1956), Withgott & Smith (1998), Wolters (1979), Wunderlich (1983a, 1983b, 1986, 1988b), Zink *et al.* (2006).



PLATE 3

inches 3
cm 8

Genus *SITTA* Linnaeus, 1758

1. Eurasian Nuthatch

Sitta europaea

French: Sittelle torchepot **German:** Kleiber **Spanish:** Trepador Azul
Other common names: (Common/Wood) Nuthatch; European Nuthatch (*europaea*); Southern Nuthatch (*caesia*); Chinese (!)/Oriental Nuthatch (*sinensis*); Hondo Nuthatch (*hondoensis*); Kamtschatkan Nuthatch (*albifrons*); Yesso Nuthatch (*clara*)

Taxonomy. *Sitta europaea* Linnaeus, 1758, Europe and America = Sweden.

Forms a superspecies with *S. nagaensis*, *S. cashmirensis*, *S. castanea*, *S. cinnamoventris* and *S. neglecta*; has often been treated as conspecific with some or all of these. Geographical variation complex. Races usually divided into three main groups, buff-breasted “*caesia* group” (in W Europe, N Africa and Middle East), white-breasted “nominate group” (N Palearctic from Scandinavia E to Japan, S to E Tien Shan and N China), and buff-breasted “*sinensis* group” (C & E China), with large race *arctica* (NE Siberia) as a separate “group”; recent detailed morphological studies of Asian populations, combined with examination of mitochondrial DNA (mtDNA) from many localities across range (but excluding Turkey, the Levant, Iran and China), have revealed a more complex situation, but details not yet resolved. Present treatment tentative, based on incomplete molecular-genetic material: European “nominate group” (now including “*caesia* group”), within which mtDNA reveals a European clade, as well as a separate clade based on individuals of race *caucasica* (but other Middle Eastern populations not sampled and limits of Caucasian grouping impossible to define, hence provisionally combined with European clade); Asian “*asiatica* group”, comprising white-bellied N forms and buff-bellied SE forms, which shown by mtDNA to form a natural grouping (although birds from Hokkaido, in N Japan, differed by c. 1% uncorrected mtDNA, and some or all of Japanese forms may represent a distinct subgroup); “*sinensis* group” of China (no DNA data); NE Asian *arctica*, which differs significantly in mtDNA from all other races and may well represent a separate species (several reports of its occurring sympatrically with “*asiatica* group”). Also, “nominate group” meets or overlaps with “*asiatica* group” in two small areas (S Urals, and lower basins of R Kama and R Vyatka), with hybridization reported as limited and not significantly affecting the phenotype of adjacent “pure” populations; these two groups possibly represent distinct species. In addition, nominate race and *caesia* intergrade over broad front from E Denmark E to Lithuania and W Belarus and S to W Ukraine, E Bulgaria and NW Turkey; birds in N Turkey are intermediate between *caucasica* and *caesia/levantina*; race *amurensis* intergrades with *baicalensis* in Amur valley (SE Russia) and with *sinensis* in relatively narrow zone in NE Hebei (E China). Birds of this species in Altay region of N Xinjiang (NW China) of uncertain racial identity, provisionally included in *seorsa*. Races *baicalensis*, *sakhalinensis*, *clara* and *takatsukasai* often merged with *asiatica*, and race *formosana* often synonymized with *sinensis*. Twenty-two subspecies currently recognized.

Subspecies and Distribution.

S. e. caesia Wolf, 1810 – W Europe from Britain E to Denmark, Poland and W Belarus, S to N Spain (Cantabrian Mts and Pyrenees), Alps, Balkans (except Dalmatian coast), Greece and W Turkey (Thrace and NW Anatolia).

S. e. europaea Linnaeus, 1758 – S Scandinavia (including most islands in S Baltic) and W Russia (E to Volga and Vyatka basins) S to E Poland, E Romania, E Bulgaria, NW Turkey (N Thrace) and Ukraine.

S. e. hispaniensis Witherby, 1913 – Portugal, C Spain and N Morocco (Middle Atlas and C High Atlas).

S. e. cisalpina Sachtleben, 1919 – Switzerland (S of Alps), Italy, N Sicily, coastal Croatia and SW Montenegro.

S. e. levantina E. J. O. Hartert, 1905 – S Turkey (SW Anatolia E to E Taurus).

S. e. persica Witherby, 1903 – extreme SE Turkey, N Iraq (Kurdistan) and W Iran (Zagros Mts S to Fars province).

S. e. rubiginosa Tschusi & Zarudny, 1905 – SE Transcaucasia (Talyshskiy Gory Mts and Lenkoran area) and N Iran (Elburz and Caspian districts E to extreme NW Khorasan).

S. e. caucasica Reichenow, 1901 – NE Turkey, SW Russia (in Caucasus S from basins of Terek and Kuban), Georgia, Armenia and Azerbaijan.

S. e. asiatica Gould, 1835 – C Russia (W foothills of middle Urals E to C Siberia and W shore of L Baikal) S to N & NE Kazakhstan (S to Kokchetau and Tarbagatay Mts) and W Mongolian Altai.

S. e. arctica Buturlin, 1907 – C & NE Siberia from Yenisey basin and Yakutia E to Anadyrland, upper R Penzhina and NW Koryak Highlands.

S. e. baicalensis Taczanowski, 1882 – E Siberia from W Yakutia (Vilyui valley) and L Baikal E to Sea of Okhotsk and N Amurland, S to Transbaikalia, C Mongolia and NE China (NE Nei Mongol and NW Heilongjiang).

S. e. albifrons Taczanowski, 1882 – NE Russia (S Koryak Highlands and Kamchatka Peninsula) and N Kuril Is (Paramushir).

S. e. amurensis Swinhoe, 1871 – Russian Far East (S & E Amurland, Ussuriland), NE China (N Heilongjiang S to NE Hebei) and Korea.

S. e. sakhalinensis Buturlin, 1916 – Sakhalin I.

S. e. takatsukasai Momiyama, 1931 – SC Kuril Is (Urup, Iturup).

S. e. clara Stejneger, 1887 – S Kurils (Kunashir, Shikotan) and N Japan (Hokkaido).

S. e. hondoensis Buturlin, 1916 – C & S Japan (Honshu, Shikoku and N Kyushu).

S. e. roseilla Bonaparte, 1850 – extreme S Japan (S Kyushu).

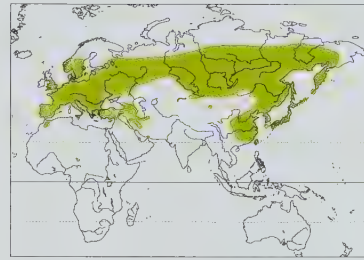
S. e. bedfordi Ogilvie-Grant, 1909 – Cheju I, off S Korea.

S. e. seorsa Portenko, 1955 – N & E Xinjiang (Altay region, in Altai Mts; Hami, in extreme E Tien Shan), in NW China.

S. e. sinensis J. Verreaux, 1870 – E China from S Gansu E to Shanxi, Beijing and NE Hebei, S to C Sichuan (to Wanyuan and W border of Red Basin), Guizhou, N Guangxi, Hunan, Jiangxi and Fujian.

S. e. formosana Buturlin, 1911 – Taiwan.

Descriptive notes. 14 cm; 17–28 g. Medium-sized nuthatch. Male nominate race has crown and upperparts blue-grey, black eyestripe; upperwing-coverts blue-grey, inner webs of greater coverts



dark grey; flight-feathers, primary coverts and alula dark grey-brown, secondaries, inner primaries and primary coverts fringed blue-grey (fringes widest on inner secondaries); central pair of tail feathers dull blue-grey, remainder blackish with blue-grey tip (broadest on outermost), outer three pairs with white subterminal spot on inner web and sometimes extending as bar across outer web (especially on outermost pair); throat and underparts off-white or creamy, with extensive deep rufous on flanks, lower vent and side of undertail-coverts, pale centres of undertail-coverts forming mottled patch; underwing grey, under

primary coverts black, contrasting white bases of primaries; in worn plumage, upperparts duller and not so blue, rufous on underparts slightly paler; iris brown to blackish-brown; stout and moderately blunt bill dark grey, darkest on culmen and tip, base of lower mandible bluish-white or horn-grey; legs greenish-yellow to pale brown or dark grey. Female is very similar to male, but often slightly paler above, eyestripe somewhat browner (less black), and underparts usually lightly washed buff, with rufous of flanks to vent strongly tinged buff. Juvenile resembles adult (especially adult female) but upperparts slightly duller, with faint brown cast and sometimes paler feather centres (especially on forehead), eyestripe duller, slightly browner and less well defined (especially female), also slightly duller below; base of bill pale bluish, legs generally paler than adult. Races differ mainly in plumage coloration, especially of underparts, also in size: *caesia* has cheek, ear-coverts and throat white, tinged buff, merging into dull orange-buff or cinnamon-buff on underparts, with flanks and rear vent deep rufous or brick-red, side of belly and anterior vent streaked chestnut, undertail-coverts whitish with broad deep rufous fringes and very narrow rufous tips (tips sometimes absent); *hispaniensis* is very similar to previous, but underparts paler (pinkish-cinnamon or pinkish-buff), flanks more contrasting, also smaller, with bill on average slightly more slender and pointed; *cisalpin*a also is very similar, but underparts brighter, more orange-buff or orange-cinnamon (less brownish-buff), bill on average shorter and more slender and pointed; *levantina* is poorly differentiated, as *hispaniensis* but underparts more pinkish (less buff), flanks slightly paler and less contrasting, upperparts on average slightly paler grey (especially in SE), often with faint white forehead, bill slender, culmen almost straight; *persica* is smaller than previous, differs also in having upperparts paler grey, white forehead and supercilium always present and better marked, underparts creamy with yellow-ochre wash, bill relatively short, very slender and attenuated; *caucasica* is rather small, has upperparts dark grey, forehead often whitish, underparts bright orange-tinged cinnamon-buff, bill short, thick and blunt; *rubiginosa* resembles last, but upperparts darker and more slaty, underparts on average paler orange-buff, usually lacks white forehead and supercilium, has less white in tail, bill slightly longer; *asiatica* resembles nominate but rather smaller, bill shorter and sharply pointed, culmen only gently downcurved, forehead and supercilium white (especially in E populations), upperparts slightly darker, in fresh plumage greater coverts tipped white (distinct wingbar), underparts white, chestnut of flanks to vent rather more restricted, female belly often washed buff and undertail-coverts paler rufous; *baicalensis* is slightly larger, with slightly longer bill and darker upperparts, but white forehead and supercilium reduced or absent; *sakhalinensis* is much smaller than last, upperparts somewhat less dark, white forehead fairly prominent, bill short (on average, shorter than all other races), near-straight culmen giving distinct upturned appearance; *clara* is larger than *asiatica*, bill shorter and more conical (culmen more noticeably curved), upperparts paler, white forehead and supercilium more pronounced; *takatsukasai* is as previous, bill similarly conical in shape but larger (most massive bill of all races), upperparts similarly pale but not so bluish, white tail spots larger, white forehead and supercilium bolder, belly of both sexes pure white; *albifrons* is large and pale, bill long and slender, culmen nearly straight, upperparts slightly paler than previous, slightly less white in tail, belly of female faintly or not at all washed buff; *amurensis* is large (largest Asian race apart from *arctica*), bill massive with gently curved culmen, upperparts relatively dark (slightly darker than *baicalensis*), white of forehead and supercilium faint or absent, no pale tips on greater coverts (unlike preceding six races), white of throat and breast grading to cinnamon-buff on belly (but nearly white in Sikhote-Alin Range); *hondoensis* is similar to last, but slightly paler and bluer above, white of forehead and especially supercilium more prominent, belly paler (pale pinkish-buff), bill only slightly smaller; *roseilla* also is similar, but upperparts rather darker, lower breast and belly more rufous-tinged brownish-buff; *bedfordi* is as previous, but throat and breast whiter and belly contrastingly darker orange-buff; *seorsa* is pale, bill and upperparts as *asiatica* but slightly larger, white of forehead and supercilium more prominent, belly pale buff; *sinensis* has bill medium-long with strongly decurved culmen, male throat and underparts pale cinnamon-buff, grading to white on chin, and whitish on cheek and below eye, side of neck slightly richer and brighter orange-buff, rear flanks brick-red with slight orange wash (contrasting with rest of underparts), feathers of undertail-coverts rufous with grey base and off-white shaft streak, streak broadening at tip (appearing as white inverted triangle), female as male but chin and cheeks lightly washed buff, rear flanks rufous-orange (little contrast with rest of underparts), undertail-coverts rufous-orange (paler than male and contrasting less with vent), both sexes in worn plumage slightly duller below (more cinnamon, even hint of drab-grey wash) and cheek and chin not so pure white, some variation (populations at higher elevations slightly larger, with greyer underparts); *formosana* is like last but slightly smaller, with longer, thinner bill, upperparts much paler, forehead and supercilium whitish, underparts slightly paler; *arctica* is large (largest Asian race), wing more pointed, tarsus and toes short (but hind claw rather long), bill slender with straight culmen (appears upturned with sharply pointed tip), plumage dark blue-grey above, black eyestripe narrower and shorter than in all other races, white of forehead and supercilium reduced or absent, much more white in tail (outer two rectrices mostly white), breast and centre of belly white, flanks extensively chestnut, undertail-coverts cinnamon with white tips, underwing-coverts dark grey (pale in all other races), sexes similar. VOICE. Very vocal, with loud piping and trilling calls. Commonest call, used in excitement, an abrupt, liquid whistled “twit” or “dwip”, singly or sometimes in slow sequence, more usually in couplets (“dwip-dwip”) or groups of 3–4 notes in quick succession (“dwip-ip-ip”), but in great excitement at up to c. 10 notes per second; also gives shrill, sibilant, almost trilling “sirrrr” or “tsi-si-si”, becoming harsher “sirrrp” in excitement or alarm, and cat-like “meeu-meeu” or “neu-neu”, and in extreme agitation harsh “trah”; contact call a high-pitched, thin “tsit” or “seet”, often just prior to taking flight; other calls include very high, thin, lisping “tsee-tsee-tsee...”. Song rather variable, a repetition of rising or falling or

On following pages: 2. Chestnut-vented Nuthatch (*Sitta nagaensis*); 3. Kashmir Nuthatch (*Sitta cashmirensis*); 4. Indian Nuthatch (*Sitta castanea*); 5. Chestnut-bellied Nuthatch (*Sitta cinnamoventris*); 6. Neglected Nuthatch (*Sitta neglecta*); 7. White-tailed Nuthatch (*Sitta himalayensis*); 8. White-browed Nuthatch (*Sitta victoriae*); 9. Pygmy Nuthatch (*Sitta pygmaea*); 10. Brown-headed Nuthatch (*Sitta pusilla*); 11. Corsican Nuthatch (*Sitta whiteheadi*); 12. Algerian Nuthatch (*Sitta ledanti*); 13. Krüper’s Nuthatch (*Sitta krueperi*); 14. Chinese Nuthatch (*Sitta villosa*); 15. Yunnan Nuthatch (*Sitta yunnanensis*); 16. Red-breasted Nuthatch (*Sitta canadensis*).

up-and-down notes, from 3-6 drawled penetrating whistles slowly repeated at c. 2 per second, e.g. "pee-pee-pee...", "ueeh ueeh ueeh..." or "weeu weeu weeu...", to rapid trill of up to at least 32 notes at rate of as many as 19 per second, "wiwiwiwiwiwi..."; many intermediate variants, and "song" may intergrade with repetitions of excitement call. Song of race *arctica* reported as being distinctly different, but no details available.

Habitat. Favours mature forest with large old trees and well-developed canopy providing extensive foraging areas, as well as nesting cavities. In much of Europe, deciduous and mixed forest, especially oak (*Quercus*), but found also in riverine woodland, parkland, old orchards, cemeteries, and sometimes large gardens (although requires minimum territory size of c. 1 ha of good-quality habitat, so generally absent from small stands of trees); locally in old spruce (*Picea*) and pine (*Pinus*) forests, especially in mountains. Similar habitats occupied in Far East, but favours pine forest in Taiwan; in Morocco found in oak forest, as well as fir (*Abies*) and cedar (*Cedrus*). In European Russia and throughout much of range in Siberia also in coniferous woodland, even quite stunted larch (*Larix*) forest in forest-tundra zone, but at very low densities. Outside breeding season wanderers may occur in riverine thickets, orchards and shelter-belts in steppe zone, and noted among dwarf junipers (*Juniperus*) at least 50 km from nearest woodland in W Mongolia, and in rocky terrain in Sayan Mts of S Siberia. Generally in lowlands in N parts of range, but in S Europe extends to tree-line in Switzerland (uncommon above 1200 m), to 1500 m and exceptionally to near tree-line at 1800–2100 m in Austria, and to 1200 m in Czech Republic; 300–1800 m in Turkey, to 1800 m in Caucasus (where favours mixed forest), to at least 1830 m in N Iraq and 2225 m in SW Iran, and at 1000–2200 m in Morocco; up to 2200 m in Altai and N Mongolia; in Japan primarily montane, in C Honshu at 760–2400 m and on Shikoku at 1370–1525 m, but at c. 300–1300 m in N Honshu and from sea-level to c. 915 m (Mt Daisetsu) on Hokkaido; montane also in Taiwan, where recorded at 800–3300 m, and to at least 2000 m in NE China; but confined to low and moderate altitudes in SW China (where replaced at higher levels by *S. nagaensis*).

Food and Feeding. Feeds on insects, especially beetles (Coleoptera) and lepidopteran caterpillars, and other arthropods; also, mainly in autumn and winter, seeds and nuts, especially hazel (*Corylus*) nuts and beech (*Fagus*) mast; sometimes feeds on flower buds and sap, and readily visits birdtables in winter. Little difference in foraging niche between sexes. Young fed largely with beetles and caterpillars, occasionally also seeds. In winter months spends up to 90 % of time in gathering food. Forages mainly on trunks and larger branches of trees, but also, especially in spring, on smaller branches and in twig clusters; can climb down tree trunks head first. Feeds also on the ground, especially in non-breeding season. Will remove pieces of bark to reach food items, but unable to chisel into wood in manner of a woodpecker (Picidae) unless wood is rotten. Adept at flycatching and diving after falling prey, and able to hover. Most pair-members remain together in close contact on territory throughout year, but may join mixed-species foraging flocks as these pass through. Stores food in all months, but especially in late summer and autumn; seeds stored singly, mostly in bark crevices but also in ground or in wall cavities; usually covers items with pieces of bark, lichen or moss. Cached food exploited mainly when temperatures low. In Siberia, specializes in seeds of Siberian stone pine (*Pinus sibirica*), and, following good cone crops, larders may contain enough food to last an entire year, potentially allowing territory-holder to survive a failed crop in following winter.

Breeding. Laying Apr–May, occasionally late Mar. very exceptionally Feb, timing varying with latitude and altitude; only exceptionally double-brooded. Monogamous and territorial; most remain throughout year in close contact with partner on territory. Nest a foundation of wood chips surmounted by bark flakes (usually of pine), rarely incorporating dry leaves, lichen, conifer needles and the like, placed in hole in tree, either natural hole or, more often, abandoned woodpecker hole in living trunk, usually 2–20 m above ground, occasionally existing hole in decayed wood enlarged by female; if entrance hole too large, size reduced by “plastering” with mud, and often interior of cavity also heavily plastered to protect against wind and rain, plaster occasionally incorporates animal dung (dung may be main building material in SW Iran), also rootlets and moss as binding material; sometimes nestbox used or, rarely, wall cavity, hole in rock face or building, crevice between tree roots, or even haystack or old nest of Eurasian Magpie (*Pica pica*) utilized; final choice of nest-site probably by female, and plastering of hole and nest-building also by female over period of 2–4 weeks, with only limited assistance from male; site often reused, sometimes for many years. Clutch 4–13 eggs, usually 5–9, white, lightly speckled and blotched red, reddish-brown or reddish-purple, markings usually concentrated at broader end, average dimensions 19.5 × 14.4 mm (race *caesia*); incubation by female, period 13–18 days; chicks brooded by female, fed by both parents, nestling period 19–29 days (mostly 20–26 days) in Europe, 18–22 days in Siberia; young largely independent after a further 8–14 days.

Movements. Generally sedentary, but juveniles may disperse, usually over short distances, in late summer and autumn. These movements sometimes become irruptions or "invasions" when populations high; in Europe numbers involved usually small (even in an irruption), and avoids even short water crossings, although vagrants recorded on Heligoland (N Germany) and on I of Man (Irish Sea); in cold years some may disperse into coastal areas of Spain. N & E populations undertake more frequent irruptions, during which considerable numbers move from breeding areas, probably owing to dependence on cones of Siberian stone pine; crop failure can result in mass emigration, e.g. in 1981 "several dozens of thousands" noted flying S from Mirmoye, in C Siberia, during 4th–12th Aug, and individuals of race *asiatica* may appear in N Finland and Sweden, where thousands sometimes recorded, and occasionally reach Norway and Estonia; such irruptions occur from Aug onwards, invaders leaving by Apr, although some remain to breed. Others disperse to N, exceptionally to tundra. In E Asia, race *uretica* may make rather limited movements S & E in winter, and *amurensis* is regular visitor to Korea, sometimes in large numbers; in 1980, some 30,000–40,000 recorded moving SW in groups of 40–50 birds along coast of Sea of Japan (in Ussuriland) on 3rd–6th Oct. Conversely, in NE China, only a single record from Beidaihe (Hebei), and a rare migrant at Shuangtaizhekou, at mouth of R Taizi (S Liaoning), although resident in nearby mountains. Throughout range, montane populations may undertake rather limited altitudinal movements.

Status and Conservation. Not globally threatened. Fairly common to locally common. Estimated European population c. 7,000,000 breeding pairs; in Siberia, numbers variable and closely tied to size of cone crop. Densities as high as c. 3–7 breeding pairs/ha in high-quality habitat, but generally lower, and usually much lower in coniferous forest and towards N of range; most sparsely distributed (sometimes rare) near tree-line, and also on S fringes of range. Parkland can support high densities owing to abundance of large trees, which may be scarce or absent in commercially managed woodland. Has spread N & W in W Europe (Norway, Netherlands), and expanded into Wales and N England; has become increasingly regular in Scotland, where breeding first proved in 1989. In Morocco has spread to Haut Atlas. Breeds irregularly in Finland (10–30 pairs) and N Sweden, following irruptions of race *asiatica* from E. Dependent on presence of large trees, and throughout range forest destruction and fragmentation lead to local decline and extinctions; is often rare or absent in small forest fragments.

Bibliography. Bellamy *et al.* (1998), Bosch (2007), Buturlin (1916), Cramp & Perrins (1993), Dementiev *et al.* (1954a, 1970), Dickinson (2006), Dickinson *et al.* (2006b), Gorman (1996), Hagemeijer & Blair (1997), Handrinos & Akriviotis (1997), Harrap & Quinn (1996), Kren (2000), Krenovich *et al.* (1996a), Löhrl (1993a), Matthysen (1989, 1997, 1998, 1999a, 1999b), Matthysen & Adriaenssen (1998), McCarthy (2006), Minder (2006), Pravosudov

(1991, 1993a, 1993b), Red'kin & Konovalova (2006), Rogacheva (1992), Roselaar (1995), Schönfeld (1999), Stepanyan (1990), Thévenot *et al.* (2003), Vaurie (1959), Voisin *et al.* (2002), Voous & van Marle (1953), Wassink & Oreeel (2007), Wesolowski & Stawarczyk (1991), Zink *et al.* (2006).

2. Chestnut-vented Nuthatch

Sitta nagaensis

French: Sittelle des Naga **German:** Rostflankenkleiber **Spanish:** Trepador de las Naga
Other common names: Mountain/Naga Nuthatch

Taxonomy. *Sitta nagaensis* Godwin-Austen, 1874, Naga Hills, extreme north-east India.

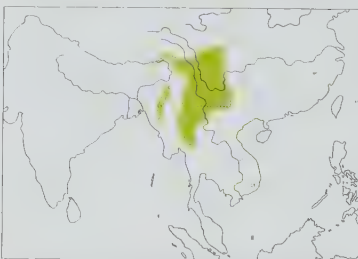
Forms a superspecies with *S. europaea*, *S. cashmirensis*, *S. castanea*, *S. cinnamoventris* and *S. neglecta*. Formerly considered conspecific with *S. europaea*, but the two differ vocally, and in area of range overlap in E China (Fujian) they differ also in ecology (present species montane, *S. europaea* in lowlands); farther W in China, the two have been found at same locality in Sichuan and may overlap without intergradation, but situation far from clear, and more detailed study required. Birds of this species observed in NE Arunachal Pradesh (NE India) presumed to refer to race *montium*. Birds of this species observed in S Laos tentatively included in race *grisiventer*; allocation of widely separated populations (in W Myanmar, S Laos and S Vietnam) to same race, however, seems untenable, and more detailed study likely to demonstrate that one or more hitherto unnamed races are involved. Three subspecies currently recognized.

Subspecies and Distribution.

S. n. montium La Touche, 1899 – S & E China (SE Xizang, W & SW Sichuan, Yunnan and extreme SW Guizhou; isolated population in higher mountains of NW Fujian), extreme NE India (NE Arunachal Pradesh), E Myanmar (N Kachin S to S Shan State) and NW Thailand.

S. n. nagaensis Godwin-Austen, 1874 – NE India (Patkai Range of SE Arunachal Pradesh, Nagaland, Manipur, Cachar hills of S Assam, Khasi hills of Meghalaya) and W Myanmar (N Chin Hills)

S. n. grisiventris Kinnear, 1920 – SW Myanmar (Mt Victoria, and probably also other mountains of C & S Chin Hills), S Laos (Bolovens Plateau) and S Vietnam (Da Lat Plateau S to Mt Pantar).



Descriptive notes. 12.5–14 cm; 12–22 g (*montium*). A medium-small to medium-sized nuthatch, typical in shape and behaviour. Male nominate race has crown and upperparts blue-grey, with prominent black eyestripe from lores to side of mantle; lesser and median upperwing-coverts and tertials as back, remainder of wing dark grey, greater coverts broadly fringed and tipped dull blue-grey, primary coverts finely fringed blue-grey, smaller feathers of alula, secondaries and inner primaries fringed dull blue-grey; central tail feathers dull blue-grey with trace of dark shaft streak, other rectrices blackish-grey with dull blue-grey tips

(increasing in extent towards outermost rectrix); T3 with small white spot on tip of inner web, outer three feather pairs with larger white spot subterminally on inner web, outermost feather with pronounced white panel in centre of outer web; ear-coverts and side of neck, chin, throat and underparts very pale grey, faintly washed buff, rear flanks strongly contrasting brick-red; undertail-coverts grey with brick-red subterminally, broad white inverted triangle at tip and narrow rusty tip (appear rusty with tear-shaped white spots); axillaries buff, underwing-coverts blackish, long, under primary coverts and base of primaries white; in worn plumage, duller and slightly brown-tinted above, purer grey below; iris brown or dark brown; bill grey-black to blackish, base of lower mandible (and sometimes upper mandible) slate-grey or grey-blue; legs greenish-brown to reddish-brown, dark brown or black, claws horn-black. Distinguished from *S. himalayensis* mainly by lack of white in central tail feathers, and much paler underparts with contrasting reddish rear flanks. Female is as male but flanks rufous, concolorous with undertail-coverts. Juvenile resembles adult, but underparts on average slightly buffier. Races differ mainly in tone of underside: *montium* has chin and cheek buff-white, ear-coverts, side of neck and underparts dull pale buff with slight grey wash (greyer when plumage worn), white undertail-coverts very narrowly tipped and slightly more broadly fringed rufous (slightly more orange-rufous than flanks) and with concealed bases dull blue-grey (appear white with rufous "ladder" on each side and rufous centre); *grisiventris* resembles nominate but with underparts purer grey (pale to light grey), in fresh plumage (Oct) male shows no trace of buff (in worn plumage underparts slightly drabber grey, less whitish), female tends to have buff wash in centre of belly and vent. VOICE. Calls include slightly squeaky "sit", often as couplet ("sit-sit"), with varied emphasis and inflection and repeated at faster and slower speeds in irregular series; also a similar but lower and drier "chip" or "chit", often run into trilling "chit-it-it-it-it..." (not so emphatic and structured as the song); in alarm and agitation a nasal, inquisitive or whining "quirr", "kner" or "mew" and loud, hard, emphatic and metallic "tsit" notes, which may be doubled, or run into fast "tsit-tsit-tsit-tsit..." series (individual units sometimes repeated very rapidly, but rather higher, thinner and less full than song). Song a stereotyped fast, flat, monotonous stony rattle or trill, "chichichichichi..." or "tr-r-r-r-r-r-r-r-r-r...", c. 0.5-1 second per burst, and sometimes slightly rising in pitch towards end; individual notes often repeated so fast as to be almost indistinguishable, but sometimes rather slower, with shriller, better-spaced notes, "chi-chi-chi-chi-chi...", or much slower "diu-diu-diu-diu-diu" (latter may closely resemble one of the song variants of *S. europaea*).

Habitat. Hill evergreen forest, also pine (*Pinus*) forest (or stands of pines on drier ridges amid hill evergreen). In NE India recorded also in mixed and light deciduous forests, and in NE Myanmar in open oak (*Quercus*) and alder (*Alnus*) forest. In China, in holly oak (*Quercus illex*) and deciduous forest in SE Xizang (along R Tsangpo), in spruce (*Picea*), fir (*Abies*) and rhododendron (*Rhododendron*) in Yunnan, and in valley-bottom poplar (*Populus*) and walnut (*Juglans*) trees in Sichuan. Altitudinal range in NE India 1400–2600 m, occasionally to 3050 m; in Myanmar, recorded at 1220–2285 m in E but 1400–2810 m on Mt Victoria; found at 1300–2100 m in Thailand and at 915–2285 m in S Vietnam. In China, recorded at 1980–3650 m in SE Xizang, 1525–4570 m in Yunnan, 1200–3960 m in Sichuan and 1250–2480 m in Guizhou; isolated population occurs above 1000 m in NW Fujian.

Food and Feeding. No details of diet; presumably small arthropods and some seeds. Found singly and in pairs; outside breeding season also in small loose parties, often joining mixed-species foraging flocks. Often feeds on the ground, foraging over rocks and the sides of old cuttings, as well as on trees.

Breeding. Season Mar–Jun in NE India; in Myanmar, Apr to early Jun in E and recently fledged juveniles seen end Mar in W (Mi Victoria); Mar–May and nest-building in Jan in Thailand, and nest-building recorded in Jan in Vietnam; Apr–May in E China (Fujian). Nest a pad of scraps of bark or moss, lined with fur, placed up to c. 10 m above ground in hole in tree or stump, size of entrance sometimes reduced with “plaster”. Clutch 2–5 eggs, white, spotted with red over under-

ing reddish-violet spots, markings concentrated at larger end, mean dimensions 18.3 × 14 mm (race *montium*), 18.6 × 13.8 mm (nominata). No other information.

Movements. Resident. May be some withdrawal to lower elevations in winter, but also recorded at or near top of altitudinal range in cold months.

Status and Conservation. Not globally threatened. Fairly common throughout range; locally common.

Bibliography. Ali & Ripley (1983), Deignan (1945), Delacour & Greenway (1940), Delacour & Jabouille (1931), Dickinson (2006), Dickinson *et al.* (2006b), Duckworth *et al.* (1998), Harrap & Quinn (1996), Matthysen (1998), McCarthy (2006), Rasmussen & Anderton (2005b), Robson (2000b, 2002c), Robson *et al.* (1998), Stuart Baker (1932), Thet Zaw Naing (2003), Vaurie (1957b, 1959), Voisin *et al.* (2002), Voous & van Marle (1953).

3. Kashmir Nuthatch

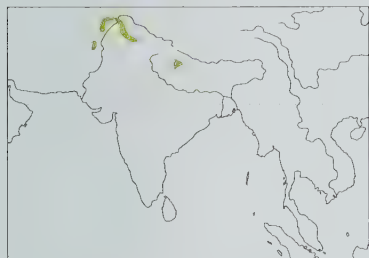
Sitta cashmirensis

French: Sittelle du Cachemire **German:** Kaschmirkleiber **Spanish:** Trepador de Cachemira
Other common names: Brooks's Nuthatch

Taxonomy. *Sitta cashmirensis* W. E. Brooks, 1871, Kashmir.

Forms a superspecies with *S. europaea*, *S. nagaensis*, *S. castanea*, *S. cinnamoventris* and *S. neglecta*. Intermediate in many respects between *S. europaea* and *S. castanea*/*S. cinnamoventris* and has often been treated as conspecific with one or other of these, but differs in vocalizations and plumage (especially undertail-coverts); occurs within 5 km of *S. cinnamoventris* in N Pakistan (Murree Hills). One alarm call (like that of *Garrulus jay*) and nest construction suggest possible affinity with *S. neumayer* and *S. tephronota*. Monotypic.

Distribution. NE Afghanistan (Nuristan and Kohistan S to Safed Koh), N Pakistan (S to extreme N Baluchistan, and W Himalayas E from Chitral) and Kashmir; also NW Nepal (Humla, Mugu, Jumla and Dolpo E to Phoksumdo Tal, S to Surkhet).



Descriptive notes. 14 cm; 17.2–21 g. A medium-sized nuthatch, typical in shape and behaviour. Male has crown and upperparts, including upperwing-coverts and tertials, dull blue-grey, eyestripe from extreme base of bill and lores sooty black, extending to side of mantle, where it broadens somewhat; alula and primary coverts dark brownish-grey, latter fringed dull blue-grey, flight-feathers dark brownish-grey, secondaries and all except outer two primaries fringed blue-grey; central tail feathers dull blue-grey (sometimes dark shaft streak near tip), others blackish-grey with drab-grey at tip (more extensive on outer web), pale

tips progressively wider towards outermost rectrix, T4 with dull white spot on tip of inner web, T5 with dull white subterminal spot on inner web mid-way along feather; cheek and chin off-white, grading through pale buff on ear-coverts to buff or pale cinnamon on upper throat and side of neck, rich cinnamon on lower throat and breast, and cinnamon-rufous on side of breast, flanks and belly; rear flanks, vent and undertail-coverts deep rufous, undertail-coverts with at most a trace of greyish or greyish-brown on feather centres; thighs dull blue-grey with darker grey feather tips; axillaries blue-grey, finely tipped whitish, underwing-coverts blackish-grey, tips of under primary coverts and base of flight-feathers contrastingly white; in worn plumage upperparts slightly duller, but little seasonal variation in underpart coloration; iris reddish-brown to dark brown; bill blackish-grey or blackish-brown, basal half of lower mandible whitish to horn-grey; legs greyish, dark olive-brown or yellow-brown, soles dull yellow, claws dark slaty or blackish. Distinguished from *S. cinnamoventris* mainly by less dark underparts without contrasting white band from chin to ear-coverts, and uniform undertail-coverts. Female is as male, but chin and cheek with slight buff wash, lower throat and breast pinkish-buff, upper flanks, belly and vent cinnamon or rich cinnamon, rear flanks rich cinnamon. Juvenile resembles adult but may show more pale mottling on nape (paler feather centres) and dark barring in submoustachial area (dark grey feather bases). **VOICE.** Contact call a very high, thin, almost squeaking "tsi" or "tseet" in rather rapid (c. 3 notes per second), irregular extended series, "tsi, tsi, tsi-tsi, tsi, tsi...", each note rising slightly; excitement call, given in intraspecific conflicts and in alarm (often when human nearby), a repeated loud, far-carrying, harsh, rasping or groaning "kreeaa" or "schree-e" (0.4–0.8 seconds long), reminiscent of call of Eurasian Jay (*Garrulus glandarius*). Song a rapid, high-pitched, squeaking "pee-pee-pee-pee-pee".

Habitat. Coniferous, mixed and deciduous forests; apparently some dependence on presence of deciduous, broadleaf tree species, even in essentially coniferous habitats. Also in valley-bottom hazel (*Corylus*) scrub and poplar (*Populus*) groves in winter in Afghanistan. In Afghanistan recorded at 1850–2600 m, breeding proven 2000–2400 m; in Pakistan breeds at 2100–3050 m, locally up to 3350 m in Chitral, and in winter descends regularly to c. 1800 m, but recorded in Dec at 2500 m (in deep snow) in Murree Hills; breeds locally down to c. 1800 m in Kashmir; recorded at 2400–3505 m in Nepal.

Food and Feeding. Food insects, spiders (Araneae) and, especially in winter, seeds and nuts; grit often found in stomach. In summer found singly and in pairs; outside breeding season usually in mixed-species flocks. Forages on trunks and larger branches, usually at low levels, and often in understorey or on ground, on fallen and rotten trees and logs and moss-covered boulders. Utilizes both conifers and oaks (*Quercus*) if present. Recorded as hoarding seeds in captivity.

Breeding. Season May–Jun in Afghanistan, and late Apr to late Jun in Pakistan. Nest a layer of bark chips, seed husks and dried leaves, placed 2–9 m or more above ground (mostly over 10 m in Afghanistan) in tree hole, often abandoned woodpecker (Picidae) hole or natural knothole, in deep forest or in well-wooded open country; entrance may be reduced to c. 38 mm or less in diameter with "plaster" of wet mud (often small seeds mixed in), this sometimes forming cone-shaped short tunnel-like extension (reminiscent of nests of *S. neumayer* and *S. tephronota*), plaster occasionally extending for moderate distance around hole (perhaps consequence of reuse of nest from year to year and thus a build-up of material); male assists female in nest-building and plastering. Clutch 5–7 eggs, rarely 8, white with reddish spots and small blotches, mean size 19.7 × 14.4 mm; no information on incubation period; both sexes feed chicks, no information on duration of nestling period; fledged juveniles remain with adults for 5–6 weeks after leaving nest.

Movements. Resident, with some limited seasonal altitudinal movement.

Status and Conservation. Not globally threatened. Restricted-range species: present in Western Himalayas EBA. Common to locally common in E Afghanistan, Pakistan (although scarce in Murree Hills) and Kashmir; fairly common in Nepal.

Bibliography. Ali & Ripley (1983), Dickinson (2006), Dickinson *et al.* (2006b), Harrap & Quinn (1996), Löhr & Thielcke (1969), Martens & Eck (1995), Matthysen (1998), McCarthy (2006), Paludan (1959), Raja *et al.* (1999), Rasmussen & Anderton (2005b), Roberts (1992), Stuart Baker (1932).

4. Indian Nuthatch

Sitta castanea

French: Sittelle indienne

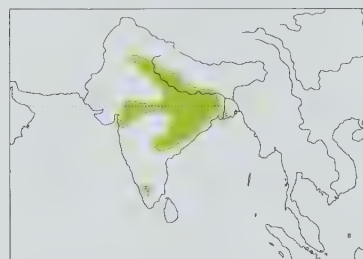
German: Kastanienkleiber

Spanish: Trepador Indio

Taxonomy. *Sitta castanea* Lesson, 1830, no locality = Bengal, India.

Forms a superspecies with *S. europaea*, *S. nagaensis*, *S. cashmirensis*, *S. cinnamoventris* and *S. neglecta*; formerly treated as conspecific with last two of these, but differs morphologically from both. Birds in S Bangladesh (Sundarbans) presumed to belong to this species, rather than to *S. cinnamoventris*. Birds from Anantagiri, in NE Andhra Pradesh (E India), described as race *prateri* on basis of slightly longer bill and paler underparts, but variation slight and naming of geographical races considered unwarranted. Monotypic.

Distribution. India on Gangetic Plain and terai from SC Punjab and E Rajasthan E to Bihar and West Bengal, and from N Maharashtra E to Orissa and S to N Andhra Pradesh, also in foothills of S Western Ghats from S Karnataka S through Nilgiris to Palghat hills (E Kerala and W Tamil Nadu); also SW Nepal and S Bangladesh (Sundarbans).



Descriptive notes. 12.5 cm; one male 12 g. A medium-small nuthatch with short, slender bill. Male has crown to nape and upper mantle light blue-grey, remainder of upperparts, including lesser and median upperwing-coverts and tertials medium blue-grey; extreme base of bill and lores blackish and extending into black eyestripe which expands broadly on side of mantle, sometimes with faint paler supercilium immediately behind eye; greater secondary coverts, primary coverts and alula dark grey, fringed and tipped blue-grey, flight-feathers dark grey-brown, secondaries and inner primaries broadly fringed blue-grey, primaries

P6–P3 fringed light blue-grey inward of emargination; central tail feathers blue-grey, others blackish-grey with broad dull blue-grey fringe on outer web and tip of inner web (widest on outermost rectrix), outer two feather pairs with off-white subterminal spot on inner web, T4 with small whitish tip on inner web; chin, cheek and fore ear-coverts white, feathers very faintly tipped darker, rear ear-coverts, side of neck and underparts brick-red, faintly washed orange; undertail-coverts blue-grey, broadly fringed brick-red, often with narrow pale creamy subterminal band (not visible in field), thigh feathers dark grey with blue-grey subterminal band and brick-red tip; axillaries blue-grey, tipped brick-red, underwing-coverts sooty black, longer under primary coverts and base of under primaries contrastingly white; in worn plumage, crown to upper mantle paler and more contrasting (some pale feather bases showing), remainder of upperparts dull blue-grey, flight-feathers duller and browner, underparts slightly paler and more orange; iris brown; bill black, variable blue-grey base of culmen, cutting edges and lower mandible; legs dark brown, soles pale yellow. Distinguished from very similar *S. cinnamoventris* mainly by having crown to upper mantle slightly paler than rest of upperparts, white more extensive on chin but more restricted on rear ear-coverts, slightly darker and browner (less orange) underparts, no white scallops on undertail-coverts, shorter and slimmer bill. Female is as male but paler, chin to cheek and fore ear-coverts off-white (less well defined), side of neck, throat and breast dull beige, belly and vent dull pinkish-cinnamon, rear flanks vinaceous cinnamon, undertail-coverts medium grey with pinkish-cinnamon fringes. Juvenile male resembles adult, but tiny pale feather centres on forehead and forecrown, feathers of crown and scapulars variably tipped faintly darker, greater upperwing-coverts finely tipped rufous, cheek and chin tipped faintly darker, throat slightly paler (some feathers with tiny pale centres), underparts slightly paler and more orange-brown; juvenile female underparts more uniform, slightly duller, drabber and more orange (less pinkish) than adult female, with less contrast between breast and belly. **VOICE.** Song a loud, mellow, rapid trill, level or slightly falling in pitch towards end, "chi-li-li-li-li-li-li", c. 12–13 notes per second, duration 1–2 seconds, very similar to slower song types of *S. cinnamoventris*; also slower, shorter and more musical variants at c. 8 notes per second, duration 1 second. Calls include short, stony "stii", sometimes accelerating into very fast trill (c. 18 notes per second).

Habitat. Deciduous forest, village groves, roadside trees, sometimes gardens; in N India and SW Nepal confined to lowlands, but elsewhere in India occurs both in plains and in hills to c. 1000 m.

Food and Feeding. Food insects and spiders (Araneae), also seeds and nuts. Found singly, but more often in pairs or loose family parties; frequently joins mixed-species foraging flocks. Usually forages in upper part of tall trees.

Breeding. Season late Feb to May (most eggs laid in Mar) in N of range and Apr–Sept in S (Andhra Pradesh). Nest a meagre layer of dried leaves, wood chips, bark fragments or moss, usually placed in natural cavity up to 9 m above ground in tree, especially mango (*Mangifera*), entrance usually reduced with a "plaster" up to 50 mm thick of mud, saliva and tree resin (even when hole selected is small enough, area around, both outside and inside, may be plastered), any damage to masonry quickly repaired; hole may be reused in successive years. Clutch 4–5 eggs, rarely 6, white to pale pink, finely spotted reddish, spots may be concentrated at larger end, average 17 × 16.5 mm; incubation by female, fed on nest by male, period 11–12 days; no information on nestling period.

Movements. Resident; no evidence of altitudinal movements.

Status and Conservation. Not assessed. Probably not globally threatened. Common but rather local; commonest in N, especially in Bihar, and scarce in Madhya Pradesh and Andhra Pradesh. Records of a "chestnut-bellied nuthatch" from Sundarbans of S Bangladesh presumed to refer to present species. Occurs in several protected areas, including Mudumalai National Park, in W Tamil Nadu (on borders with Karnataka and Kerala), in SW India.

Bibliography. Ali & Ripley (1983), Deignan (1945), Dickinson (2006), Dickinson *et al.* (2006b), Gill (1923), Harrap & Quinn (1996), Law (1948), Matthysen (1998), McCarthy (2006), Rasmussen & Anderton (2005b), Ripley (1959c), Stuart Baker (1922, 1932), Vaurie (1950b), Voous & van Marle (1953).

5. Chestnut-bellied Nuthatch

Sitta cinnamoventris

French: Sittelle de Blyth

German: Zimbauchkleiber

Spanish: Trepador Ventricastano

Other common names: Cinnamon-bellied Nuthatch

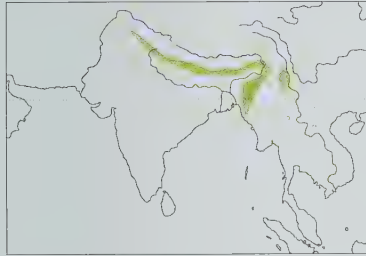
Taxonomy. *Sitta cinnamoventris* Blyth, 1842, Darjeeling, north India.

Forms a superspecies with *S. europaea*, *S. nagaensis*, *S. cashmirensis*, *S. castanea* and *S. neglecta*; often treated as conspecific with last two of these, but differs morphologically from both. Overlaps in range with *S. nagaensis* in parts of NE India and SE Asia, but the two replace each other

Affinities within genus uncertain. Formerly considered conspecific with *S. victoricae* on grounds of common character of white in central tail feathers, but otherwise morphologically distinct and both occur on Mt Victoria (Myanmar), although probably separated altitudinally; suggested also as being close to *S. pygmaea* and *S. pusilla*, and relationship with these two supported by possibility that

partners may duet; alternatively, strongly developed black eyestripe and uniform undertail-coverts may indicate affinity with *S. yunnanensis*. Birds from Lushai Hills (Mizoram), in NE India, described as race *lushaiensis* on basis of somewhat paler underside, but variation slight and naming of geographical races considered unwarranted. Monotypic.

Distribution. NW Himachal Pradesh (Chamba) E in Himalayas to NE India (NE Arunachal Pradesh, also from Nagaland S in hills to S Mizoram) and W & NE Myanmar, also adjacent parts of S China (S Xizang, W Yunnan); also NW Vietnam (Fan Si Pan, in NW Tonkin). Single records from E Myanmar (near Kengtung, in S Shan State) and N Laos (Tranninh plateau) possibly refer to non-breeding visitors.



Descriptive notes. 12 cm; 11–17 g. A small, dumpy, relatively short-billed nuthatch. Male in fresh plumage (Sept–Apr) has crown to rump dull blue-grey, sometimes crown and especially nape and upper mantle slightly paler; forehead, lores and eyestripe sooty black, expanding broadly on to side of upper mantle, sometimes an indistinct narrow grey-white supercilium just above and behind eye; upperwing dark grey-brown, wing-coverts (including primary coverts) fringed blue-grey, extensively so on outer web of greater coverts, alula fringed blue-grey on outer web, tertials medium grey (tinged blue on outer

web), secondaries broadly fringed blue-grey, primaries finely fringed light grey, pale fringes progressively restricted to base of feather towards outer wing; central tail feathers dull blue-grey, slightly darker and greyer along shaft and at tip, basal half of outer web adjacent to shaft white, basal two-thirds of inner web white, other rectrices sooty black, outermost with white diagonal stripe subterminally across feather, next to outermost with large white subterminal spot on inner web; chin, cheek and throat whitish, variably washed buff, grading into cinnamon-orange on upper and rear ear-coverts, upper flanks and breast, and darker and richer orange-cinnamon on belly and flanks to undertail-coverts; axillaries grey-buff, underwing-coverts sooty black, base of under primaries and secondaries (inner webs only) white; in worn plumage, whitish feather bases may show on nape and upper mantle, black eyestripe more extensive, especially at rear (on upper mantle), wings darker and sootier (blue-grey fringes abraded), underparts paler and whiter, may be buff-white on breast and belly; iris brown; bill black or blackish-brown, base of lower mandible bluish-white or grey; legs dark brown, dark greenish-brown or dark yellowish-brown, soles greyish-white. Distinguished from *S. vittoriae*, which likewise has white in central tail feathers, by less boldly patterned head and less contrastingly patterned underparts; from similar *S. cashmirensis* (which also has uniform undertail-coverts) mainly by white in central rectrices (when visible), smaller size and shorter bill, also by slightly paler underside with less well-defined white throat, cheek and ear-coverts. Female is as male, but ear-coverts and underparts on average slightly paler and duller. Juvenile resembles adult. VOICE. Calls include squeaky single “nit” and soft, mellow “chak” or “tschak”, given singly at irregular intervals; harder and sharper, almost stone-clicking versions may be given in couplet (“chak’kak”) or in short, irregular groups, and may be combined into monotonous rattle in which up to 25 notes at rate of c. 10 per second, “chik’kak’ka’ka’ka’ka’ka...”; in alarm or agitation a similar but louder, shrill (sometimes squeaky) but full “chik”, near-disyllabic “ts’lik” or even shriller “tsik”, often in series which initially quite fast but slow to c. 3 notes per second, and in prolonged series can tail off to maximum of c. 2 notes per second, notes sometimes then becoming shriller “shree” which may be repeated for minutes at a time (these series from agitated bird may be at higher and lower pitches, perhaps reflecting difference between sexes). Duetting by presumed partners, with higher and thinner “tsik” calls and lower but squeaky “chik” notes, in a chatter almost like that of sparrow (*Passer*). Also gives high-pitched, thin, sibilant “sisirrr” or “sisisit”, variety of fussy twitterings, and strange long, shrill squealing or quavering notes, e.g. “kreeeeeeeeee” or “preeeehh”; these may rise or fall in pitch, and last almost 1.5 seconds. Song a rapid repetition of a single note in a trill lasting c. 0.8–1.8 seconds, some fast (up to c. 15 notes per second), some slow (c. 5 per second), varying both among males and within individual male’s repertoire, e.g. slightly querulous or inquisitive series of piercing “pee” notes and slower and much mellower but still loud, whistled “dui-dui-dui...”.

Habitat. Temperate broadleaf and mixed forests. In Himalayas and NE Myanmar middle-altitude oak (*Quercus*) and rhododendron (*Rhododendron*) forests, with preference for mossy forest, also at higher altitudes in mixed forests of fir (*Abies*), hemlock (*Tsuga*), rhododendron, oak and maple (*Acer*), although apparently avoids pure stands of conifers; thus, found in oak–rhododendron forest at 1525–2135 m and maple–hemlock forest at 2745–3050 m in Nepal. In NE hill states of India found in broadleaf evergreen forest. Breeds in Himalayas at 1500–3500 m, highest in E, with optimum zone c. 1800–2800 m; in non-breeding season recorded down to 915 m in Nepal, 945 m in Sikkim and 500 m in Bhutan, but also as high as 3050 m in Jan in Nepal and N India (Darjeeling). In NE hills of India found above 1700 m, and in adjacent W Myanmar (Chin Hills) at 1675–2500 m; in NE Myanmar at 1525–2900 m (but down to 980 m in winter) and recorded once at 2285 m in S Shan State; in S China (W Yunnan) noted at 2000–2745 m; in NW Vietnam from 2000 m to at least 2800 m, and in N Laos at c. 2000 m.

Food and Feeding. Food insects, also nuts and seeds. Found singly and in pairs, in summer and early autumn also in flocks of up to ten individuals (comprising family parties); often joins mixed-species flocks in non-breeding season. Forages on mossy branches, usually in upper parts of trees, less frequently on trunk; occasionally in low shrubs.

Breeding. Season mid-Mar to early May in Indian Subcontinent, and probably similar in NE Myanmar. Nest built by female, male occasionally providing material, a pad of green (sometimes dried) moss, mossy fibres and rhododendron leaves, placed 1–15 m above ground in tree cavity, usually in oak; hole if too large may be “plastered” up with mixture of mud and berries, diameter reduced to 25–38 mm, plaster setting rock hard. Clutch 4–7 eggs, white, densely covered with dark red spots and blotches, which may form ill-defined ring at larger end, mean size 18.6 × 13.4 mm; incubation of eggs and feeding of chicks reported as by both sexes; no information on duration of incubation and nestling periods.

Movements. Resident, with seasonal altitudinal movements.

Status and Conservation. Not globally threatened. Common in Himalayas, perhaps occurring at highest densities in E; variously rare, uncommon and fairly common in NE hill states of India, where probably occurs at reduced densities. More or less uncommon in NE Myanmar, and perhaps rare in adjacent W Yunnan (S China). Common in NW Vietnam. Status in Laos unknown, and only one record (of a single flock at Tranninh), also only one record from E Myanmar; both of these possibly refer to non-breeding visitors from N parts of range.

Bibliography. Ali & Ripley (1983), Dickinson *et al.* (2006b), Harrap & Quinn (1996), Hume & Oates (1889), King *et al.* (2001), Martens & Eck (1995), Matthysen (1998), Rasmussen & Anderton (2005b), Robson (2000b), Spierenburg (2005), Stuart Baker (1922, 1932), Sultan & Khan (2000), Thet Zaw Naing (2003), Vaurie (1957b).

8. White-browed Nuthatch

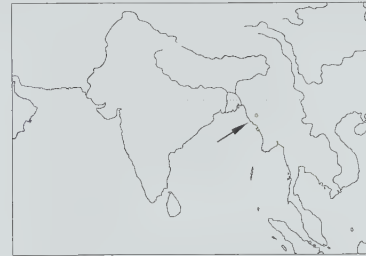
Sitta vittoriae

French: Sittelle du Victoria **German:** Weißbrauenkleiber **Spanish:** Trepador Birmano
Other common names: Victoria Nuthatch

Taxonomy. *Sitta vittoriae* Rippon, 1904, Mount Victoria, Chin Hills, Myanmar.

Formerly considered conspecific with *S. himalayensis*, both having white in central tail, but otherwise morphologically distinct and both occur on Mt Victoria, although probably separated altitudinally. Small size and prominent white supercilium suggest possible affinity with *S. yunnanensis*. Monotypic.

Distribution. Mt Victoria and nearby Mindat (S Chin Hills) in W Myanmar.



Descriptive notes. 11.5 cm. A small nuthatch with tiny, spike-like bill. Has forehead and narrow supercilium (to rear of ear-coverts) whitish, crown to rump dull blue-grey, nape and upper mantle paler and with white feather bases showing (variable whitish mottling); narrow black eyestripe, broadening considerably on upper mantle; upperwing dark grey-brown, wing-coverts (including primary coverts) fringed blue-grey, outer webs of tertials extensively blue-grey, secondaries fringed blue-grey, primaries finely fringed paler at base; central tail feathers with basal half of inner web and narrow streak along shaft on outer web whitish, grading on distal half to blue-grey with dark border of outer web and marbled with grey towards tip, often with triangular black spot near tip of shaft, remaining rectrices blackish-grey, small white triangle of white on tip of inner web of T4, large white subterminal spot on inner web and variable white subterminal streak along shaft on outer web of T5, and large white subterminal streak diagonally across both webs of T6; lores and cheek whitish, upper and rear ear-coverts orange-rufous (rearmost ear-coverts often contrastingly white), rufous then forming continuous line down side of neck and onto flanks, rear flanks darker and more extensively rufous, innermost rear flanks blue-grey; chin, throat, lower ear-coverts, breast and belly white, vent and undertail-coverts cinnamon-rufous, thighs grey; axillaries blue-grey, under primary coverts sooty black, longest coverts and base of primaries contrastingly white; iris red-brown or dark brown; bill slate-grey, paler on culmen and lower mandible, black at tip; legs dull yellowish-brown or olive-brown. Easily distinguished from *S. himalayensis*, which similarly has white in central tail feathers, by head pattern (white forehead and broad supercilium, more sharply defined black eyestripe) and more contrastingly patterned underparts. Sexes apparently similar. Juvenile is reported as being much paler than adult on side of neck (possibly also on breast and flanks). VOICE. Calls include “pee”, variably insistent and tooting or less emphatic (and then recalling a lost domestic chick), repeated steadily at 2–3 notes per second for long periods, sometimes declining in speed and volume towards end of phrase, also a subdued, liquid “pit” and more sibilant “tsit”. Song a slow, mellow trill made up of “tuwi” couplets at rate of 4 couplets per second, whole phrase lasting c. 1.5 seconds and rising in pitch, “tuwi-tuwi-tuwi-tuwi-tuwi-tuwi”.

Habitat. Oak–rhododendron (*Quercus*–*Rhododendron*) forest. On Mt Victoria from 2285 m to summit at 3053 m; in recent study recorded only above 2450 m (habitat below 2450 m may now be unsuitable), with nests found at 2510 m and 2750 m; species found only above 2600 m during expedition in late 1930s (earlier records at lower altitudes were made during breeding season and thus did not represent winter dispersal). Recorded at 2440–2560 m at Mindat. Occurs at higher elevations than *S. himalayensis* where ranges overlap.

Food and Feeding. Food small insects. Usually found singly or in pairs, only occasionally in small flocks of up to four individuals. Tends to forage on outer branches (69.6% of observations), less often inner branches (19.6%) or trunk (10.8%), mostly on oaks and rhododendrons. Items gleaned from mosses, lichens and other epiphytes, or from beneath dislodged bark fragments.

Breeding. Nest-building observed on 12th Mar, and nests with chicks recorded in early Apr. Three nests known, the first built by female over period of c. 6 days, all sited in cavity, respectively 4 m, 6 m and 10 m above ground, no mud “plaster” around nest-hole entrance. Only female observed to feed young. No other information.

Movements. Resident.

Status and Conservation. ENDANGERED. Restricted-range species: present in Eastern Himalayas EBA. Global population estimated at 2500–9999 individuals, all within area of 820 km²; thought to be decreasing. Recent observers report this species variously as fairly common and as sparsely distributed, and it may be local even within its highly restricted range. Mt Victoria lies within Natna Taung National Park, but this appears to offer little protection; forest has been cleared below 2000 m and is degraded between 2000 m and 2500 m.

Bibliography. Anon. (2007i), Butchart & Stattersfield (2004), Collar *et al.* (2001), Dickinson *et al.* (2006b), Harrap & Quinn (1996), Rasmussen & Anderton (2005b), Robson (2000b), Robson *et al.* (1998), Stattersfield & Capper (2000), Stressemann & Heinrich (1940a), Thet Zaw Naing (2003), Vaurie (1957b).

9. Pygmy Nuthatch

Sitta pygmaea

French: Sittelle pygmée **German:** Zwergkleiber **Spanish:** Trepador Enano
Other common names: Californian Nuthatch

Taxonomy. *Sitta pygmaea* Vigors, 1839, Monterey, California, USA.

Forms a superspecies with *S. pusilla*; sometimes considered conspecific, but differs in e.g. plumage, vocalizations, and various aspects of biology. Together, the two are sometimes considered closely related to *S. himalayensis*, shared characters including white at base of tail and nape feathers. Alternatively, superspecies may represent an older invasion of North America by ancestral stock of *S. canadensis*, and in recent limited phylogenetic analysis of mitochondrial DNA present species emerged basally to a clade containing the “*S. canadensis* group”. Geographical variation slight; in particular, all Mexican races apparently very similar (*chihuahuae* often merged with *melanotis*) and taxonomic revision possibly needed. In California (SW USA), *melanotis* intergrades with nominate (on Howell Mt, in Napa County) and with *leuconucha* (in region of San Bernardino Mts). Proposed race *canescens*, described from Lee Canyon, in Charleston Mts (Nevada), in SW USA, considered indistinguishable from *melanotis*. Seven subspecies recognized.

Subspecies and Distribution.

S. p. melanotis van Rossem, 1929 – extreme SW Canada (S British Columbia), and mountains of W USA (Cascades, Sierra Nevada, Rocky Mts and desert ranges of Great Basin) S to California (Riv-

erside County) and E to W Montana, SW South Dakota (Black Hills), W Nebraska (Pine Ridge area), NW Colorado (Douglas Mts), New Mexico and W Texas (Davis Mts, Guadalupe Mts), also extreme N Mexico in NE Sonora (San José Mts) and NW Coahuila (Sierra del Carmen).

S. p. pygmaea Vigors, 1839 – C coastal California (from Mendocino County S to San Luis Obispo County).

S. p. leucomucha Anthony, 1889 – mountains of extreme S California (S of San Bernardino Mts) and extreme NW Mexico (Sierra de Juárez and Sierra San Pedro Mártir, in N Baja California).

S. p. chihuahuae van Rossem, 1929 – NW Mexico at scattered sites in Sierra Madre Occidental from S Sonora and W Chihuahua S to Nayarit, SW Durango, NW Zacatecas and N Jalisco (S to Santa Teresa and Guadalupe).

S. p. eli A. R. Phillips, 1986 – N & NC Mexico in Sierra Madre Oriental, SE Coahuila (SE of Saltillo) and SW Nuevo León (Cerro Potosí).

S. p. brunescens Norris, 1958 – SW Mexico in S & W Jalisco (Sierra Nevada de Colima), Colima and SW Michoacán; possibly also NE Nayarit.

S. p. flavinucha van Rossem, 1939 – E & C Mexico in W Veracruz (Las Vigas, Pico Orizaba), Distrito Federal, Morelos and W Puebla (Cerro San Miguel, Volcán Ajusco, La Cima, Popocatepetl).

Descriptive notes. 11 cm; average 9.3–11.4 g. A very small nuthatch with brownish cap.

Nominate race has crown to upper mantle brownish-olive, paler spot in centre of upper mantle (concealed or indistinct), remainder of upperparts, including tertials and upperwing-coverts, medium blue-grey; inner webs of tertials slightly darker, concealed inner webs of greater coverts dark brown; lores and ill-defined eyestripe sooty brown, contrasting little, if at all, with cap; alula and primary coverts blackish, smaller feathers of alula fringed blue-grey, primary coverts finely fringed medium grey, flight-feathers sooty brown, secondaries fringed grey, inner primaries finely fringed light grey, P3 broadly fringed white on basal third, P4–P7 with whitish fringe around emargination, P3–P6 with white at base (showing as slight flash at tips of primary coverts); central tail feathers blue-grey, broad off-white shaft streak on basal half, other rectrices blackish-grey, tipped brownish-olive (broadly so on outermost feather), outer two feather pairs with broad off-white diagonal subterminal stripe; chin, cheek and ear-coverts off-white, darkening to pale buff on side of neck, throat and upper breast and yellow-buff on rest of underparts, flanks pale grey; axillaries light grey, underwing-coverts dark grey, longer under primary coverts and base of primaries white; in worn plumage, cap slightly paler, lores and eyestripe slightly more contrasting, pale feather bases on upper mantle more obvious, upperparts slightly duller and less blue, underparts paler and less buff; iris brown; upper mandible blackish, lower mandible dusky grey with pale blue-grey base; legs grey, soles often pale yellow or greenish-yellow. Differs from very similar *S. pusilla* mainly in darker crown, somewhat darker eyestripe, and more white on fringes of primaries. Sexes similar. Juvenile resembles adult but greyer above, with little contrast between crown and upperparts (often some pale buff-white of feather bases visible in centre of upper mantle), lores and eyestripe dark sooty grey, greater upperwing-coverts fringed brownish, underparts pale greyish-white with buff wash (similar to worn adult), flanks pale buff-brown; base of lower mandible pink to off-white for up to three months after fledging. Races differ little: *melanotis* is like nominate, but crown to mantle with greyish cast, eyestripe better defined (especially behind eye), colour of underparts varies from very pale buff (in interior USA) to rich buff, also relatively longer wing and shorter tarsus; *leucomucha* resembles previous (cap colour similar), but upperparts paler and greyer, underparts whiter, darker and longer-billed than other Mexican races; *chihuahuae* is as nominate, but upperparts on average slightly darker, wing longer, bill and tarsus relatively shorter; *brunescens* is similar to previous, but cap on average slightly browner (olive-brown), nuchal spot slightly more prominent and tinged yellow-buff, underparts buffy (as *melanotis*); *flavinucha* also is similar, but cap may be fractionally less brown (although birds from Mt Toluca, in Mexico, may match preceding race), mantle spot only faintly tinged buffy yellow; *eli* also is like *chihuahuae*, but longer wing, tail and tarsus (probably largest race), and has upperparts paler, underparts dull and pale, but bill smaller, juvenile lacks yellow-brown fringes on median and greater wing-coverts and is whiter (less buffy) below. Voice. Noisy. Call a clear, high-pitched, rapid “kit-kit, kit-kit...”, “pit-pit, pit, pit-pit...” or “peep peep”, in variety of pitches and sequences, in flocks may be prolonged into twittering “de-de-de-de-de-de...pit-pit-dit, pi-dit, pi-dit...” (sometimes calls of different individuals become so mixed as to sound like a brood of chicks); other calls include high-pitched “bree-ee-ee-ee-ee-ee” (when tending young, especially by female). Song a rapid, high-pitched, staccato sequence of disyllabic piping notes, “wee-bee, wee-bee, wee-bee...” or “ki-dee, ki-dee, ki-dee”; song given Feb to mid-summer in California, but similar calls heard throughout year; alarm also similar although tends to be a faster repetition of more monosyllabic or irregularly disyllabic notes (sometimes just 3–4 notes). Pair-members have rapid, synchronized duets, e.g. male/female as “poo toot/pee tit/poo toot/pee tit”. Juvenile’s call a rapid, slurred, chattering “durr-urp-urp-urp-urp...” varied with louder “swe-swe swe-swe swe-swe swe-swe”, differs from that of *S. pusilla*.

Habitat. Almost exclusively in forests of long-needled pines, distribution closely paralleling that of ponderosa pine (*Pinus ponderosa*) and Jeffrey pine (*Pinus jeffreyi*), and in California also in Monterey pine (*Pinus radiata*) and bishop pine (*Pinus muricata*); occasionally other conifer species, e.g. lodgepole pine (*Pinus contorta*) in N Colorado. Prefers open, park-like woodland, and in Mexico very much a bird of high, cold pine forests; favours old-growth, mature, undisturbed forest, and populations in unlogged forest significantly higher than in logged forest. In winter, may occur in Douglas fir (*Pseudotsuga menziesii*) and pinyon-juniper (*Pinus-Juniperus*) woodlands, mixed pine-oak (*Pinus-Quercus*) forest, riparian woodland and conifer plantations, but very rarely in pure deciduous forest. From near sea-level to 1220 m in coastal California, otherwise 550–3350 m in USA; 1585–2745 m in Baja California and 1830–4270 m in remainder of Mexico (reaching highest altitudes in S).

Food and Feeding. Food in summer mainly insects and spiders (Araneae), in autumn and winter shifting to variable extent to pine seeds; young fed principally with animal food, but well-developed nestlings sometimes given pine seeds (after hard shell removed). Will visit feeders to eat suet and sunflower (*Helianthus*) seeds. May store pine seeds, hiding them in bark crevices. Family-members tend to stay together in autumn, subsequently joining with other families to form stable winter group, which may roam over area formerly occupied by several territories, occasionally more widely. In some areas tends to form single-species group (usually of 5–16 individuals, but up to 100 recorded), but in montane habitats joins mixed-species foraging flocks. Forages almost exclusively in pines, climbing up and down trunk, over and under branches, and exploring twigs, needle clusters and cones; searches open cones for insects. Flakes off pieces of bark to find insects, and occasionally fliccatches or picks off insects while hovering. Wedges pine seeds in bark crevices and hammers vigorously at them. Single record of tool use: an individual, while holding a 3-cm

twig, worked along a branch, probing the bark, and when it found something it dropped twig and pecked at the object. Occasionally utilizes broadleaf trees and shrubs, and sometimes descends to ground to take swarming termites (Isoptera), to extract seeds from fallen cones and to retrieve fallen items; has been noted as consuming a flaky layer of ice (in a very dry winter).

Breeding. Season Apr to early Aug in USA, possibly slightly earlier in S Mexico; very occasionally double-brooded (probably all dates after Jun refer to second broods). Tends to form permanent pair-bond. Up to 40% of pairs assisted by 1–3 (exceptionally four) male helpers, usually immature or sibling related to the pair (and always from same winter group), which assist in defending nest and territory, nest-building and nest sanitation, feed female on nest, feed young, and at all stages of breeding cycle roost in nest; most help for one year, but a few assist same pair for two or more years, some participate throughout breeding cycle, others arrive mid-cycle after own nest failure. Lives all year in territory, selected by male and comprising nesting/roosting site and foraging areas, territories of pairs with helpers on average larger; little overlap between territories, but actively defended only in breeding season (defence usually limited to vicinity of nest-site). Nest, built by both sexes, a cup made from bark shreds, fine moss, grass, plant down, fur, hair, cocoons, and other soft fibrous material, usually with feathers incorporated, placed in cavity 0.3–2.3 m (usually 5–15 m) above ground in standing dead tree or dead snag on live tree, mostly conifer, with hair, feathers and similar material used to “caulk” cracks in walls; usually excavates own hole (or reuses old cavity), but may utilize old hole of woodpecker (Picidae), and recorded as nesting in fence post, telephone pole and old building; excavation, which takes 3–6 weeks, undertaken by both sexes (and helpers, if present), and often several holes started before final selection made; nestbox also used, especially in absence of suitable natural sites. Clutch 2–12 eggs, usually 5–9 (average 7), white, sparsely and unevenly spotted reddish-brown, markings often concentrated at larger end, mean size 15.8 × 12.2 mm (nominate); replacement clutches unusual; incubation by female, fed on and off nest by male and by any helpers present, period 12–17 days; chicks usually fed by both sexes, male making more feeding visits, fed also by helpers, but brooded only by female, nestling period 14–22 days; juveniles not independent until a further 23–28 days and may continue to be fed until c. 50 days after fledging. Pairs with helpers less likely to lose nest to predation or other causes of nest failure, and helpers may benefit by gaining entrance to winter group, membership of which is critical for survival.

Movements. Mainly resident; limited seasonal altitudinal movements by montane populations irregularly Jul–Dec, both to higher elevations (up to timber-line) and to lower valleys and cities along edge of mountains. Otherwise, little autumn and winter dispersal with remarkably few records from plains, even from areas immediately adjacent to breeding range. Irregular “micro-irruptions”, when dispersal slightly more pronounced, perhaps associated with failure of cone crop, thus a rare visitor to Oklahoma panhandle and rare migrant and winter visitor in Texas away from breeding areas; rare and erratic visitor to coastal lowlands of SW California, to SW Arizona (adjacent to breeding areas) and to E New Mexico. Away from these areas, extremely rare vagrant to SW British Columbia (near Vancouver and on Vancouver I), C & E Montana, North Dakota, E Nebraska, Kansas (flock of about ten individuals at Wichita, Nov 1961–Jan 1962, also spring and autumn records in six counties), and Iowa.

Status and Conservation. Not globally threatened. Common in much of range, and locally abundant. In N of range, uncommon in Canada (British Columbia) and in US states of Washington, Montana and Wyoming, and rare in Nebraska and South Dakota. Elsewhere in USA, common in Oregon, California, Arizona and New Mexico, and often abundant and one of most numerous bird species in pine forests, although numbers fluctuate markedly (probably in association with size of cone crop); fairly common within breeding range in Idaho, Nevada, Utah, Colorado and Texas. Recorded densities vary widely, from 0.75 to 12.25 pairs/10 ha. In Mexico, common in N Baja California and locally fairly common in other parts of range. In non-breeding season, high densities found in Spring Mts (S Nevada), foothills around Spokane (Washington), foothills of Rocky Mts in Colorado, and Monterey (California). Human population growth and the resulting logging, fire suppression, grazing, development and road-building have reduced the amount of available habitat, and forestry practices (especially the removal of suitable nesting trees) have degraded much remaining habitat.

Bibliography. Bent (1948), Bleitz (1951), Boek (1969), Burleigh (1972), DeSante & Pyle (1986), Güntert *et al.* (1988), Harapp & Quinn (1996), Kingery & Ghalambor (2001), Marshall (1957), Matthysen (1998), Norris (1958), Phillips (1986), Spellman & Klieka (2006), Sydesman (1989), Sydesman *et al.* (1988).

10. Brown-headed Nuthatch

Sitta pusilla

French: Sittelle à tête brune

German: Braunkopfkleiber

Spanish: Trepador Cabecipardo

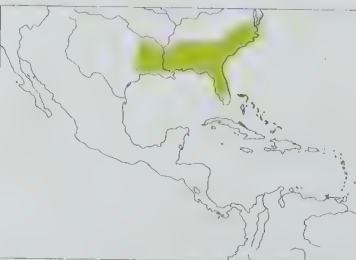
Taxonomy. *Sitta pusilla* Latham, 1790, Carolina, Jamaica = South Carolina, USA.

Forms a superspecies with *S. pygmaea*; sometimes considered conspecific, but differs in e.g. plumage, vocalizations, and various aspects of biology. Together, the two are sometimes considered closely related to *S. himalayensis*, shared characters including white at base of tail and nape feathers. Alternatively, superspecies may represent an older invasion of North America by ancestral stock of *S. canadensis*. Geographical variation slight, size decreasing clinally from N to S, with a “step” between more or less isolated population in Maryland (large, long-winged, deep-billed) and that of Virginia/North Carolina; distinctiveness of race *insularis* requires confirmation. Two subspecies provisionally recognized.

Subspecies and Distribution.

S. p. pusilla Latham, 1790 – USA from extreme SE Oklahoma, E Texas and W & S Arkansas (S from Ouachita Mts) E to SE Tennessee, C & E North Carolina, SE Virginia, tidewater areas of SE Maryland (S from Talbot County, mostly E of Chesapeake Bay) and extreme S Delaware, S to Gulf States (absent from grassland strip along coast) and Florida (S to Collier County).

S. p. insularis Bond, 1931 – Bahamas (Grand Bahama).



Descriptive notes. 10.5 cm; average 10.2 g. A very small nuthatch with brown cap. Nominate race in fresh plumage (Aug–Oct) has lores, crown, nape and upper mantle warm pale brown, variable whitish spot in centre of uppermost mantle, upperparts medium blue-grey, inconspicuous dark narrow eyestripe (in worn plumage, lores and ear-coverts contrastingly darker, forming a mask); lesser and median upperwing-coverts grey, fringed blue-grey, greater coverts and tertials grey, faintly washed brown, greater finely fringed light grey or blue-grey, tertials slightly darker on inner web, alula, primary coverts and flight-feathers dark

brownish-grey, primary coverts finely fringed mid-grey, secondaries fringed light grey, inner primaries very finely fringed pale grey, P3–P5 narrowly fringed off-white around emargination; central tail feathers blue-grey, slightly paler at base (and may show whitish along shaft), other rectrices sooty black with medium to light grey tip (narrow on T2–T3, broad on T6), outer two feather pairs with greyish-white broken diagonal subterminal bar; cheek, ear-coverts and side of neck whitish, chin white, washed buff and darkening to pale buff on throat, buffish or pale cinnamon-buff on breast (quickly wears to pale buff) and greyish-buff on belly to undertail-coverts and thighs, with side of breast and flanks light grey; axillaries light grey, underwing-coverts medium grey, longer under primary coverts and base of primaries white; in worn plumage, cap rather paler, feather tips extensively bleached to pale greyish-drab or whitish-buff, lores and eyestripe contrastingly darker brown, nuchal spot whiter and more prominent, upperparts slightly duller and less blue, underparts paler, whitish to dirty pale grey with buff tinge; iris dark brown; bill dark slate, base of lower mandible extensively pale bluish-grey; legs dark grey, soles paler. Distinguished from very similar *S. pygmaea* mainly by somewhat paler crown (much paler in worn plumage) and less prominent dark eyestripe, more conspicuous white nuchal spot, less white on primary fringes, less white in tail. Sexes similar. Juvenile is marginally distinct from adult, has cap generally greyer and mantle slightly browner (thus much less contrast between cap and mantle), nuchal spot less conspicuous, greater upwing-coverts fringed buffish, tertial and secondary fringes washed cinnamon, underparts as fresh-plumaged adult but with slight rosy flush, browner flanks. Race *insularis* is similar to nominate but has longer, thinner bill and darker eyestripe. VOICE. Rather vocal. Contact call a soft “tip” or “pit”, during foraging often given continuously for extended periods at up to 60–90 notes per minute in twittering “pit, pit, pit...” sequence; other calls include so-called “rubber ducky” call as alarm, in excitement or by individual separated from flock, an explosive squeaky, nasal “ziu!” or “niu!”, or more usually a “ziu-uu” couplet (when very like a toy rubber duck being squeezed and released), second note repeated up to twelve times but most commonly 1–3 times, “ziu-uu-uu-uu”, and calling occasionally continued at up to 80 notes per minute for several minutes. Loud repeated series of 2-note “rubber ducky” calls given by male in spring as “song”. Juvenile emits buzzy “sh-h-r-r-p, sh-h-r-r-p” (given also by adult). Voice generally slightly lower-pitched, less pure and more reedy than that of *S. pygmaea*, and song generally slower.

Habitat. Found almost exclusively in association with pines, especially loblolly pine (*Pinus taeda*). Favours mature old-growth pine forest in which natural fire patterns have been maintained, keeping understory open and creating snags (for nesting and roosting), or where small clearings created naturally (hurricanes, disease, or bark beetles) or artificially (clear-fell) and in which snags left standing; or forest-wetland ecotone where snags created by flooding. May breed in residential areas if snags or nestboxes, as well as mature living pines (for foraging), are available. Found also in pine-oak (*Pinus-Quercus*) woodland and in oak-hickory-pine (*Quercus-Carya-Pinus*) forests; in Florida may nest in cypress (*Taxodium distichum*) swamps and in prairies adjoining pine woodland. Will venture outside woodland to areas of scattered trees, and seedling pines in abandoned farmland; even investigates fence posts and telegraph poles along roads. Mainly lowlands and piedmont, usually below 150 m (90 m in Texas), but recorded at up to 670 m in Georgia and 550–600 m in South Carolina (although a rare accidental in mountains of Carolinas).

Food and Feeding. Food insects and spiders (Araneae), in winter mainly pine seeds; young fed mostly with animal matter, but occasionally also on pine seeds (after hard covering removed). May store pine seeds, using its bill to pound them into crevices in bark of a pine, but caches not large; has been observed apparently to use bark flakes to cover seed caches. Family-members tend to remain together through autumn and winter, and forage beyond the territorial boundary; these small groups may amalgamate to form single-species flocks (up to 24 individuals recorded), and routinely join mixed-species foraging flocks. Forages on trunks, limbs, smaller branches, twigs, cones, and needle clusters of pine trees, and usually spends majority of its time in upper third of trees, with apparent preference for cones, needle clusters and outer part of branches (this perhaps due especially to competition with other species in mixed flocks). Often hangs upside-down, exploring clusters of needles for insects or picking seeds from cones; occasionally visits the ground, or forages in deciduous trees, on old tree stumps, fence posts, telegraph poles or buildings, and will visit garden feeders to take suet and sunflower (*Helianthus*) seeds. Does not often hawk for insects, but adept at flycatching when insects are disturbed. Will deliberately prise off bark scales to reveal hidden prey. Occasionally uses a scale of pine bark as a wedge with which to pry off bark scales; usually drops this “tool” after removing a scale, but may remove 3–4 scales before dropping it, or may carry it from tree to tree.

Breeding. Season early Mar to mid-May, sometimes Feb in Florida, exceptionally mid-Jul in Georgia, but nest-hole excavation from late Feb (rarely, late Jan); occasionally double-brooded. May form permanent pair-bond. Sometimes breeds co-operatively, in various studies 20–60 % of pairs assisted by helper male (usually a second-year individual, and related to one of the pair), rarely by two or even three helper males; helpers assist in chasing intruders, cavity excavation, and nest construction and sanitation, feed female on nest and feed young. Male probably maintains permanent territory around nest-hole, chasing away other males (exceptionally, two pairs may share a cavity); pairs with a helper hold larger territory than simple pairs, but these larger territories (and those of non-breeding pairs) may overlap more extensively with those of neighbours. Nest constructed by both sexes, usually from pine-seed wings, also bark chips, grass and other vegetable fibres, lined with cotton, feathers, wool and seed wings, placed in cavity 0.15–28 m above ground (but usually low, c. 2–3 m) in partially rotten wood, usually stump or dead tree (with preference for pine), sometimes fence post, but sometimes no nest built (eggs laid on bare floor of cavity); excavates own cavity (or reuses old one), entrance hole typically c. 3–3 cm in diameter, the work predominantly by male, taking 1–6 weeks, and several holes may be started before final choice made; nestbox also used, and occasionally pre-existing natural hole (including cavity under bark), rarely old woodpecker (Picidae) hole; often selects site in clearing, along roadside, in windbreak, over pond or in field, sometimes well away from foraging area. Clutch 3–7 eggs, usually 4–6 (very rarely, 9), white or creamy, heavily spotted reddish-brown to lavender, mean size 15.3 × 12.1 mm; occasionally replaces lost clutches; incubation by female, fed on and off nest by male and by any helpers present, period average 14 days; chicks fed by both sexes, also by helpers, but brooded only by female, nestling period 18–19 days (rarely, to 23 days); juveniles not fully independent until 2–4 weeks after fledging. In some studies, pairs with helpers significantly more successful at fledging young than those without helpers.

Movements. Resident, with very limited post-breeding dispersal. Accidental in Wisconsin, New York (near Elmira) and Pennsylvania, also sight records Indiana and New Jersey.

Status and Conservation. Not globally threatened. Common throughout most of US range; uncommon in Arkansas, Tennessee, Maryland and Delaware, and rare in Oklahoma. Recorded densities vary from 0.25 to 4 pairs/10 ha; highest breeding densities in upper coastal plain of W South Carolina, W Georgia, C Florida and S Mississippi. Significant downward trend in numbers throughout range between 1966 and 1996; prior to 1980 decline confined to coastal flatwoods, particularly in Florida and Mississippi, but since 1980 significant declines have continued both in these flatwoods and in upper coastal plain, and has declined also on periphery of range in S Delaware, W Tennessee and SE Oklahoma; may have been extirpated in Missouri (although the two records from there may have involved vagrants, rather than breeding birds). In S Florida now largely absent from most

counties near and SE of L Okeechobee; pine forests in SE USA have been altered by commercial logging and other practices, and old-growth pine forest almost gone (replaced by even-aged stands of pines on short rotations). Degradation of habitat by fire suppression may also depress populations, as can fragmentation of habitat; this species’ weak flight and sedentary character make recolonization of distant fragments following local extirpations unlikely, and this could explain its absence from apparently suitable habitat at edge of range in S Tennessee, SE Missouri and S Florida (e.g. suitable habitat appears to exist in Everglades National Park, but it has failed to recolonize the area, which lies only 65 km S of current range). Conversely, is apparently expanding its range N in Georgia, and first recorded SE Tennessee in 1968, with population of 50–70 individuals by 1981. In W North Carolina, recent records from counties of Caldwell and Buncombe may indicate range expansion to W. Race *insularis*, confined to Grand Bahama (Bahama Is), is rare, with few recent records; was fairly common in late 1960s and 1970s, but numbers declined by over 95% between 1969 and 1993, this probably due to logging of Caribbean pine (*Pinus caribaea*).

Bibliography. Bent (1948), Cox & Slater (2007), Dornak et al. (2004), Haney (1981), Harrap & Quinn (1996), Hayes et al. (2004), Mathueson (1998), McNair (1983, 1984), Miller & Jones (1999), Morse (1967, 1968), Norris (1958), Oberholser (1974), Pranty (1995), Root (1988), Smith & Smith (1994), Wilson & Watts (1999), Withgott & Smith (1998).

11. Corsican Nuthatch

Sitta whiteheadi

French: Sittelle corse

German: Korsenkleiber

Spanish: Trepador Corso

Taxonomy. *Sitta whiteheadi* Sharpe, 1884, mountains of Corsica.

A member of a species group that contains also *S. ledanti*, *S. krueperi*, *S. villosa*, *S. yunnanensis* and *S. canadensis*, and all sometimes thought to form a superspecies. Present species formerly treated as conspecific with *S. villosa* and *S. canadensis*; close relationship with these two supported by recent data on mitochondrial DNA, which indicate also a more distant relationship to *S. krueperi* and *S. ledanti* (no *S. yunnanensis* material was available for analysis). Earlier taxonomic separation of present species from *S. canadensis* based on studies of vocalizations, together with those of breeding biology and behaviour. A nesting pair of nuthatches resembling present species and *S. villosa* found at 2000 m in Altai Mts of extreme S Siberia (at Aktru, S of Karay) in 2006; this could represent a remarkable range extension of either species, or an as yet undescribed species, but requires verification. Monotypic.

Distribution. Inland mountain ridges on Corsica (from Tartagine S to Ospedale and Mt Cagna).



Descriptive notes. 12 cm; 11.8–14.4 g. A small nuthatch with rather long bill and prominent broad white supercilium. Male in fresh plumage (autumn) has glossy black cap from forehead to nape (ill defined at rear), faintly buff-washed white supercilium (from nostril) to side of mantle and ending irregularly at rear, black eyestripe finely spotted white behind eye and less well defined at rear of ear-coverts (merging irregularly into mantle); upperparts, including lesser and median upwing-coverts, blue-grey; greater wing-coverts and flight-feathers dark grey-brown, tertials washed blue-grey on outer web, greater and primary

coverts, secondaries and inner primaries narrowly fringed blue-grey, primaries P3–P6 finely fringed blue-grey inward of emarginations, secondaries and inner primaries finely tipped white (only when fresh); central tail feathers dull blue-grey, other rectrices sooty black, tipped grey (widest on outermost feather), outer three pairs marbled with white subterminally, especially on inner webs; cheek, ear-coverts, chin and throat white, washed dirty buff, side of neck and underparts pale drab grey, variably tinged buff, especially on flanks, belly and undertail-coverts; underwing-coverts and axillaries whitish, median under primary coverts medium grey, base of primaries white (not strongly contrasting); in worn plumage (summer), crown slightly less glossy, upperparts duller and less blue, flight-feathers abraded and bleached paler, supercilium, throat, cheek and ear-coverts whiter, underparts duller, light greyish with little or no buff wash; iris dark brown, narrow white eyering; bill slate-black to grey-brown, more bluish at base of upper mandible, base of lower mandible pale grey to whitish; legs dark grey-brown or slate-grey, soles sometimes yellow. Female resembles male, but crown and ear-coverts medium blue-grey (as upperparts), dark feather centres largely or totally concealed but may show as slightly darker mottling on (usually) forecrown and forehead, especially in worn plumage (exceptionally, dull blackish forecrown); eyestripe grey and less well defined behind eye, supercilium and underparts tend to be greyer. Juvenile is as adult but slightly duller overall, with faint brown tips on greater upwing-coverts, pale base of lower mandible more extensive, legs paler grey; cap of very young male may be sooty black with no gloss, and juvenile female lacks blackish feather bases on forecrown. VOICE. Contact call a soft, whistled “pu”, singly or in groups of 5–6 notes, sometimes as rapid trilling “pupupupupu...”, especially immediately prior to or during flight; also gives thin, sometimes lisping “tsi-tsi-tsi” and nasal “pink”, often in irregular series; in agitation a hissing “psch-psch-psch...” and a nasal note like sound from toy trumpet, becoming louder and harsher in excitement or alarm; also a repeated harsh “chay-chay-chay” or “sch-wer sch-wer” similar to call of distant Eurasian Jay (*Garrulus glandarius*), and increasing in intensity as excitement heightens, when may lose harsh quality and become more musical. Song, fairly regularly in spring, a repetition of single clear, high-pitched note at c. 15 notes per second to produce rapid, sometimes quavering trill, “hididididid...”, also slower variant of pure, ascending whistled “dew” or “dui” notes at c. 10 per second; the two may be combined, as “dewdewdewdewdew-di-di-di-di-di”.

Habitat. Primarily forests of Corsican pine (*Pinus nigra*), characterized by heavy autumn and winter rainfall and rather dry summers; especially unmanaged pure stands of tall trees (some 300 years old, producing greatest quantities of seeds) with abundant standing dead and rotting trunks and occasional clearings. Lower densities (less than 20% of maximum density) in young forests, mature stands under heavy management, and where Corsican pines mixed with cluster pine (*Pinus pinaster*), beech (*Fagus sylvatica*) or silver fir (*Abies alba*), usually below 1000 m (but can reach high densities in stands of cluster pine at c. 800 m); densities low also above 1500 m, where trees scattered and stunted. In winter some dispersal, occasionally to cork oak (*Quercus suber*) forest, sweet chestnut (*Castanea sativa*) plantations and villages at lower altitudes, although still favours pines overall. Found at 750–1800 m during Apr–Oct, with breeding recorded at 760–1600 m, optimum 1000–1500 m; down to 300 m, and rarely even at sea-level, in non-breeding season.

Food and Feeding. Food largely insects and spiders (Araneae) during May–Aug, switching to seeds, especially those of Corsican pine, during rest of year. Forages in pairs and singly; outside breeding season, may join mixed-species flocks. Forages in manner of a tit (Paridae) in needle

clusters and among small branches, especially in spring and summer, also (particularly in winter) on trunks and larger branches. May hover to pick small items from cones etc., and can also flycatch. From late autumn to early spring (i.e. when cones are mature), and during sunny weather (i.e. when cones are open), extracts seeds from cones and caches them behind bark, or places seeds on thicker branches and covers them with fragments of bark or lichen; retrieves cached seeds in cold and wet weather. These stores probably essential to survival, especially in early spring when snow prevents access to pine cones.

Breeding. Season mainly Apr–May, and laying dates synchronous, generally at end Apr or in first ten days May; may be double-brooded. Mated partners remain on territory all year. Nest, built by both sexes, a coarse foundation of pine needles, wood chips and bark pieces, lined with hair, feathers, moss, lichen or plant fibres, placed in cavity 1.6–30 m above ground in medium-sized to large dead or dying Corsican pine, usually in dead pine stump (200–300 years old at time of death) 3.5–22 m high and well rotted; cavity generally excavated by birds themselves, work carried out by both sexes, majority of excavations exploit hole originally started by woodpeckers (Picidae), and some, in very rotten trunk, may have two entrances; living pine with rotting top occasionally used. Clutch 5–6 eggs, white, speckled reddish, especially at broader end, sometimes with light brown or dark violet-grey markings, mean size 17.3–13 mm; replacements laid if clutch fails; incubation by female, fed on nest by male, no information on duration of incubation period; chicks fledge after 22 days.

Movements. Resident. Territorial adults almost completely sedentary, probably a reflection of their seed-hoarding behaviour. Some dispersal in winter to slightly lower altitudes, usually by immatures and unmated adults; such movements most frequent following snowfalls, when recorded in valleys of C Corsica at 300–600 m, and even at sea-level towards W coast (at Calvi) in Oct and in E (Aleria plain) in Jan.

Status and Conservation. Not globally threatened. Restricted-range species: present in Corsican Mountains Secondary Area. Uncommon and somewhat local; occurs on inland mountain ridges from Tartagine S to Ospedale and Mt Cagna, with main concentrations around the mountains of Cinto, Rotondo, Renoso and Incudine; absent from Nebbio and Cap Corse. Population estimated at only 1570–2230 occupied territories (= breeding pairs) in early 2008; in 1981–1984 c. 2000 pairs calculated, on basis of average density of 0.85 pairs/10 ha in c. 24,000 ha of suitable forest. These figures represent marked decline from estimate of 3000 pairs in 43,750 ha of forest in late 1950s. Presence of old stands of Corsican pine appears to be key factor in survival of this species, and main factors limiting its abundance are fire (can destroy habitat for many decades) and removal of dead and rotting trees (used as nesting sites). Although large numbers of Great Spotted Woodpeckers (*Dendrocopos major*) can result in high predation of chicks, the woodpecker increases availability of suitable nest-sites. Species readily tolerates close proximity of houses, powerlines and traffic. Almost the entire global population of the species occurs within the Natural Regional Park of Corse (Corsica).

Bibliography. Beck (1992), Brichetti & Di Capi (1985, 1987), Cramp & Perrins (1993), Hagemerijer & Blair (1997), Harrap & Quinn (1996), Hobson (1964), Ledant (1978), Löhle (1960, 1961), Matthysen (1998), Matthysen & Adriaenssen (1989), Thibault (1983), Thibault & Bonaccorsi (1999), Thibault & Jenuvier (2006), Thibault & Villard (2005a, 2005b), Thibault, Monégia & Beck (2002), Thibault, Prodon *et al.* (2006), Thibault, Seguin *et al.* (2002), Villard & Thibault (2001), Villard *et al.* (2003).

12. Algerian Nuthatch

Sitta ledanti

French: Sittelle kabyile

German: Kabylenkleiber

Spanish: Trepador de Kabila

Other common names: Kabyli/Kabylian Nuthatch

Taxonomy. *Sitta ledanti* Vieillard, 1976, Djebel Babor, Algeria.

A member of a species group that contains also *S. whiteheadi*, *S. krueperi*, *S. villosa*, *S. yunnanensis* and *S. canadensis*, and all sometimes thought to form a superspecies. Differs from others of group in being slightly larger and less restricted to coniferous forest. Recent evidence from mitochondrial DNA suggests that its closest relative is *S. krueperi*, with *S. whiteheadi*, *S. villosa* and *S. canadensis* more distantly related (no *S. yunnanensis* material was available for analysis). Monotypic.

Distribution. NE Algeria (Petite Kabylie mountain region).



Descriptive notes. 13.5 cm; 16.6–18 g. A medium-sized nuthatch prominent white supercilium and short, slender and sharply pointed bill; bill often appears upturned owing to rather straight culmen and distinct angle at gonys. Male in fresh plumage (autumn) has forecrown black, odd feathers faintly tipped grey, broad white or creamy supercilium from nostril to nape, gradually merging at rear with blue-grey of upperparts, some grey flecking in front of eye, dull black eyestripe from bill to rear ear-coverts (ill defined behind eye); hindcrown and upperparts, including side of neck, tertials and upwring-coverts, blue-grey, wing-coverts

diffusely tipped paler; flight-feathers sooty black, secondaries fringed blue-grey, outer primaries finely fringed pale grey at base, inner primaries and secondaries tipped white; central tail feathers blue-grey, other rectrices blackish with narrow blue-grey tips, subterminal white bar from outer web of T3 to T6, broadest on T6; cheek and ear-coverts white, washed buff and variably mottled blackish or dark grey, especially at rear; throat and underparts creamy pink or washed pinkish-buff, some grey feather centres showing on undertail-coverts; in worn plumage, cap pure black, supercilium purer white, eyestripe darker, also broader at rear, encompassing lower ear-coverts (where mottled off-white), upperparts duller and less blue, tail and flight-feathers bleached slightly paler, pale tips of wing-coverts and flight-feathers abraded, underparts orange-buff to creamy, washed pinkish-buff; iris blackish-brown, narrow whitish eyering; bill slaty black, base of cutting edge of upper mandible and basal half of lower mandible blue-grey; legs grey or dark grey. Female as male, but in fresh plumage most of crown and eyestripe concolorous with upperparts, blackish confined to diffuse spot on forehead; when worn, has variable black cap, although generally paler, rather less extensive and less well defined than male's. Juvenile has cap and eyestripe concolorous with upperparts, supercilium very poorly marked, upperparts paler and less blue than adult and underparts also paler; variation with sex and age not fully understood, black-capped juveniles once described but existence of this plumage strongly contested by subsequent observers; nevertheless, juveniles from a single nest can vary in head pattern (of a brood of three, one had black forecrown and resembled adult male, one resembled adult female, and third had crown grey and concolorous with mantle), and juveniles presumably sexually dimorphic. **Voice.** During foraging and in flight a quiet, soft, nasal "kna" (reminiscent of *S. canadensis* call), which can become inquisitive, nasal

"quuwee"; in excitement or territorial defence a harsh, rasping, "vschrr vschrr" or "schrr, schrr-schrr" and sometimes, when more agitated, a louder, even cawing "chwa-chwa-chwa". Other calls include nasal, inquisitive "du-wa, du-wa" or "qu-wa-di-wa". Song a stereotyped repetition of 7–12 similar notes, sometimes nasal, sometimes fluty, at 3–4 couplets per second, "quair-di, quair-di, quair-di..." or "verdi-verdi-verdi...", which can be slightly rising in pitch; sometimes somewhat faster, "du-wid-du-wid-du-wid...", or even more accelerated, each note almost monosyllabic and slightly higher-pitched, "vid-vid-vid..."

Habitat. On Djebel Babor (climate cool and humid, annual precipitation 2000–2500 mm, falling mostly in winter; up to 4 m of snow Nov–Apr/May), found in relict stand of montane forest with many epiphytic mosses and lichens; at 1200–1650 m forest dominated by deciduous Atlas oak (*Quercus tlemcenensis*), with significant proportion of Atlas cedar (*Cedrus atlantica*), from 1650 m to 1800 m percentage of cedar and Algerian fir (*Abies numidica*) increasing, and summit area at 1800–2004 m dominated by cedars, with small proportion of oak and fir; nuthatches occur above 1450 m, with highest densities above 1900 m, and much lower densities in pure stands of oak or cedar. A good mixture of tree species (thus a reliable supply of seeds) may be important for winter survival, while size and age of trees and hence amount of dead wood and epiphytes also important. Found from 350 m to summit (at 1121 m) in Guerrouch forest (in Taza National Park), which has rather warmer and drier climate (rarely experiencing frosts, annual rainfall 1000–1400 mm); at lower altitudes forest dominated by cork oak (*Quercus suber*) and at higher altitudes by Algerian chestnut-leaved oak (*Quercus castaneifolia*), with Algerian oak (*Quercus canariensis*) also prominent; good understorey of alder (*Alnus*), cherry (*Prunus*), willow (*Salix*), ash (*Fraxinus*) and maple (*Acer*). Apparently found at 900–1400 m in Tamentout forest (lying along a ridge which culminates in peak of Tamesguida, 1626 m) and nearby Djimla forest (rises to 1532 m), mostly in Algerian oak and Algerian chestnut-leaved oak above 1000 m, rarely (and only in Tamentout) in cork oaks at lower altitudes. Range of habitats utilized, and clear preference for foraging in oaks, suggest that this species' distribution is determined by availability of forest, rather than by a very specific ecological niche, and that it is not dependent on Algerian fir or Atlas cedar as suggested following its initial discovery, at Djebel Babor (perhaps the least typical site).

Food and Feeding. Food probably mainly insects and spiders (Araneae) in summer; diet in winter largely seeds and nuts (four seed-producing tree species on Djebel Babor appear to ensure relatively constant supply); nestlings fed with insects, spiders and conifer seeds. In summer forages in twigs and outer branches of oaks (90% of observations in Jun), also in firs and cedars; searches underside of branches and flowers in manner of a tit (Paridae), but seldom comes to ground, and not known to flycatch; a pair with territory in stand of cedars flew long distances to forage in oaks for brood-feeding. In winter forages on trunks, branches and twigs of moss-laden or lichen-covered oaks (45% of observations in Mar), cedars (32%) and firs (22%), often knocking off chips of bark to reveal food items. Also stores seeds in lichen-covered branches and thick cushions of epiphytic mosses for later retrieval (even as late as breeding season). Defends winter territory, and may join mixed-species foraging flocks.

Breeding. Season May; probably single-brooded. Strongly territorial in breeding season, both sexes defending territory boundaries. Nest constructed from wood chips, leaves, feathers and hog bristles, placed in hole in dead or dying tree, usually in dead branch 3–15 m above ground, on Djebel Babor usually in fir, sometimes in oak or cedar, and often uses cavity produced by snow damage to lower crown of tree; may excavate own hole or take over abandoned hole of woodpeckers (Picidae), entrance often relatively large; of nine nests located in 1978, one abandoned nest-site had entrance extensively "plastered" with clay and rotten wood (confirmation that species does, at least occasionally, plaster up nest hole is required). No information on clutch size, but broods of 2–4 young recorded; incubation probably by female alone, no information on duration; young fed by both parents, probably leave nest after 22–25 days; juveniles continue to be fed for 1–2 days after fledging, but become fully independent relatively quickly, wandering into adjacent territories after just 7 days.

Movements. Resident. On Djebel Babor may undertake some altitudinal movement and limited post-juvenile dispersal, but downslope movement inhibited by treeless zone below breeding area; presumed to spend winter months on Babor, despite deep snow (seen in breeding area in mid-Apr, with snow still 2–3 m deep), perhaps aided by cached food supplies. No information on possible movements by populations elsewhere in range (Guerrouch, Tamentout and Djimla).

Status and Conservation. ENDANGERED. Restricted-range species: present in North Algerian Mountains Secondary Area. Discovered as recently as 1975, on Djebel Babor. Has small population, estimated at 250–999 individuals, within very small global range of 240 km². Known from four localities, habitat at one of which severely threatened and declining in quality. Forest on Djebel Babor covers c. 1300 ha, but optimum habitat extends for less than 250 ha in summit area, and population estimated at c. 80 pairs in 1982; highest densities, of 3–4 pairs/10 ha, in summit forest above 1900 m, but much lower in pure stands of oak or cedar (c. 0.5 pairs/10 ha). Forested massif of Guerrouch protected by Taza National Park (total area 3807 ha); surveys in Taza in summer 1989 (when species first located there) revealed 91 individuals in 800 ha, extrapolation from which gives figure of 364 individuals in the 3197 ha of forest within park (total forest cover on Guerrouch estimated at 8577 ha in 1955, and this species found also to SW of park boundary); densities at Guerrouch exceed 3 pairs/10 ha. Tamentout forest covers area of c. 9500 ha and Djimla forest c. 1000 ha; no information on these two populations (both discovered in 1990), but, with combined total area of 10,500 ha, they may hold a summer population of c. 1200 individuals if density is similar to that at Guerrouch. Searches elsewhere in region have failed to find any more populations of this nuthatch. Although the area has national park status, summit forests of Djebel Babor are threatened, but their conservation has received some attention since discovery of the species. Nevertheless, grazing hinders regeneration, wood-cutting removes potential nest-sites, and fires result in replacement of rich mixed forest by poorer cedar-dominated succession. All three factors reduce quality of habitat for this species, as well as reducing total forest area; further, construction of a motorable track in 1970s has led to erosion, increased risk of fire, and fears of disturbance by tourists. Guerrouch population not considered at risk, as national park is fully protected. At Tamentout and Djimla, overgrazing has led to impoverished understorey and poor regeneration, and deforestation throughout region is rife.

Bibliography. Anon. (2007i), Bellatreche (1991), Bellatreche & Chalabi (1990), Bison & van der Laan (1985), Burnier (1976), Butchart & Stattersfield (2004), Cramp & Perrins (1993), Collar & Stuart (1985), Doumadji & Kissler (1993), Fosse (1992), Fosse & Vaillant (1982), Fry *et al.* (2000), Gatter & Mattes (1979), Harrap & Quinn (1996), Jacobs *et al.* (1978), Ledant (1977, 1978, 1981), Ledant & Jacobs (1977), Ledant *et al.* (1985), Matthysen (1998), Stattersfield & Capper (2000), Vieillard (1976, 1978, 1980).

13. Krüper's Nuthatch

Sitta krueperi

French: Sittelle de Krüper

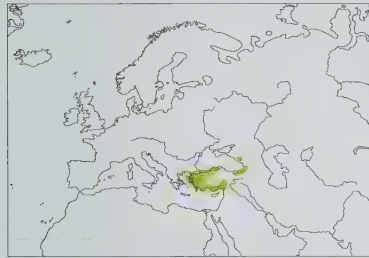
German: Türkenkleiber

Spanish: Trepador de Krüper

Taxonomy. *Sitta krüperi* Pelzeln, 1863, Smyrna (Izmir), west Turkey.

A member of a species group that contains also *S. whiteheadi*, *S. ledanti*, *S. villosa*, *S. yunnanensis* and *S. canadensis*, and all sometimes thought to form a superspecies. Present species has sometimes been treated as conspecific with *S. canadensis*, at least, but differs from that and all others of group in having rufous breast patch (significant in courtship and territorial display) and relatively large difference between adults and juveniles. Recent evidence from mitochondrial DNA suggests that its closest relative is *S. ledanti*, with more distant relationship to *S. canadensis*, *S. whiteheadi* and *S. villosa* (no *S. yunnanensis* material was available for analysis). Monotypic.

Distribution. Extreme E Greece (Lesbos), Turkey (except most of C & E), extreme SW Russia (Krasnodar region and N watershed of NW Caucasus) and S Georgia (foothills of Kuzey Anadolu Mts).



Descriptive notes. 12.5 cm; male 10–14.3 g. A medium-small nuthatch with black forecrown, white supercilium and distinctive rufous breast. Male in fresh plumage (autumn and winter) has forecrown black with slight blue gloss, sharply demarcated from rear crown; supercilium (from nostril to rear of ear-coverts) white, occasionally mottled grey, black eyestripe well defined on lores, broken and less distinct behind eye; upperparts, including lesser and median upwearing-coverts and tertials, medium blue-grey, dark centres of coverts fully concealed, tertials tipped slightly paler; greater secondary coverts and primary

coverts blue-grey, inner webs dark brown, flight-feathers and alula dark brown-grey, smaller feathers of alula, secondaries and inner primaries fringed pale blue-grey, P3–P6 fringed blue-grey inward of emargination; central tail feathers dark brown, tinged blue-grey (especially on outer web), other rectrices black, tipped blue-grey (broadest on outermost rectrix), often some white subterminally on outer two feather pairs; cheek, ear-coverts, side of neck and throat white; centre of breast deep rufous, side of breast and flanks light blue-grey, lower breast to vent pale grey, often washed buffish-brown on side of breast, flanks, thighs and vent; undertail-coverts chestnut, tipped whitish; underwing-coverts and axillaries off-white, longer under primary coverts tipped sooty-black; in worn plumage, cap, supercilium and eyestripe duller and less well defined, cap sometimes with grey mottling, upperparts duller and less blue, flight-feathers (tertials) browner, breast patch paler and less well defined, underparts darker with slight buff tinge, some grey mottling on belly and vent, white tips on undertail-coverts worn away; iris dark cinnamon or brown, narrow white eyering; bill dark horn-grey, cutting edge of upper mandible at base and entire base of lower mandible blue-grey; legs grey-brown or dark grey. Female is as male, but black forecrown duller and less well defined at rear, eyestripe paler, breast on average paler and more orange-rufous, and lower breast washed buff; in worn plumage differences (apart from buffish lower breast) less obvious. Juvenile is distinctive, much dingier than adult, lacking black on forecrown (forehead may be marginally darker than rest of crown), with supercilium and eyestripe poorly marked, breast patch pale rufous and poorly demarcated from dirty brownish belly, bill dark horn-brown, base of lower mandible tinged pink, gape yellow; sexes probably similar, but breast patch of juvenile male possibly darker and more rufous than that of young female. Voice. Very vocal. In excitement or alarm gives subdued, often rather quiet harsh or hissing “cha” or “scharr”, like call of distant Eurasian Jay (*Garrulus glandarius*), becoming louder and given in series as agitation mounts, and may be accelerated into excited, scolding, churring rattle; other calls include soft “pwit”, and “doid” or “dwi” similar to call of European Greenfinch (*Carduelis chloris*); in flight, a nasal “jek”. Song, throughout year (most frequently in spring), a trill given at varying speeds and with differing inflections, in its basic form a shrill, rippling repetition of simple notes at c. 8 per second, “pip-pip-pip-pip...” or “veet-veet-veet...”, lasting 4–8 seconds; in more complex form comprises two alternating notes repeated more slowly (c. 4–6 couplets per second), although still high-pitched and yodelling, for 3–4 seconds, “yu-di yu-di yu-di” or “wicka-wicka-wicka...”.

Habitat. Closely associated with Turkish pine (*Pinus brutia*). In Turkey, found in forests of Turkish pine at lower altitudes and in forests of spruce (*Picea*), fir (*Abies*), pine, cedar (*Cedrus*) and occasionally juniper (*Juniperus*) at higher altitudes; in both dense and open woodland, and sometimes in areas of scattered trees; mostly at 500–1000 m, locally down to near sea-level in W & S and up to 1700 m on Ulu Dag, and at 500–1800 m (exceptionally, to tree-line at 2500 m) in Taurus Mts and Black Sea coastlands. On Lesbos dependent on Turkish pine, although will nest in broadleaf trees if pines nearby; breeds at 200–700 m, mostly above 400 m, and recorded down to sea-level in late summer and winter. In Caucasus region found in fir (favouring old-growth forest), mixed woodland, e.g. beech–fir (*Fagus–Abies*), pines (perhaps especially where a good mixture of fir or spruce) and, at much lower densities, in maple (*Acer*) parkland, and has been recorded as breeding in stand of aspen (*Populus tremula*); at 1000–2000 m, but at 150 m on Black Sea coast near Sutchumi (in a woodland park with introduced conifers).

Food and Feeding. Food largely insects and spiders (Araneae) in breeding season, switching to seeds of Turkish pine and other coniferous trees in autumn and winter; nestlings fed entirely with animal matter. Found singly and in pairs in breeding season; at other times in parties of 2–5 individuals and may join mixed-species foraging flocks. Normally forages in tree-tops among smaller branches and cones, but will utilize all levels of vegetation, including bushes, and sometimes feeds on ground. Inserts the bill between the scales of cones to pull out the seeds, which are then taken to bark crevices and hammered. Arthropods sometimes taken in flight. Will store food for future consumption; as pine seeds can be extracted only when cones partly open, may rely largely on cached food in wet weather (when cones temporarily close); territory probably maintained through winter to guard hoards.

Breeding. Season early Apr to mid-May (depending on altitude and locality) on Lesbos and in Turkey, and Apr–May in Caucasus; probably single-brooded. During breeding season territory vigorously defended, usually by song-duels at territory boundary; rufous breast expanded in threat displays. Nest, built largely by female, a foundation of coarse bark chips, rotten wood and cone scales, lined with a pad of moss, bark fibres, hair, wool, fur and feathers, placed up to 24 m above ground in hole in tree, usually a conifer; excavates own hole in dead trunk or branch or, more frequently, cleans out existing cavity, the work being undertaken mainly by female; eggs sometimes laid on top of a stump or even in pile of twigs in a fork (perhaps only when holes not available); smallest territory on Lesbos 3–4 ha. Clutch 5–7 eggs, creamy white with rusty or purplish spots, often concentrated at larger end, mean size 17 × 13 mm; incubation by female, fed on and off nest by male, period c. 14–17 days; chicks brooded by female, fed by both parents, fledging period 16–22 days.

Movements. Resident, with some post-breeding dispersal. In Turkey noted at Çamlıca hills (in Istanbul) in autumn, and on Black Sea coast at Kizil İrmak delta in spring (late Apr). Some seasonal altitudinal movements, perhaps involving mostly immatures, and on Lesbos recorded down to sea-level in late summer and winter. In Caucasus some descend into montane broadleaf woodland, others reach foothills, and even locally Black Sea coast (in mixed woodland and regularly in conifer arboretum at Sochi, and Kolkhida forests of W Georgia). Many remain near high-altitude breeding

grounds throughout winter. A flock of 15–20 individuals recorded in Sept, suggesting unusual dispersal. Vagrant in mainland Greece.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Fairly common throughout range. Estimated population in Turkey 60,000–120,000 pairs, in Russia 20,000–50,000 pairs, and in Greece (Lesbos) 200–600 pairs; numbers in Georgia unknown. In Caucasus, densities vary from 4 pairs/km² in maple parkland to 48 pairs/km² in fir forest and 50–90 pairs/km² in mixed forest. Overall, numbers were stable during 1970–1990, but the two largest populations (in Turkey and Russia, which together hold more than 95% of global population) both declined by over 20% in period 1990–2000. In Turkey, increase in tourism has placed great pressure on old coniferous forests, especially in coastal regions, where the species was once numerous; urbanization and the construction of summer houses a growing problem throughout Mediterranean region. Population on Lesbos believed to be stable, although commercial resin extraction has reduced the number of old trees suitable for nesting.

Bibliography. Albayrak & Erdogan (2005, 2006), Anon. (2007i), Cramp & Perrins (1993), Delin & Svensson (1988), Dementiev *et al.* (1954a, 1970), Frankis (1991), Hagemeijer & Blair (1997), Handrinos & Akriotis (1997), Harrap & Quinn (1996), Kumeriove (1958), Leonovich *et al.* (1996a), Löhr (1962), Matthysen (1998), Neufeldt & Wunderlich (1984), Roselaar (1995), Vaurie (1959).

14. Chinese Nuthatch

Sitta villosa

French: Sittelle de Chine

German: Chinakleiber

Spanish: Trepador Chino

Other common names: Snowy-browed/Black-headed Nuthatch

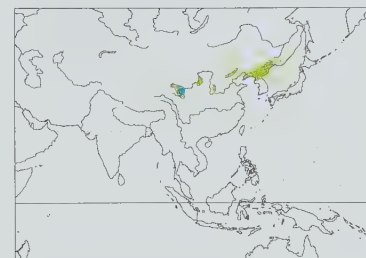
Taxonomy. *Sitta villosa* J. Verreaux, 1865, China north of Beijing.

A member of a species group that contains also *S. whiteheadi*, *S. ledanti*, *S. krueperi*, *S. yunnanensis* and *S. canadensis*, and all sometimes thought to form a superspecies. Present species formerly treated as conspecific with *S. whiteheadi* and *S. canadensis*; close relationship with these two supported by recent data on mitochondrial DNA, which indicate also a more distant relationship to *S. krueperi* and *S. ledanti* (no *S. yunnanensis* material was available for analysis). A nesting pair of nuthatches resembling present species and *S. whiteheadi* found at 2000 m in Altai Mts of extreme S Siberia (at Aktru, S of Karay) in 2006; this could represent a remarkable range extension of either species, or an as yet undescribed species, but requires verification. Geographical variation partly clinal, birds in W part of range largest and darkest below and those in E smallest and palest. Three subspecies recognized.

Subspecies and Distribution.

S. v. bangsi Stresemann, 1929 – NC China in NE Qinghai (Daban Shan), adjacent C & S Gansu (E Qilian Shan S to N Min Shan), extreme N Sichuan and, probably disjunctly, W Ningxia (Helan Shan). *S. v. villosa* J. Verreaux, 1865 – NE China in N Hebei (S at least to mountains N of Beidaihe and Eastern Qing Tombs), Beijing Municipality and W Shanxi (Kelan S to Zhongtiao Shan).

S. v. corea Ogilvie-Grant, 1906 – Russian Far East (S Ussuriland S of 45° N, and possibly S Sakhalin), extreme N Korea (around Mt Paektu, in Changbai Shan, and scattered from N Hamgyong, Yanggang and Pyongan S to Pyongyang) and NE China (S Jilin and S Liaoning).



Descriptive notes. 11.5 cm; 8–11 g. A small nuthatch with dark cap and pale supercilium; slender, sharply pointed bill may give distinct upturned effect owing to straight culmen. Male nominate race in fresh plumage (Aug to mid-winter) has crown and nape black, slightly glossy, upperparts blue-grey; white supercilium faintly washed buff, flecked blackish over bill and at rear (supercilia barely meet over bill), extending broadly onto side of mantle, narrow blackish eyestripe from nostril to rear of ear-coverts with some pale grey feather tips (may largely obscure black bases); upwearing-coverts dark brownish-grey (greater coverts

washed blue-grey), fringed medium blue-grey, primary coverts and alula dark grey, fringed medium blue-grey; tertials and flight-feathers dark brownish-grey, tertials washed blue-grey, secondaries and inner primaries fringed blue-grey, primaries P3–P6 fringed paler and greyer (inward of emarginations only); central tail feathers dull blue-grey, other rectrices sooty black with mid-grey tips (tip tiny on T2, extensive on outer web of outermost rectrix), outermost rectrix with whitish subterminal area on outer web extending diagonally onto inner web, and faintly indicated on T5 (especially on tip of inner web); cheek, ear-coverts, chin and upper throat white, grading to buffy white on lower throat and side of neck, and pale greyish-buff (or pale pinkish-buff with grey wash) on remainder of underparts, slightly cleaner and more cinnamon on flanks and belly; thighs dark grey, tipped dull buff; axillaries drab buffish, underwing-coverts medium to dark grey, finely tipped paler; longer under primary coverts and base of primaries white; in worn plumage, upperparts duller and slightly less blue, flight-feathers bleached and worn paler, but underparts little changed; iris brown or dark brown, narrow whitish eyering; bill slaty black, base of lower mandible grey-blue; legs dull blue-grey or brownish-grey. Differs from remarkably similar *S. whiteheadi* mainly in somewhat brighter plumage, especially below; easily distinguished from *S. przewalskii* (which has similar rich cinnamon underparts) by head pattern. Female as male, but cap grey and only slightly darker than mantle (with plumage wear, becomes darker and more contrasting sooty grey, especially on forehead, and sometimes entire crown sooty black and gradually merging with blue-grey nape), supercilium slightly narrower, eyestripe duller and less well defined (more extensively flecked pale grey), upperparts duller, fringes of wing feathers brown-tinged, underparts slightly duller and darker. Juvenile is marginally distinct, male has cap duller and less glossy black than adult (but blacker than even darkest-crowned female), and rather darker and richer cinnamon underparts. Race *bangsi* is largest, with underparts brighter, in fresh plumage male orange-cinnamon below (slightly darker than juvenile male of nominate), female dull buffy cinnamon, fringes of wing feathers tinged cinnamon; *corea* is marginally the smallest in size and palest, greyish-smoky, below. Voice. Three basic calls: type 1 is a prolonged, harsh, rasping “schraa, schraa” similar to call of Eurasian Jay (*Garrulus glandarius*), given (in agitation or excitement) singly or in irregular series at intervals of 0.3–1 second (then sometimes becoming shorter and higher); type 2 is various quiet conversational short notes, more melodic or piping, and repeated in series e.g. “wip, wip, wip...”, or “quip-quip-quip-quip”, becoming thin, squeaky “quit, quit, quit...”, series very variable in duration and in number of notes (short or long, and individual notes repeated either very rapidly or at irregular intervals); type 3 is short nasal “quii, quii” at varying pitches, again sometimes in long series, either very rapidly or at irregular intervals. Song, from tree-tops (while flicking wings and tail), a rapid repetition of c. 5–30 type-2 calls, pure and melodic upwardly inflected whistles increasing in volume during first part of series, c. 7 notes per second but each note easily distinguish-

able, series lasting c. 1.5–2.25 seconds, may be introduced by higher note, “tsi-pui-pui-pui-pui...”. A variant is a much flatter, less musical and more monotonous rattle, “duiduiduidui...” (c. 12 units per second). Another variant (“slow song”) is slow repetition of 7–11 “quit” notes.

Habitat. In China inhabits coniferous forest, probably chiefly pine (*Pinus*) and spruce (*Picea*), sometimes with mixture of oak (*Quercus*) and birch (*Betula*), predominantly in hills; recorded in N Sichuan at 2100–2600 m, in Jilin (Changbai Shan) 780–2100 m (with breeding noted at 780–1800 m), and breeds in Beijing area at 1300 m; recorded also from conifer plantations at lower altitudes and perhaps breeds also in relict stands of trees around tombs and temples in lowlands, and certainly disperses to plains level in winter. In SE Russia (Ussuriland) and N Korea associated with relict plateau larch forest (*Larix dahurica*), mixed tree stands and, in extreme N, also with *Picea obovata* at 600–1500 m (600–750 m in Ussuriland) and foothill pinewoods (mainly *Pinus densiflora*) below 600 m (in N Korea), but recorded as breeding also in city park of Pyongyang.

Food and Feeding. Food in summer almost exclusively insects, in winter (through to at least May) pine seeds and other seeds also taken; young fed entirely with animal items. In studies in China, diet in Apr–Aug consisted of 98.5% insects, mainly beetles (Coleoptera), Hymenoptera, Lepidoptera, heteropteran bugs, homopteran bugs (including Aphidina, Cicadina), Neuroptera, flies (Diptera). In winter found in pairs, often in mixed-species foraging flocks. Forages in tops of moderately tall trees, on branches and twigs, clinging upside-down to small cones while rapidly fluttering wings; less often on trunks. Sometimes flycatches, and dives after dropped items. Larger insects held down with foot and torn apart with bill. Habitually hoards food.

Breeding. Recorded in Apr, with nest-building in Mar, in NE China and Korea; normally single-brooded, perhaps occasionally a second brood (copulation by nesting pair observed in May). Nest built by both sexes, taking 7–8 days, bowl-shaped, made from plant fibres, feathers and grass, placed in cavity in tree (conifer or broadleaf), rotten stump or old building (e.g. damaged wooden roof of pagoda), in N Korea mainly in larch or old chestnut (*Castanea*) but also in poplar (*Populus*), oak and cherry (*Prunus*), height above ground 0.3–14 m (maximum 7 m in one study, average of 13 nests 9.4 m in another); either excavates own hole or uses abandoned woodpecker (Picidae) hole, diameter of entrance c. 35 mm; during incubation stage, male habitually brings mud to sitting female, and she uses this to repair inside wall of nest-hole (although species appears not to daub entrance hole with mud or resin). Clutch 4–9 eggs, usually 5–6, white, marked with reddish-brown, size 15–17 × 12.5–13 mm; incubation by female, fed on nest by male, period 15–17 days; chicks fed by both sexes, fledge after 17–18 days.

Movements. Summer visitor in SE Russia (Ussuriland), arriving mid-May; regular on passage in May on Bol'shoy Pelis, in Zaliv Petra Velikogo (Peter the Great Bay), off S Ussuriland. Apparently a summer visitor also to breeding areas in N Korea (some post-breeding dispersal into surrounding area), and in Changbai Shan (Jilin) and perhaps other areas of NE China, but possibly moving only to lower altitudes or dispersing short distances in winter; thus, in Hebei disperses to lowlands, occasionally to coastal areas (e.g. near Beidaihe). In remainder of range in China resident, with some altitudinal movements, and some erratic dispersal in winter; vagrant or winter visitor in S Shaanxi (Qin Ling Shan). Very rare non-breeding visitor in S Korea, mainly Oct–Mar, only recent record from Kwangnung Experimental Forest (near Seoul), in Mar 1968.

Status and Conservation. Not globally threatened. Common to fairly common in much of range; rare in Russia (Ussuriland). Status on Sakhalin unclear, one record, in May 1983, of a pair near Yuzhno-Sakhalinsk, in far S of island; female seen to enter a tree cavity, but this contained no nest material, and male was singing nearby. May sometimes be overlooked as a result of its preference for dense vegetation in canopy of coniferous trees. Fairly common in China, although densities not high, and confined to remaining areas of pine forest in hills; deforestation has reduced population of this nuthatch throughout much of range. In N Korea, common around Mt Paektu but rare farther S. Rare in Ussuriland, where population unlikely to exceed 20–30 pairs and recent systematic searches detected only 2–3 pairs; suitable habitat covers no more than 30–40 km², and surviving areas are being degraded by fire and logging.

Bibliography. Dickinson (2006), Dickinson *et al.* (2006b), Fiebig (1992, 1995), Gao Wie (1978), Harrap & Quinn (1996), Leonovich & Veprintsev (1986), Leonovich *et al.* (1996a), Ler (1989), Matthysen (1998), Matthysen *et al.* (1991), Mauersberger (1989), Nazarenko (1988, 2005, 2006), Smit *et al.* (2007), Tomek (2002).

15. Yunnan Nuthatch

Sitta yunnanensis

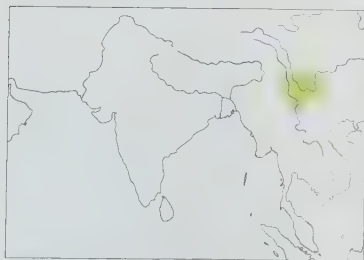
French: Sittelle du Yunnan **German:** Yünnankleiber **Spanish:** Trepador de Yunán
Other common names: Black-masked Nuthatch

Taxonomy. *Sitta yunnanensis* Ogilvie-Grant, 1900, near Wei Yuan, south Yunnan, China.

Usually considered a member of a species group that contains also *S. whiteheadi*, *S. ledanti*, *S. krueperi*, *S. villosa* and *S. canadensis*, and all sometimes thought to form a superspecies; differs, however, from others of group in that crown of male is concolorous with upperparts. Alternatively, sometimes thought to represent a link between that group and the “*S. europaea* superspecies” (containing also *S. nagaensis*, *S. cashmirensis*, *S. castanea*, *S. cinnamoventris* and *S. neglecta*), but as yet no DNA evidence to lend support to either argument. Monotypic.

Distribution. S China, from extreme SE Xizang (Zayu and Zhuwagan) E to S Sichuan (S from Yajiang) and S to W & C Yunnan and W Guizhou.

Descriptive notes. 12 cm; 7.5–13 g. A small nuthatch with slender, slightly upturned bill, narrow supercilium and broad long black eyestripe. Male in fresh plumage (Aug to spring) has whitish lower forehead and narrow supercilium extending to rear of ear-coverts, black eyestripe from nostril to side of mantle, broad (c. 5 mm) at rear, sometimes invaded with grey behind ear-coverts; crown and upperparts, including tertials and upperwing-coverts, medium grey-blue, often some paler feather centres visible on nape and upper mantle, inner webs of tertials greyer, grey inner webs of greater coverts fully concealed; alula,



primary coverts and flight-feathers dark grey-brown; smaller feathers of alula, primary coverts, inner primaries and secondaries fringed grey-blue, primaries P3–P6 fringed pale grey-blue inward of emargination; central tail feathers grey-blue (as upperparts), other rectrices blackish, broadly tipped blue-grey (extending along fringe of outer web), amount of white in tail variable, some individuals having T4–T6 with white triangle subterminally on fringe of inner web, T6 narrowly fringed white on inner web, others having a much larger subterminal white spot on inner web of T4–T5 and narrow broken diagonal subterminal bar across both webs of T6; chin, cheek, lower ear-coverts and side of neck white (forming contrasting line below dark eyestripe); throat and

underparts clean pale pinkish-buff, flanks and vent washed greyer, thighs dark grey, tipped pale pinkish-buff; axillaries light grey, underwing-coverts sooty grey, longest under primary coverts and base of primaries contrastingly whitish; in worn plumage, whitish feather tips forming supercilium abraded (on forehead reduced to few white flecks, sometimes entirely absent), eyestripe broader and more prominent (and black feather bases on forehead revealed), upperparts duller and less blue, wing and tail very abraded (but grey-blue fringes on flight-feathers present until at least May), underparts dirty pale buff-grey or greyish-white (when very worn, dark feather bases visible and underparts very dingy); iris dark brown, narrow white eyering; bill grey-black, yellowish-horn base of lower mandible (in museum specimens); legs grey-black. Female as male, but eyestripe on average less intensely black and underparts slightly duller and greyer, less pure pale pinkish-buff. Juvenile is duller than adult, with supercilia faint and not meeting on forehead (and sometimes almost lacking), eyestripe similarly reduced or absent, cheek patch dirty grey-white (rather than pure white), throat whiter, underparts dull greyish-cinnamon (not so pale as worn adult), bill considerably shorter, yellowish-horn base of lower mandible more extensive. **VOICE.** Rather vocal. Calls include nasal “nit” or “kni”, a shorter, more abrupt and higher-pitched (although still nasal) “tit”, an abrupt squeaky “pit” and a low nasal “toik”, all these given singly, but “nit” call sometimes in couplets as full “nit-nit” or abrupt nasal “chit-chit”, also often in series of 4–10 units at 5–6 notes per second, “kni-kni-kni...”, variations including purer, thinner and more peevish “kit-kit-kit...”, clearer and more piping “pi-pi-pi...”, and more nasal (but relatively high and weak) “niew-niew-niew”, each unit falling slightly in pitch. Other calls include harsh, scolding “schri-schri-schri...” (or “szi-szi-szi...”), similar to call of Eurasian Jay (*Garrulus glandarius*), which may grade into high, strident nasal “ziew-ziew-ziew...” (similar to sound made by squeaky toy) in series at c. 3 calls per second; “ziew” calls quite well separated or may be run together into cacophony of sound, and sometimes shortened to “zi”. Related calls include full explosive nasal “quit-quit-quit”, singly or in groups of 2–3 units, harsher and emphatic nasal “schu-schu-schu”, and thinner upwardly inflected nasal “tui-tui-tui”.

Habitat. Open mature pine (*Pinus*) forest with little undergrowth or scrub, apparently avoiding denser stands of spruce (*Picea*) and fir (*Abies*). Occasionally forages in relatively small pines, even as short as 2–3 m, in open forest and among scattered trees. Found at 2440–3400 m, sometimes to 3960 m, in summer; some movement to lower altitudes in winter, when recorded in Guizhou at 1670 m in Mar and c. 2750 m in Nov, and in Yunnan noted at 1200 m in Gaoligong Shan in Feb and 2000 m at Shuangbai in Sept, but also at 2600–4000 m in Nov–Jan.

Food and Feeding. Little information. Food insects. Frequently forages among needle clusters of pines in manner of a tit (Paridae).

Breeding. Female in Guizhou on 9th Mar was near to laying, and juveniles found from 21st May onwards. No other information.

Movements. Resident.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Yunnan Mountains EBA. Locally common. Occurs at few sites on edge of range, e.g. in W Guizhou recorded only from Shuicheng (two individuals at Tuoda forest, 60 km NW of Weining, in Nov 1987). Has disappeared from several localities where recorded in early 20th century. Is presumably continuing to decline as a result of logging and forest fires, and, although this species does appear able to adapt to degraded and secondary forest, it could be dependent on mature pines for nesting; detailed ecological studies needed.

Bibliography. Anon. (2007i), Butchart & Stattersfield (2004), Cheng Tsohsin (1987), Collar *et al.* (2001), Dickinson *et al.* (2006b), Harrap & Quinn (1996), Hornbuckle (2003), Matthysen (1998), Riley (1926, 1931), Stattersfield & Capper (2000), Vaurie (1957b).

16. Red-breasted Nuthatch

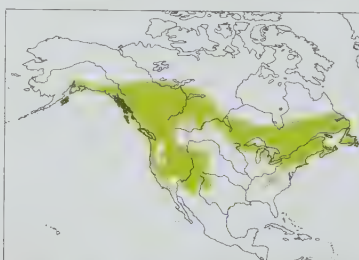
Sitta canadensis

French: Sittelle à poitrine rousse **German:** Kanadagleiber **Spanish:** Trepador Canadiense
Other common names: Red-bellied Nuthatch

Taxonomy. *Sitta canadensis* Linnaeus, 1766, Canada.

A member of a species group that contains also *S. whiteheadi*, *S. ledanti*, *S. krueperi*, *S. villosa* and *S. yunnanensis*, and all sometimes thought to form a superspecies. Present species formerly treated as conspecific with *S. whiteheadi* and *S. villosa*; close relationship with these two supported by recent data on mitochondrial DNA, which indicate that all three form a sister-clade to *S. krueperi* and *S. ledanti* (no *S. yunnanensis* material was available for analysis), with a genetic distance of approximately 10% between the two clades. Monotypic.

Distribution. Breeds from SE Alaska (E from Kodiak I) and S Canada (S from S Yukon, including Queen Charlotte I and Vancouver, N Saskatchewan and C Manitoba, and E to SC Quebec, S Labrador and Newfoundland, including islands of Prince Edward, Anticosti, and St Pierre and Miquelon), S in W USA (absent much of E Washington) to mountains in California (excluding immediate coast, but breeds irregularly Santa Cruz I) and Rocky Mts and Great Basin from W & S Montana (also isolated forests in E) S to C & W Colorado, E Arizona and S New Mexico, also W South Dakota (Black Hills) and irregularly SW North Dakota and N Nebraska; in E, breeds S to NE & E Minnesota, N Wisconsin, S Michigan, N Ohio, C Pennsylvania, S New Jersey and N Connecticut, extending S in Appalachian Mts to E Tennessee and W North Carolina.



Descriptive notes. 11.5 cm; male average 11 g, female average 10 g (summer, Maine), autumn migrants 8–12.7 g (New Jersey). A small nuthatch with conspicuous white supercilium. Male in fresh plumage (Aug–Jan) has crown and nape black, faintly glossed blue, forehead and supercilium whitish, extending to side of upper mantle, eyestripe (from extreme base of bill) black, extending to side of upper mantle (on some very broad at rear, connecting with rear crown, on others narrower and with white mottling on lower border and side of neck); upperparts, including lesser and median coverts, medium grey-blue, often some white

feather centres visible on uppermost mantle; greater upperwing-coverts and tertials dark brown-grey, broadly fringed grey-blue, flight-feathers, primary coverts and alula dark grey-brown, all but outer primaries narrowly fringed grey-blue, P3–P6 fringed pale grey inward of emargination; central tail feathers medium grey-blue as upperparts, other rectrices black, outer four pairs tipped blue-grey, outer three pairs with diagonal white subterminal bar (largest on outermost); chin, cheek, ear-coverts and side of neck pale buff to whitish, darkening to cinnamon-orange on breast and rufous-cinnamon on side of breast, flanks and belly to undertail-coverts, but colour of underparts very variable (from buffy white to ochre-cinnamon); underwing-coverts and axillaries whitish,

washed cinnamon, median under primary coverts dark grey, base of primaries whitish; in worn plumage, cap duller, upperparts duller and less blue, with more white mottling on nape, flight-feathers paler and browner, underparts paler and less richly coloured, dirty pale orange-buff; iris brown, narrow white eyering; upper mandible black, lower mandible pale blue-grey, darker towards tip; legs dusky. Female is as male, but in fresh plumage cap medium grey-blue to blackish-grey (in worn plumage forecrown may be dull black), eyestripe narrower, mottled grey when fresh but usually dull black when worn (and at all times often darker than cap), underparts on average paler and duller, more cinnamon-buff. Juvenile is rather similar to adult of respective sex, but has yellow base of lower mandible (changing to white after 2–4 weeks) and paler legs for short period after fledging, upperparts less bluish than fresh adult (sometimes a few black fringes), can have faint dark specks in supercilium, chin and cheek, greater upperwing-coverts may be faintly tipped brownish, underparts on average paler; juvenile male has cap duller and less well defined than adult, juvenile female has cap and eyestripe dull grey and concolorous with mantle (as feather bases grey, does not darken with wear). **Voice.** Commonest call a nasal, bleating or mewling “knair, knair, knair” or “yna, yna, yna”, like sound made by a toy tin horn (rather more nasal, less cawing, than equivalent call of *S. carolinensis*), usually far-carrying, but may be quiet and inconspicuous in absence of other nuthatches, and varies in pitch and inflection; may be repeated in rapid series (“k-k-k-k-k-...”) or in slow regular sequence (“yaaaaa, yaaaaa, yaaaaa”); from late winter onwards given by unpaired male from tall trees, and probably serves both territorial and courtship functions. When irritated or angry emits variable fast but slightly quavering notes, e.g. “hnhnhnhn...” or “nananana-...” or “biddy-biddy-biddy-...”, sometimes in long series, essentially a rapid repetition of call, which at high intensity sounds like an electric buzzer, and in heightened excitement becomes trilled “thiiiiirrrrr”. Contact call is a soft, conversational nasal “it”, “pit” or “het”. Other calls include “phew”, singly or in short series, in situations of emotional intensity and sometimes elaborated into a “song”; a “zee zee zee zee zee”, by male when scolding intruder near nest and when chasing rival; repeated “purp”, becoming “we-we-we” or “peep, peep, peep-...”, by food-soliciting female; also a variety of musical “songs” comprising low twitterings and medleys of notes, at greater volume and intensity by male when feeding mate or young, and more loudly during courtship or fights, e.g. quavering soft “tee-you-you-you” and “wee-wur-tee-teo-too-too-wee-r”.

Habitat. Breeds in most temperate coniferous and mixed forests, especially where spruce (*Picea*), fir (*Abies*), pine (*Pinus*), hemlock (*Tsuga*), larch (*Larix*) and cedar (*Cedrus*) present, less commonly in pure stands of pine and hemlock; found also in mixed woodland with strong coniferous element and, more rarely, in deciduous woodland such as American aspen (*Populus tremuloides*). Standing dead wood required for nesting. Across wide range of elevations, from near sea-level to montane forest, but in S of range suitable habitat usually montane or submontane; in California breeds at 760–3075 m in Sierra Nevada (although recorded in summer as low as 275 m in N Coast Range); breeds above 900 m in North Carolina and above 1060 m in Tennessee. In winter in same habitat, but away from breeding areas utilizes much wider range of habitats, including deciduous forest, orchards, scrub, riparian woodland, and parks, shade trees and gardens in suburban areas, although with distinct preference for conifers where available. Montane breeders may descend to lower altitudes in winter but, depending on food supply, may remain in montane coniferous forests throughout year, e.g. recorded mid-winter in Idaho at 1830 m and above. On migration can be found in very wide range of wooded habitats, even shrubs and isolated riparian woodland in desert areas, although appears still to prefer coniferous trees; in extreme situations sometimes found away from trees, foraging on rocks, cliffs and roofs or in weeds and long grass.

Food and Feeding. Diet in summer diet mainly insects, especially beetles (Coleoptera), and spiders (Araneae), and young fed exclusively with insects; in winter largely conifer seeds, but will take seeds also of other plants, e.g. sedges (Cyperaceae), and occasionally eats fruit. Often attracted to garden feeders. In summer usually in pairs, and partners remain together on territory throughout winter if food resources adequate; otherwise, wintering migrants found singly or in flocks, typically of up to 4 individuals, and both migrants and residents may join mixed-species flocks. Forages primarily in conifers, in mixed forest also in deciduous trees, spending most time in crown, on small branches, probing beneath flakes of bark, at base of needle clusters and in cones; much less frequently forages lower on trunks or on the ground, the last especially in autumn when searching for fallen seeds and arthropods. Extracts seeds from cones; wedges food item into a crevice and pecks it into smaller pieces. Sometimes indulges in aerial flycatching, particularly during non-breeding season. Stores food, especially conifer seeds but also arthropods, in bark crevices, in disused sapsucker (*Sphyrapicus*) holes or occasionally in ground, sometimes covering stored item with a scrap of bark; has been seen to stuff seeds into cracks on granite wall very high above valley floor in Yosemite National Park, in California. In regions where species is resident, food caches are probably critical for overwinter survival.

Breeding. Season mid-Apr to late Jun; normally single-brooded, only one recorded case of two broods being reared. Pairs on breeding grounds, and territorial during breeding season; partners

stay together on territory throughout year if food resources allow, and remain mated for more than one season. Nest, built by female with some help from male, a bed of bark chips, pine needles, grass or rootlets, often lined with hair, fur, feathers, fine grass or shredded bark, placed 0.6–37 m (usually 2–12 m) above ground in cavity in tree; excavates own nest-hole, preferring standing dead tree, less often partially dead or live tree, either deciduous or coniferous, or sometimes existing cavity (only rarely nestbox) used, female selects site but unmated territorial male may initiate excavation of up to four different cavities and sing from these potential nest-sites; excavation by both sexes, female undertaking most of work, male typically perches nearby and brings food to her while she excavates; when nest completed, regularly smears entrance and trunk around it with sticky resin from balsam fir (*Abies balsamea*), spruce or pine, usually employing bill but sometimes using small piece of bark as applicator, fresh globules of pitch brought by both sexes until young fledge (during incubation stage, male applies resin primarily to outside of cavity entrance, female primarily to inner walls of entrance), resin may be thick enough to flow down trunk (pitch presumably discourages predators or nest-hole competitors); adults avoid pitch by flying straight in to nest (rarely, found dead, stuck to resin), and when young about to leave nest adults cover entrance floor with litter or fur (presumably to neutralize pitch and ensure safe passage for young). Clutch 2–8 eggs, usually 6, creamy white, sometimes pinkish-white, variably spotted reddish-brown, mean size 15.7 × 12 mm; incubation by female, fed both on and off nest by male, period 12 days; chicks fed by both sexes, leave nest at 18–21 days, remain with parents for at least two weeks after fledging.

Movements. An irruptive migrant, winter distribution and abundance dependent on crop of spruce, fir and pine seeds; generally has two-year cycle, although invasions sometimes in consecutive years. In years with good cone crop in N, the “centre of gravity” of population shifts S only slightly, with records as far N as SE & S coastal Alaska (rare; also casually in C Alaska) and, in Canada, NC Alberta, C Saskatchewan, S Ontario, S Quebec and throughout Maritime Provinces; also, montane populations remain at higher altitudes. In years of crop failure, exodus from breeding areas takes place, and can reach extreme S California, lowlands of S Arizona and S New Mexico, S Texas (occasionally as far S as Rio Grande delta), Gulf Coast and N Florida; degree to which birds penetrate S parts of USA variable, large numbers reaching Gulf Coast (where otherwise uncommon) every 5–10 years, but largely absent from Great Plains and a rare visitor to N Mexico (N Baja California, two records, Sept and Apr) and irregularly S to Sinaloa and NE Nuevo León. Timing of movements variable, typically migration begins late Jul or Aug and may continue to Nov, first birds penetrating S of breeding range from late Sept; major invasions sometimes start earlier, with large numbers on E seaboard and S edges of breeding range from mid-Aug or even Jul, and in big “flights” impressive passages of several hundreds moving S in a few hours (e.g. at sites on Gaspé Peninsula, in Quebec, number can exceed 1000 birds per day); recorded in S states late Oct to mid-Apr/early May (from late Sept, exceptionally late Aug, in invasion years). Return passage N in spring occurs Mar–May, and always less impressive than movement in autumn. Vagrants recorded on Socorro I, off W Mexico (Mar 1957), Bermuda (three recent records in 1970s, in Oct and Mar), Iceland (May 1970) and England (Oct 1989 to May 1990).

Status and Conservation. Not globally threatened. Generally fairly common to abundant; less common in extreme NW and extreme NE of range, and locally rare in Alaska. S boundary of breeding range variable, with isolated nesting records in many localities away from main range, and greater numbers breeding at S limit in years following good cone crops in these areas; thus, irregular in summer NW Indiana, S New Jersey, Connecticut and Rhode Island, and extremely rare breeder Iowa, Kansas, Missouri, Illinois, Maryland, C & NC Oklahoma and Texas (Guadalupe Mts); recorded also WC & SE Kentucky. Formerly bred on Guadalupe I, off N Baja California (Mexico), but last recorded there in 1971 and considered now extinct. Highest densities from British Columbia S to California, Idaho, Montana and Wyoming, in SC Canada (Manitoba, Ontario), and in New Hampshire, Maine and Nova Scotia; lower densities in Alaska (where uncommon to rare), Yukon and Newfoundland; breeding densities variable, e.g. 0.3–0.7 pairs/ha in SE British Columbia, 0–15 pairs/ha in NW Washington and 0–3 pairs/ha in N California. Spread S & E during 20th century, especially in E of range, following colonization of mature spruce and fir plantations and ornamental conifers; throughout breeding range populations increased significantly (average 2.8% per year) from 1966 to 1996. Winter abundance highly variable, but areas that constantly hold high numbers are dense forests of SE British Columbia and NE Washington, around the Michigan–Wisconsin border, and in NE USA. Historically, destruction of habitat and degradation of many remaining forests by unfavourable management practices, especially removal of dead and diseased trees and replacement of mature mixed conifer forests with homogeneous even-aged stands, presumed to have caused significant decrease in population sizes.

Bibliography. Aley & Aley (1995), Anon. (1998b), Bent (1948), Bock & Lephthien (1972), Cramp & Perrins (1993), Gaines (1988), Ghalambor & Martin (1999), Godfrey (1986), Harrop & Quinn (1996), Kilham (1973), Löhri (1961), Matthysen (1998), Matthysen *et al.* (1992), Pasquet (1988), Phillips (1986), Robinson *et al.* (2005), Root (1988), Ruiz-Campos & Quintana-Barrios (1991), Templeton & Greene (2007).



17. White-cheeked Nuthatch

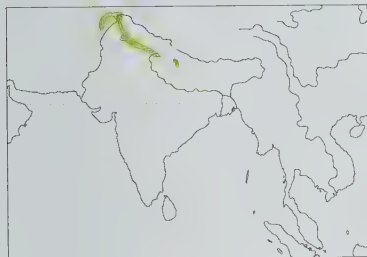
Sitta leucopsis

French: Sittelle à joues blanches **German:** Weißwangenkleiber **Spanish:** Trepador Cariblanco

Taxonomy. *Sitta leucopsis* Gould, 1850, interior NW Himalayas.

Forms a superspecies with *S. przewalskii*; until recently considered conspecific, but separated on basis of significant morphological and vocal differences. Sometimes thought to be closely related to *S. carolinensis* and has been treated by some authors as conspecific with it, the contact calls of the two being rather similar; has also been allied with the “*S. canadensis* group” and, again, some similarity with latter in vocalizations. Given the close similarity of all the medium-small nuthatches, however, precise relationships obscure, and comprehensive genetic studies required. Monotypic.

Distribution. NE Afghanistan (Nuristan S to N slopes of Safed Koh and Paktia province), and Himalayas from N Pakistan (S to Kurram valley and Murree Hills) E to Kashmir and N India (N Himachal Pradesh, N Uttaranchal Pradesh E to Kumaon), and NW Nepal (Langu valley, L Rara and Dolpo E to Tarakot, on Dhaulagiri massif).



Descriptive notes. 13 cm; 13.5–15.9 g. A medium-sized, relatively long-billed nuthatch with distinctive combination of black cap and whitish side of head, lacking black eyestripe. Male in fresh plumage (Aug–Mar) has crown, nape and side of mantle glossy black, upperparts, including tertials and upperwing-coverts, medium to dark grey-blue, median and greater coverts with dark grey centres; primary coverts and alula dark grey, flight-feathers dark grey-brown, inner primaries and secondaries fringed grey-blue, P3–P5 fringed grey-blue inward of emargination and very narrowly whitish distally of emargination; central tail

feathers grey-blue as upperparts, other rectrices blackish-grey, tipped medium grey, tips progressively broader towards outer feathers, T5 with small subterminal white spot on inner web, T6 with oblique white bar subterminally on inner web and narrow white fringe centrally on outer web; lores, supercilium, ear-coverts and throat white, faintly tinged buff, breast, upper flanks, belly and centre of vent white, washed creamy buff, rear flanks and side of vent rufous, undertail-coverts slightly paler and more orange, thighs greyish-rufous; axillaries pale grey, underwing-coverts sooty black, longest under primary coverts and base of primaries white; in worn plumage, cap slightly less glossy, upperparts duller and greyer, underparts dirty creamy with grey wash (paler and less buffy); iris hazel-brown to dark brown; bill blackish, base of lower mandible pale grey; legs yellowish-brown, greenish-brown or dark brown. Female is very like male, but cap somewhat less glossy and extending a little less far on to mantle. Juvenile resembles adult, but cap duller, less clear-cut at rear, flight-feathers with slightly paler fringes and tips, cheek patch more creamy buff, and cheeks and underparts faintly vermiculated darker. **VOICE.** Call, constantly during foraging (but can be very quiet during latter stages of breeding), a distinctive, insistent, nasal or bleating “knair” or “nyah”, like sound made by tin trumpet, similar to call of *S. carolinensis* and even more so that of *S. canadensis*, given singly or in irregular series; also similarly nasal notes as rapid couplet, “que-que”, sometimes repeated for long periods, “que-que, que-que, que, que-que...”, or “quair-quair” (again recalling *S. carolinensis*).

Habitat. Coniferous forest, especially fir (*Abies*) and pine (*Pinus*), occasionally mixed forest; in Pakistan found in inner, colder mountain valleys in dry coniferous zone and also in moist temperate forest with richer mixture of broadleaf and coniferous trees. Altitudinal range generally extends to near tree-line. In E Afghanistan recorded from 2135 m in Safed Koh to 3000–3200 m in Nuristan, in latter to upper limit of coniferous forest although not up into juniper (*Juniperus*) zone; in Pakistan and NW India in summer c. 2100–3000 m, even as high as 3660 m in Chitral, optimum zone 2440–3000 m, descending in winter locally to 1800 m; in W Nepal recorded at 2745–3900 m (reports of this species to 4575 m, well above tree-line, considered improbable).

Food and Feeding. Few details of diet; insects, and conifer seeds (of various species). Usually in pairs in spring and summer; at other times may join mixed-species foraging flocks. Forages both in upper canopy of tall trees, on trunk or small branches, and on underside of thick, lichen-draped branches in lower part of cedar (*Cedrus*) trees; less frequently lower down on main trunk. Observed in summer to catch prey by flycatching.

Breeding. Season late Apr to mid-Jun; single-brooded. In apparent territorial display, male perches on top of tall fir, jerking body from side to side and flicking wings, calling all the while. Nest variable, simply a pad of grass and dead leaves, or a more elaborate construction of moss with fur and hair lining, placed 5–30 m (usually above 9 m) above ground in hole or crevice in conifer, often a crack in trunk of lightning-struck tree; abandoned woodpecker (Picidae) excavation sometimes used, and has been recorded as using a hole in ground below a root; observed to perform “bill-wiping” around nest-site (as *S. carolinensis*), but does not use mud or resin to reduce size of entrance hole. Clutch 4–8 eggs, usually 6–8, pinkish-white, with numerous reddish and purple-grey spots concentrated at one end, mean size 18.1 × 13.8 mm; incubation by female, young fed by both sexes; no information on duration of incubation and nesting periods.

Movements. Resident. May undertake some altitudinal movements, although recorded as high as 2400 m in Pakistan in winter, and perhaps not unduly inconvenienced even by deep-lying snow.

Status and Conservation. Not assessed. Usually treated as conspecific with *S. przewalskii*. Unlikely to be at any immediate risk. Common to fairly common in most of range; rather scarce in Nuristan, in NE Afghanistan.

Bibliography. Ali & Ripley (1983), Dickinson (2006), Dickinson *et al.* (2006b), Fleming *et al.* (1984), Harrap & Quinn (1996), Inskipp & Inskipp (1991), Jamdar (1987), Martens & Eck (1995), Matthysen (1998), Raja *et al.* (1999), Rasmussen & Anderton (2005b), Roberts (1992), Wunderlich (1988b).

18. Przewalski’s Nuthatch

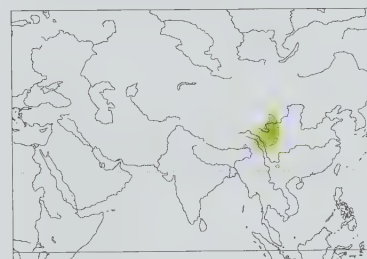
Sitta przewalskii

French: Sittelle de Przewalski **German:** Przewalskikleiber **Spanish:** Trepador de Przewalski

Taxonomy. *Sitta przewalskii* Berezowski and Bianchi, 1891, Mindzheuskago Okrug [= Mindscheu District, presumably Minhé Huizu, in Haidong Prefecture], upper Huang He (Yellow River), east Qinghai, China.

Forms a superspecies with *S. leucopsis*; until recently treated as conspecific, but separated on basis of significant morphological and vocal differences. Monotypic.

Distribution. C China in E & S Qinghai (Daban Shan S to Amdo Plateau and upper R Hwang He, and Nanggen area), extreme SW Gansu (region SW of Xiahe and Minxian), N, C & W Sichuan (Songpan region, Qionglai Shan and around Litang) and extreme NE Xizang (NE of Qamdo); also, separately, in SE Xizang (Kongbo, in Tsangpo valley) and C Yunnan (Kunming).



Descriptive notes. 12.5 cm. A medium-small nuthatch with rich cinnamon underparts. In fresh plumage, crown, nape, side of upper mantle and rear side of neck are glossy black, upperparts, including tertials and upperwing-coverts, medium to dark grey-blue, median and greater coverts centred dark grey; primary coverts, alula and flight-feathers dark grey, inner primaries and secondaries fringed grey-blue, primaries P3–P5 fringed grey-blue inward of emargination; central tail feathers grey-blue (as upperparts), other rectrices blackish-grey, tipped medium grey, tips progressively broader towards outer feathers, T5 with small subterminal white spot on inner web, T6 with oblique white bar subterminally; lores, supercilium, ear-coverts and throat white, washed orange-buff, underparts rich cinnamon, side of breast darker cinnamon-orange, rear flanks rufous, undertail-coverts orange-rufous; in worn plumage, underparts paler and more patchy in colour; iris blackish; bill dark blue-grey, tip blackish; legs blue-grey. Sexes similar. Juvenile is much as adult but duller, especially on cap and underparts, with shorter, yellow-based bill. **VOICE.** Calls include a muffled, mellow “chip” repeated in irregular series, somewhat reminiscent of a crossbill (*Loxia*); a loud, emphatic, whistled “dweep” (or “wheel”, like that of *S. europaea*), sometimes uttered as a couplet, “dweep-cep”; a slightly nasal, querulous “que”, usually repeated 3–5 times, similar to vocalizations of *S. leucopsis*, but with far less nasal quality; and thinner “pee-pee-pee-pee...” or “seet-seet-seet-seet...” notes on same pitch but slowing towards end of phrase. Loud, clear “ti-tü ti-tü ti-tü...” notes on same pitch but slowing towards end of phrase. Loud, clear “ti-tü ti-tü ti-tü...” notes on same pitch but slowing towards end of phrase.

Habitat. Recorded in spruce (*Picea*) and fir (*Abies*) forest, also more open parkland; individual at Dzeng, in SE Xizang, in Apr was in a willow tree (*Salix*) far from any coniferous forest (possibly migrant or wanderer). Altitudinal range generally extends to near tree-line: recorded at 4270 m in Sichuan in Aug and c. 2250 m in Jun, in Xizang at 3500–4000 m in NE and 2895–3050 m in SE, and in Qinghai at 2590–2895 m.

Food and Feeding. No information.

Breeding. Seen at nest in Qinghai on 2nd Jul. No other information.

Movements. Resident; may undertake some altitudinal movements.

Status and Conservation. Not assessed. Usually treated as conspecific with *S. leucopsis*. Rare; presence confirmed at relatively few sites. Probably merits conservation status of Data-deficient or even Near-threatened; apparent rarity, however, may indicate that its categorization as Vulnerable is appropriate. Occurs in Jiuzhaigou Panda Reserve, in Songpan region of N Sichuan. Isolated records in SE Xizang, at Tse (in Dec) and at Dzeng (in Apr), both localities near Qabnag, at confluence of R Tsangpo and R Nyang Qu, might possibly refer to non-breeding visitors, the individual at Dzeng being in atypical habitat; both birds, however, had underparts much paler than those of typical members of this species, possibly indicating some introgression with *S. leucopsis* and thus making local origin plausible. Status in C Yunnan unknown; discovered at Kunming in Dec 1986, when parties of three and four individuals were recorded, but may perhaps be only a non-breeding visitor.

Bibliography. Deditius (1897), Dickinson (2006), Dickinson *et al.* (2006b), Dresser & Morgan (1899), Harrap & Quinn (1996), Ludlow (1951), Matthysen (1998), Rasmussen & Anderton (2005b), Schäfer (1938), Stott (1993), Wunderlich (1988b).

19. White-breasted Nuthatch

Sitta carolinensis

French: Sittelle à poitrine blanche **German:** Carolinakleiber **Spanish:** Trepador Pechiblanco
Other common names: White-breasted Black-capped/White-breasted American/Carolina/Common Nuthatch; Florida Nuthatch (*carolinensis*); Rocky Mountain Nuthatch (*nelsoni*); Inyo Nuthatch (*tenuissima*)

Taxonomy. *Sitta carolinensis* Latham, 1790, in America, Jamaica = South Carolina, USA.

Relationships uncertain. Bears a superficial resemblance to *S. leucopsis* and *S. przewalskii* and sometimes placed in the superspecies formed by those two, although some authors doubt such a close relationship. Recent studies of mitochondrial DNA, while not addressing this problem, suggest that present species is close to *S. himalayensis* and *S. europaea*. Geographical variation relatively slight and largely clinal, upperparts (and, to lesser extent, underparts) on average darkest in Rocky Mts and Mexico, becoming paler towards W and especially E coasts; race *alexandreae* sometimes merged with *tenuissima*, and *oberholseri* with *nelsoni*; population in NE of range (E Canada and NE USA) sometimes separated as race *cookei*, with slightly paler back, and with most females pale-capped, but differences from nominate clinal and/or not constant. Proposed race *atkinsi* from SE USA (Tarpon Springs, in Florida) synonymized with nominate, and N Mexican *umbrosa* (from Sierra Madre near Guadalupe y Calvo, in SW Chihuahua) with *mexicana*. Nine subspecies recognized.

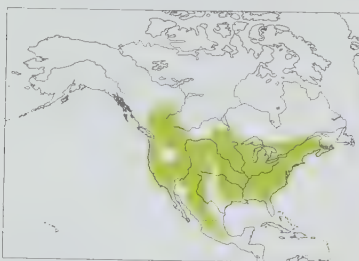
Subspecies and Distribution.

S. c. tenuissima Grinnell, 1918 – SW Canada (S British Columbia S from Lillooet), and W USA in Cascades of E Washington and Oregon, W Montana, W Wyoming, Idaho, C & W Nevada, and E California (generally E of Sierra Nevada, S to Inyo County).

S. c. aculeata Cassin, 1856 – W Washington, W Oregon and W California (Pacific lowlands W of Cascades, and crest of Sierra Nevada and mountains in S), and extreme NW Mexico (Sierra de Juárez, in extreme N Baja California).

On following pages: 20. Western Rock Nuthatch (*Sitta neumayer*); 21. Eastern Rock Nuthatch (*Sitta tephronota*); 22. Velvet-fronted Nuthatch (*Sitta frontalis*); 23. Yellow-billed Nuthatch (*Sitta solangiae*); 24. Sulphur-billed Nuthatch (*Sitta oenochlamys*); 25. Blue Nuthatch (*Sitta azurea*); 26. Giant Nuthatch (*Sitta magna*); 27. Beautiful Nuthatch (*Sitta formosa*).

S. c. alexandrae Grinnell, 1926 – N Baja California Norte (Sierra San Pedro Mártir).
S. c. lagunae Brewster, 1891 – extreme S Baja California (Sierra de San Lázaro).
S. c. nelsoni Mearns, 1902 – Rocky Mts from N Montana S to E Nevada, Utah, Wyoming, W Colorado, Arizona (except SW deserts), W New Mexico, extreme W Oklahoma and W Texas (Davis and Guadalupe mountains), and N Mexico (NE Sonora and extreme NW Chihuahua).
S. c. carolinensis Latham, 1790 – C & E Canada from C & S Alberta (S from Lesser Slave L), SE Saskatchewan (S & E from Prince Albert), S Manitoba (S from R Swan and Winnipeg) and extreme SW & SE Ontario E to New Brunswick and Nova Scotia (including Prince Edward I and Cape Breton I), and S in USA to Gulf Coast and C Florida (E from North Dakota, South Dakota, Nebraska, Kansas, Oklahoma and E Texas).
S. c. oberholseri H. W. Brandt, 1938 – SW Texas (Chisos Mts) and NE Mexico (N Sierra Madre Oriental S to W Nuevo León and, probably, interior SW Tamaulipas).
S. c. mexicana Nelson & Palmer, 1894 – W, C & S Mexico in Sierra Madre Occidental and associated ranges from SE Sonora and C Chihuahua S to Jalisco Michoacán, Hidalgo, Puebla, and WC Veracruz (Jalapa, Mt Citlaltépetl), and S Sierra Madre Oriental from C Nuevo León (Gulf slope) and SE Coahuila S to SW Tamaulipas and E San Luis Potosí.
S. c. kinneari van Rossem, 1939 – S Mexico in Guerrero and Oaxaca (Sierra Madre del Sur).



Descriptive notes. 15.5 cm; 19.6–22.9 g. A medium-large nuthatch with white face and underparts, and straight or slightly upturned long bill. Male nominate race in fresh plumage (about Aug–Mar) has crown, nape and upper mantle black, faintly glossed greenish-blue, the black narrowing at side of upper mantle, remainder of upperparts light grey, tinged blue; upperside-coverts blackish-grey, fringed and tipped light grey, greater coverts variably tipped whiter (especially on inner feathers), alula blackish, fringed white, primary coverts blackish, narrowly fringed pale grey; inner web of inner two tertials blackish, outer webs and

streak along shaft of inner web of central tertial pale grey, inner web of outermost tertial pale grey, fringed blackish on distal half (more broadly so at tip), outer web blackish, fringed and very broadly tipped pale grey; secondaries blackish-grey, fringed and narrowly tipped pale grey, primaries sooty black, inner primaries narrowly fringed grey-white and with broader pale grey tip. P3–P6 with broad white fringe around emargination and pale grey tip; central tail feathers light bluish-grey (as upperparts), other rectrices black, T2 and T3 narrowly tipped light grey and with small whitish spot at tip of shaft, outer three feather pairs with broad white subterminal diagonal band (extending to base of outer web on T6, to tip of inner web on T4); lores, supercilium, side of head and underparts whitish (sometimes very faint dark barring on side of neck), often with very thin postocular black stripe, lower breast and belly faintly tinged buff, vent warmer buff, rear flanks pale grey, undertail-coverts pale grey with broad white triangular tips and broadly fringed orange-rufous at base, thighs pale grey with orange-rufous tips; axillaries whitish, underwing-coverts sooty black, longer under primary coverts and base of primaries white; in worn plumage, underparts slightly duller; iris dark brown; bill grey-black or black, basal two-thirds of lower mandible paler and greyer, cutting edges off-white; legs dark brown or dark grey-brown, claws blackish. Female differs slightly from male, in fresh plumage has duller cap varying from dull black to light grey (on average, palest in NE USA, and with many intermediates, some not reliably distinguishable from male in field), narrower blackish band on border of upper mantle, paler and duller grey upperparts (variably tinged brown), brownish or greenish wash on fringes of wing feathers, duller face and underparts variably washed buff. Juvenile is similar to adult but a little paler and duller, male has cap dull black (resembling that of many adult females in coloration), secondary fringes washed orange-buff, underparts washed buff (coloration close to that of worn adult), juvenile female separated from young male by duller cap and more extensive drab wash on wing-feather fringes. Races vary mainly in plumage tone (darkness or lightness), also in size and bill size: *nelsoni* male has cap with more distinct and greener gloss, darker (dark grey) upperparts with more distinct blue tone, reduced contrast in wing (darker feather centres duller and slightly browner, fringes darker grey), tertials finely fringed rufous, central tertial with more black at base of outer web, longest with more black at base of inner web, underparts cleaner and whiter, flanks and belly more extensively light grey, vent tinged buff, female cap often nearly as dark as that of male (but not so clean and glossy, and contrasting less with mantle), has variable rufous-brown tone on mantle, perhaps slightly less buff on underparts than nominate female; *tenuissima* is poorly differentiated, as previous but upperparts fractionally paler (still significantly darker than nominate), also smaller, but bill rather more slender and sharply pointed; *aculeata* is as last, but on average slightly paler above (but distinctly darker than nominate), upperparts of female slightly more olive-brown, male on average slightly buffier, less grey-toned, below (female slightly buffier), vent darker and more cinnamon-brown, also smaller and with bill shorter, weak and more slender; *alexandrae* resembles last, but upperparts marginally darker, also larger, with bill longest of all races; *lagunae* is as preceding race, but upperparts slightly darker, male underparts darker and with increased buff wash, upper flanks medium grey, rear flanks more cinnamon-rufous, is also smaller, with bill relatively stout (but more slender than that of other Mexican races); *oberholseri* is poorly differentiated, resembles *nelsoni* but upperparts (especially of female) slightly darker, underparts slightly darker and greyer (rear flanks and vent of female especially so); *mexicana* is as previous, but upperparts marginally duller, female with more intense olive-brown wash and with fringes of greater coverts and flight-feathers variably (usually strongly) tinged rusty-buff, underparts rather duller and suffused buff (less grey), male flanks darker and duller grey, female with drab pinkish extending to belly, also bill shorter and relatively stout; *kinneari* is smallest race, resembles last, but female underparts on average slightly more orange-buff, this colour extending to breast and throat, bill short and stout. **VOICE.** Contact call, given all year but especially in autumn and winter, a soft, thin, relatively high-pitched and slightly squeaky “nit” or “hit”, varying in tone and emphasis, sometimes repeated at rate of 30 per minute, or combined/alternated with louder and more emphatic “chuck” or “tuk” as conversational “hit-tuk, hit-tuk”; also single “tchup” in mild excitement. Perhaps most characteristic call a rather nasal “kri”, often rendered as “kun”, “ka-un” or “quank”, variations indicating level of excitement, e.g. single shrill and rather nasal “kri” or “qui” (“quank”) in mild excitement, irregular shrill “kri, kri, kri...” or “qui-qui-qui...” series in heightened excitement, and a repetition of two “kri” calls in quick succession, “kri-kri, kri-kri”, in even greater agitation; significant agitation or excitement indicated also by rapid series of 4–8 (4–21) “kri”-type notes (up to 8–10 per second), at varying pitches, on average higher-pitched and often in rapid series in Great Basin and Rocky Mts (race *tenuissima*); alternatively, may emit slower and quieter series of conversational, nasal “krit, krit, krit-krit, krit...”; notes; all of these “kri” (or “quank”) calls sometimes given in rather harsher and even more nasal form (notes characterized by rapid frequency modulation), in couplets or long series at varying speed, from strident “krrr-krrr, krrr-krrr” couplets to “krr-krr-krr” triplets and to longer series, also chattering “krrr-krr-krrr-krrr” phrases. Other calls include loud, harsh, trilling “br-aa” during ag-

gressive encounters, long, high-pitched quiet “phee-oo” whistle (rising and then falling) by male during display-flight and by female when soliciting copulation, and high “chrr” or “k’duck, k’duck” notes by female during courtship feeding (also by begging nestlings). Song, Jan–May in NE USA, by male from top of tall tree, most regularly shortly after dawn, in two forms: “slow” song a rapid series of 6–11 nasal and quite high-pitched “que” or “hah” notes (similar to “quank” note but higher, thinner and less nasal), c. 6 per second, “qui-qui-qui-qui-qui”, each note slightly inflected, series often starting relatively quietly but quickly building in volume (variants include phrases of more clearly upward-inflected notes, “tui-tui-tui-tui-tui”); “fast” song given in heightened excitement, c. 10–12 notes per second, rather similar to the more rapid series of “kri” notes but on average faster.

Habitat. In E parts of range, primarily mature open deciduous forest, also mixed forest, e.g. maple–hemlock–pine (*Acer–Tsuga–Pinus*) in N, also orchards, woodlots, shade trees, parks, gardens and cemeteries in suburban areas, but generally absent from spruce–fir (*Picea–Abies*) forests (e.g. the Adirondacks, in New York) and from boreal forests of N; absent also from bottomlands in Arkansas, but in SE USA does breed in pine and oak–pine (*Quercus–Pinus*) forests; penetrates Great Plains in riparian woodland and scattered stands of ponderosa pine (*Pinus ponderosa*). In W of range, open montane pine forest, also Douglas fir (*Pseudotsuga*) in W Washington, and in pinyon–juniper (*Pinus–Juniperus*), aspen (*Populus*) and, in Pacific lowlands, pine–oak and evergreen oak. In Mexico, found in montane pine–oak, and in N Baja California also pine forests. Throughout range an essential requirement is mature or rotten trees with holes suitable for nesting, and in E the presence of oak, beech (*Fagus*) and hickory (*Carya*) and their fruits may be important; favours clearings and other edge habitats. Generally lowlands in E, but to 1675 m in Tennessee; in W largely montane, and occurs at up to 2590 m in Idaho, 3200 m in Nevada, 2600 m in Arizona, at 2135–2440 m in New Mexico (dispersing to both higher and lower elevations, 3050 m and 1525 m, and also in riparian woodlands in Santa Cruz valley), up to 2590 m in SW Texas (Davis Mts), and in California breeding to 3230 m (dispersing as high as 3350 m in late summer) and in Yosemite National Park (E California) common below 915 m (probably race *aculeata*), scarce at 915–2440 m but more numerous again above 2440 m (probably *tenuissima*), and often remains in winter up to at least 2600 m. In Mexico, recorded at 1830–2600 m N Baja California (Sierra San Pedro Mártir), 1585–1950 m in Sinaloa, 1525–3050 m in Chihuahua, 1980–2440 m in N Coahuila (Sierra del Carmen), at 2440 m in Durango, 915 m in Nayarit and 3350 m in México, and from 1890 m to at least 2745 m in Oaxaca.

Food and Feeding. Food in summer largely insects and spiders (Araneae), and young may be fed entirely with animal items; in autumn and winter largely vegetarian, with diet of nuts, seeds and berries; visits garden feeders for suet, and occasionally feeds on tree sap. Males always dominant over females at food. Not very gregarious, and usually found singly or in pairs; in late summer (and sometimes through winter) also in family parties, and will join mixed-species flocks as these pass through territory. Forages on trunk and larger branches of trees, also among thinner outer twigs, in shrubs and occasionally in leaf litter on ground. Gleans from bark, and has been recorded as using a bark flake to pry off other pieces of bark; searches litter for fallen mast; sometimes takes aerial insects by flycatching. Stores large quantities of food, dispersing single items throughout territory in such places as bark crevices in trunks and larger branches of trees (occasionally covers these with bark flakes or lichen), also around habitations in cracks in poles, under loose shingles and similar sites; in spring stores food both inside and immediately outside nest-hole, and may cache such items as sugar maple (*Acer saccharum*) buds and soil pellets (which are not eaten). Removes some items from feeders and caches these nearby.

Breeding. Season usually rather early, e.g. from late Apr in Canada (Ontario), and in USA mid-Apr to May in N & E (North Dakota, New York and Ohio), late Mar to Jun in W (California) and, in S, late Feb to Mar in Oklahoma and late Mar to Apr in Texas; Mar in S Mexico (Oaxaca); single-brooded. Apparently pairs for life, and pair-bond maintained from year to year, being renewed in late winter, but partners may not be together all the time (male more wide-ranging, especially in winter, contact maintained vocally). Singing male stretches vertically upwards and bows with each note (also occasionally sings in flight). Nest built by female, materials supplied by male, a foundation of wood chips, bark strips, small pellets of earth and mud, twigs, grass, leaves and fur (used as necessary to fill cavity), lined with fur, hair, wool and feathers, placed usually in natural hole 0.5–21 m (mostly 3–12 m) above ground in dead deciduous tree or decaying stump, often rotted-out knothole, less frequently abandoned woodpecker (Picidae) excavation, nestbox or even space under eave of house used, hole with entrance 30–40 mm in diameter preferred and may enlarge entrance of existing cavity; site selected by female, which may even usurp a male from his roost-hole in early spring and take over this cavity for nesting. Clutch 3–10 eggs (usually 5–9), white, sometimes tinged pink, spotted reddish-brown, spots often concentrated at larger end with some laven-der markings, mean size 19.3 × 14.5 mm; replacement clutch laid if original lost; incubation by female, fed on and off nest by male, period 12–15 days; nestlings fed by both parents, largely by male in first few days after hatching, female spending much time in brooding young; chicks fledge after 18–26 days, continue to be fed by adults for a further 14 days. Female, usually while holding insects (sometimes fur or plant material, or nothing) in bill, engages in bill-sweeping display both in and outside nest-hole, especially around protuberances and branch junctions, possibly as a means of repelling predators or nest-hole competitors.

Movements. Generally sedentary; some retreat from extreme N parts of range and from high altitudes (notably in W) in winter, some individuals returning to same wintering territory in successive years, also some irregular and localized dispersal in spring and autumn. Movements usually over short distance, but found away from breeding areas in Great Plains and in deserts of SW, in riverine forests, on isolated wooded desert massifs, and in suburban parks and gardens; frequent in lower Sonoran zone of Arizona, but scarce or rather rare Aug–Apr visitor in areas outside breeding range in Florida, Texas (not S) and California. Commoner in some years than in others away from breeding areas, but no indication of any irregular large-scale irruptions. Vagrant in Canada to Vancouver I (British Columbia) and Sable I (Nova Scotia), in SW USA on Californian islands, and also in W Atlantic (Bermuda); in Oct 1963, one came aboard an ocean liner sailing W (6 hours out of New York).

Status and Conservation. Not globally threatened. Fairly common in much of range; uncommon to rare on edges of range. Commonest in NE USA and in some areas along R Mississippi; relatively uncommon in much of Canada and Mid West, and scarce or rare on extreme N perimeter of range and local in much of Great Plains, Great Basin and S. Recorded breeding densities vary from 4.9 pairs/10 ha (West Virginia) to 0.2 pairs/10 ha (Colorado). In Mexico, common in SW Jalisco (Volcanes de Colima) and N Coahuila (Sierra del Carmen), and fairly common in Baja California; uncommon in Sonora and Oaxaca. Thought to have decreased in early 20th century throughout SE USA, from Texas E to Florida (and currently considered close to extinction in peninsular Florida). Conversely, may be extending range in N Great Plains and into SE Washington, and recent increase in Alberta (Canada); in NE USA distribution has expanded since early 1900s along with regrowth of forests.

Bibliography. Aldrich (1944), Bent (1948), Durand (1972), Dwyck *et al.* (1991), Godfrey (1986), Harrap & Quinn (1996), Hawbecker (1948), Kilham (1968, 1971, 1972), Matthysen (1998), Oberholser (1974), Pasquet (1998), Phillips (1986), Pravosudov & Grubb (1993), Riichison (1981, 1983), Spellman & Klicka (2007), Wood (1992).

20. Western Rock Nuthatch

Sitta neumayer

French: Sittelle de Neumayer **German:** Felsenkleiber **Spanish:** Trepador Rupestre Occidental
Other common names: (Lesser) Rock/Neumayer's Nuthatch; Syrian Rock Nuthatch (*syriaca*)

Taxonomy. *Sitta neumayer* Michahelles, 1830, Ragusa (= Dubrovnik), Dalmatia, Croatia. Closely related to *S. tephronota*, the two together often considered an offshoot of “*S. europaea* group”, the harsh aggressive call and nest details suggesting particularly close relationship with *S. cashmirensis*. They probably became fully ecologically isolated from each other when geographically separated, present species adapting to a Mediterranean climate and *S. tephronota* to more continental conditions (with colder winters and hotter summers) that favoured a larger body and bill. When coming into contact again, in S Iran, a process of what is termed “character displacement” selected for a bolder eyestripe and even larger body size in *S. tephronota*; overlap zone in N Iran may be more recent, and the two species may not have diverged sufficiently to permit altitudinal coexistence. Race *syriaca* intergrades with *zarudnyi* in CS Turkey (Taurus Mts) and with *rupicola* in E Turkey and Georgia; *rupicola* probably intergrades with *tschitscherini* in NW Iran (approximately from Mahabad S to Kermanshah). Birds of this species on Lesbos (E Greece) of uncertain racial identity, provisionally included in *zarudnyi*; others of this species in N & NE Turkey (E from Istanbul and N of Aras valley) and NC & NE Iran (E of Elburz Mts, and S of that range to Qom and Kavir) similarly of uncertain racial affiliation, provisionally included in *rupicola*. Six subspecies recognized.

Subspecies and Distribution.

S. n. neumayer Michahelles, 1830 – SE Europe in W Croatia (SE from Crikvenica), S Bosnia, Montenegro, S Serbia, Albania, S Macedonia, S Bulgaria and Greece (including islands of Corfu, Lefkada and Zakynthos).

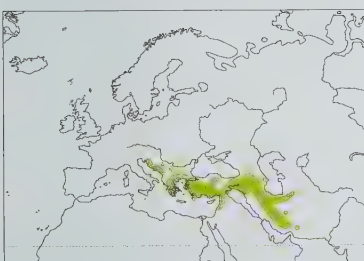
S. n. zarudnyi Buturlin, 1907 – Lesbos (E Greece) and W Turkey (W Anatolia and NW fringe of C plateau E to Elmalı and Ankara and, in S, to Taurus Mts).

S. n. syriaca Temminck, 1835 – SE Turkey E from Taurus Mts (absent S lowlands between R Firat and R Tigris), NW Syria (S to Damascus region), mountains of Lebanon and extreme N Israel (Mt Hermon).

S. n. rupicola Blanfond, 1873 – N & NE Turkey (E from Istanbul, N of Aras valley), S Georgia (S from S foothills of Great Caucasus), Armenia and SW & NE Azerbaijan (including Samaxi, in E foothills of Caucasus) S to N Iraq and NW & N Iran (E through Elburz Mts to Bojnurd, S to Kermanshah region, Qom and Kavir).

S. n. tschitscherini Zarudny, 1904 – W & WC Iran in Zagros Mts (from Kermanshah SE to Fars) and mountains S of Qom (SE to Anarak massif).

S. n. plumbea Koelz, 1950 – SC Iran (mountains of S Kerman Province).



Descriptive notes. 13–13.5 cm; 24–37.6 g. A medium-sized pale grey nuthatch with variably broad black eyestripe. Nominate race in fresh plumage (autumn–winter) has top of head and upperparts, including upperwing-coverts, light grey with faint blue tone; primary coverts and tertials medium grey with slightly paler fringes, primaries, secondaries and alula dark grey-brown, secondaries indistinctly fringed and tipped pale grey, primaries (except outer two) indistinctly fringed paler; tail as upperparts, inner webs of feathers often darker, outer four feather pairs tipped slightly paler, outer two pairs with pale buff or whitish spot at tip of

inner web; black eyestripe from nostril to side of upper mantle (c. 3 mm broad), ending irregularly; cheek, ear-coverts, side of neck and throat whitish, centre of breast and belly creamier, sides of breast and belly and rest of underparts pinkish-cinnamon; underwing-coverts and axillaries pale greyish-buff, base of underside of primaries and secondaries whitish, under primary coverts black; in worn plumage, upperparts duller and greyer, eyestripe slightly more distinct, flight-feathers bleached paler and browner, and underparts, especially flanks, paler; iris dark brown; bill dark grey or black, base of lower mandible pale bluish or bluish-flesh; legs greenish-grey to dark grey, soles sometimes slightly yellow. Differs from extremely similar *S. tephronota* in marginally darker upperparts and very slightly less prominent eyestripe. Sexes similar. Juvenile is very like adult but slightly duller, with duller eyestripe, narrow rufous tips on greater upperwing-coverts, and less contrast between breast and belly. Races vary only relatively slightly, mainly in size (nominate largest), in E of range also in prominence of eyestripe: *zarudnyi* is smaller and paler than nominate, upperparts as nominate or slightly paler, underparts paler and more extensively white, flanks and belly pinkish-buff; *syriaca* has upperparts even paler (pale ash-grey), underparts as pale or paler, size as nominate but bill slightly shorter; *rupicola* is darker above and below than preceding two, as nominate but upperparts slightly paler and less bluish, bill finer, tip laterally compressed; *tschitscherini* is small and pale, with much-reduced eyestripe 2–3 mm broad (may be virtually absent) but very narrow at rear and extending less than 10 mm behind eye (rather than 20–28 mm as in other races), upperparts slightly paler and purer grey than previous, whitish side of neck fades into grey of mantle, lower underparts paler pinkish-buff and lacking cinnamon tone; *plumbea* resembles last, but upperparts slightly darker (as *rupicola* but duller and less blue), throat, breast and belly pale grey, rather than whitish. **VOICE.** Very vocal, with wide repertoire of loud, often trilling notes. Contact call a variable “pit”, “tsik” or “chik”, may be given in flight, and at slightest excitement the notes run together to form trill or rattle, either rapidly slowing and dropping in pitch, or accelerating and then decelerating (the trills resemble the song); harsh “charr” or screeching “creea”, subdued or harsh and resembling call of Eurasian Jay (*Garrulus glandarius*), given in aggressive and sexual encounters. Song of male, from top of conspicuous rock or small tree, bird assuming very upright posture, a loud trill, typically descending in pitch, sometimes silvery, sometimes more melodic, the individual notes usually whistles of 1–2 syllables (occasionally 3), rising (“tui”, “dwi” or “dwiip”) or falling (“cheu” or “piu”), trill often preceded by descending “tititi”, thus “tititi tui-tui-tui-tui-tui...”; each male has repertoire of four or more different song types; female may sing early in season, although song much less variable; in E parts of range, at least, partners sometimes engage in antiphonal duetting in spring and autumn.

Habitat. Areas with bare rocks, typically rocky slopes, cliffs and gorges in dry or arid regions, including walls, old buildings and ancient ruins, usually on limestone; a typical species of rocky maquis. Occurs in barren regions and in areas with low shrubs, herbs and grasses, and occasionally found in woodland with scattered rocks. Generally in hilly and mountainous areas: to 800 m (locally to 1600 m) in Greece; in Turkey mostly up to 1500 m in W & C parts and 2500 m in E, but recorded to 2700 m in Taurus Mts and c. 3000 m on Nemrut and Süphan Dagı in E, and rarely to 3300 m on Karanfil Dagı (in Anatolia); in N Iran found as high as 3350 m and generally above

1525 m, but sometimes as low as 915 m; in N Israel recorded at 400–2200 m (mostly above 1000 m) and in Transcaucasus to 2000 m; in Bulgaria, recorded at up to 2200 m during post-breeding dispersal.

Food and Feeding. Food largely insects and spiders (Araneae) in summer, and nestling diet entirely animal matter; in winter mostly seeds, although snails (Gastropoda) also important. Usually singly or in pairs, and partners of established pair move around together, and sometimes defend foraging territory (disputes common at territorial boundaries), but some overlap of feeding territories can occur; in family parties after breeding and until post-juvenile moult, and sometimes larger flocks in autumn and winter (perhaps consisting mostly of immatures or individuals displaced from higher altitudes by inclement weather). Typically, forages on rocks and on ground, hopping and jumping, taking items from cracks and crevices; sometimes feeds in trees and shrubs. Wedges larger prey items in crack before smashing them with the bill; indulges in flycatching. Stores and buries food.

Breeding. Season mostly late Mar to Apr/May, at higher altitudes to late May, with presumed second clutches to early Jul; some pairs double-brooded. Both sexes defend nesting territory (i.e. immediate vicinity of nest). Nest built over course of 10–18 days, largely by male, female occasionally contributing lining material, a remarkable flask-shaped structure, sometimes rather large, with entrance tunnel (usually projecting outwards) up to 10 cm long and with internal diameter 3–3.5 cm, built of mud, animal dung, hair, feathers, beetle wings and similar, chamber lined with hair, wool, feathers, grass etc. (may fill all available space), sited on rock face, usually under slight overhang, and as low as 2 m above ground, or sometimes on building or other man-made structure; occasionally existing crevice or cavity used, entrance then sealed with mud; area around nest sometimes decorated with various objects, both natural and man-made, wedged into adjacent cracks and crevices; nests regularly reused, sometimes for many years in succession, or new nest built on to older structure. Clutch 4–10 eggs (recorded larger clutches of up to 13 eggs may include old eggs from previous years), white, usually sparsely speckled and blotched yellowish-brown to purple-brown, mean size 20.9 × 15.2 mm (nominate race); incubation by female, sometimes fed on nest by male, nest entrance may be plugged with lining material, incubation period 13–18 days; chicks fed by both parents, leave nest after 23–30 days, but probably dependent on parents for some time after fledging.

Movements. Resident; some post-breeding dispersal, sometimes to higher elevations (e.g. in Bulgaria and Israel). Also altitudinal movements in winter, when those breeding at higher elevations may descend to foothills and valleys in response to snowfall, although some remain above snow-line, on rocks and in snow-free areas. Occasional short-distance movement; in winter has occurred S of breeding range in Israel (to NW Golan and N Galilee), and two records (Apr, Oct) on Crete. **Status and Conservation.** Not globally threatened. Quite common, although local, throughout most of range; rather scarce on Kerman massif, in S Iran (race *plumbea*). European population estimated at c. 17,000–37,000 pairs in Balkans, and entire Turkish population c. 158,000 pairs. Densities variable, maximum density in Bulgaria 13 pairs/100 km². Not uncommon in mountains of Lebanon, and population on Israeli part of Mt Hermon c. 20–50 pairs.

Bibliography. Cramp & Perrins (1993), Dementiev *et al.* (1954a, 1970), Éard & Échéco-par (1970), Grant (1975), Hagemeijer & Blair (1997), Handrinos & Akriotis (1997), Harrap & Quinn (1996), Leonovich *et al.* (1996b), Lukac *et al.* (1992), Matthysen (1998), Mlikovsky (2007), Patrikeev (2004), Roselaar (1995), Shirihai (1996), Stoyanov (2004), Vaurie (1950b), Wunderlich (1986).

21. Eastern Rock Nuthatch

Sitta tephronota

French: Sittelle des rochers **German:** Klippenkleiber **Spanish:** Trepador Rupestre Oriental
Other common names: Great/Greater (Rock) Nuthatch, Persian Nuthatch

Taxonomy. *Sitta tephronota* Sharpe, 1872, Kokand, Fergana, east Uzbekistan.

Closely related to *S. neumayer*, the two together often considered an offshoot of “*S. europaea* group”, nest details suggesting particularly close relationship with *S. cashmirensis*. They probably became fully ecologically isolated from each other when geographically separated, present species adapting to continental conditions (with colder winters and hotter summers) that favoured a larger body and bill and *S. neumayer* to a less extreme Mediterranean climate. When coming into contact again, in S Iran, a process of what is termed “character displacement” selected for a bolder eyestripe and larger body size in present species; overlap zone in N Iran may be more recent, and the two species may not have diverged sufficiently to permit altitudinal coexistence. Race *obscura* sometimes treated as a separate species, but intergrades with *dresseri* in Iranian Azerbaijan and with nominate in NE & SE Iran, probably also with *iranica* in E Elburz Mts (N Iran). Birds of this species in upper Aras valley (NE Turkey) and in mountains of WC & SE Iran (Qom, Anarak massif and Yazd E to Jebel Barez; also S Sistan and Baluchistan) of uncertain racial identity, provisionally placed with *obscura*; likewise, birds in Khorasan area of NE Iran provisionally included in *iranica*. Four subspecies recognized.

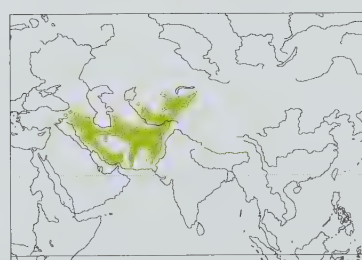
Subspecies and Distribution.

S. t. dresseri Zarudny & Buturlin, 1906 – SE Turkey (E from Gaziantep) E locally to Iranian Azerbaijan, S to N Iraq (Kurdistan) and W Iran (S in Zagros Mts to Fars and E to Hamadan and Esfahan).

S. t. obscura Zarudny & Loudon, 1905 – NE Turkey (upper Aras valley), S Armenia, S Azerbaijan and N, WC & S Iran (E in Elburz Mts to N Khorasan; also mountains in Qom, Anarak massif and Yazd E to Jebel Barez; also Baluchistan and Sistan).

S. t. iranica Buturlin, 1916 – S Turkmenistan and NE Iran, also C Uzbekistan (isolated mountains in C Kyzylkum desert).

S. t. tephronota Sharpe, 1872 – extreme E Turkmenistan (Kugitangtau Mts, Karabil' plateau), S Uzbekistan and SE Kazakhstan S in mountains to NE Iran (N Khorasan), Afghanistan and W Pakistan (S Waziristan S to N Baluchistan).



Descriptive notes. 15–16 cm; 42.7–55 g (*dresseri*). A medium-large to large, relatively pale nuthatch with long, heavy bill. Nominate race in fresh plumage (Sept–Feb/Mar) has top of head and upperparts, including tertials and upperwing-coverts, medium grey, black eyestripe from nostril to side of mantle (eyestripes sometimes meet across mantle) rather narrow and barely encompassing eye; alula grey, smaller feathers fringed lighter grey on outer web, primary coverts grey, faintly washed brown, flight-feathers medium grey, darker towards tip and distally of emarginations on outer web of primaries P3–P4, inner pri-

maries washed brown on outer web; tail grey (as upperparts), feathers finely tipped pale buff, outer

two pairs with buff spot on tip of inner web, outermost with large subterminal whitish spot on outer web (tail spots sometimes forming bars); chin and throat to ear-coverts and side of neck whitish, side of neck faintly tinged buff; breast creamy white, breast side faintly washed buff, grading into pale pinkish-buff on flanks and belly, light rufous-cinnamon on thighs and undertail-coverts, longer undertail-coverts centred light grey; axillaries whitish to pale grey, underwing-coverts medium grey, under primary coverts dark sooty grey, longer under primary coverts and base of flight-feathers whitish; in worn plumage, duller and browner above, especially on mantle and scapulars, flight-feathers bleached paler and browner, underparts slightly paler; iris dark brown; bill black or dark slate, base of lower mandible pale blue-grey; legs grey or blue-grey. Differs from extremely similar *S. neumayeri* in marginally paler upperparts and very slightly more prominent eyestripe, but some individuals perhaps not safely separable by plumage details. Sexes similar. Juvenile is very like adult, but eyestripe duller and less well defined, upperpart feathers faintly tipped paler, greater coverts finely fringed buff, underparts somewhat paler, breast tinged buff. Geographical variation rather complex, races differing mainly in body size, bill size and shape and prominence of eyestripe: *dresseri* is largest and palest, with a long, heavy bill, broad black eyestripe (c. 5 mm broad and encompassing eye, the most prominent of any race) more prominent, also crown and upperparts slightly paler than nominate, tail spots more distinct, flanks and belly slightly darker, colour saturation decreasing clinally from NW to SE, birds from N Iraq on average deepest rufous on flanks and belly (also largest in size) and those from S Iran (S Zagros Mts) palest below; *obscura* is somewhat smaller than previous, with darker upperparts (so eyestripe contrasts slightly less), some variation in underpart coloration, those in N Iran (Elburz Mts) as preceding race, birds in Armenia rather paler (paler even than nominate), birds from C Iran (Qom S to Kerman) even darker and duller grey above but size and underpart coloration as previous, and birds from extreme SE Iran on average paler (close to nominate); *iranica* is smallest, the smallest individuals (in Kyurendag Mts, in SW Turkmenistan) hardly larger than *S. neumayeri*; resembles nominate in coloration but paler grey (near *dresseri*) above, eyestripe shorter, underparts paler, also bill more slender. Voice. Very vocal, with loud, often trilling calls throughout year, perhaps least frequently in autumn and winter. Contact call "pit" or "chik", often run into trill or rattle. All calls very similar to those of *S. neumayeri*, perhaps fractionally slower and deeper, but in zone of range overlap (E Turkey, S Transcaucasia, N Iraq, N & W Iran) equivalent calls of present species generally louder, deeper, mellower and more slowly repeated; excitement call "kneuw", resembling call of Eurasian Jay (*Garrulus glandarius*), apparently less frequently used, but in agitation also utters "ch-ch-ch...". Song of male, from conspicuous rock or cliff, usually near nest, or from bush or sometimes tree (uses these for posturing and singing more than does *S. neumayeri*), given from Mar through to incubation stage, a loud, typically descending trill of whistled rising or falling notes (1–2 syllables, occasionally 3), very like song of *S. neumayeri* but perhaps slightly lower in pitch; each male has at least four different song types, repeating each several times before switching to different phrase; female has more stereotyped song, given in duet with male, coming in before male has finished his phrase.

Habitat. Rocky mountain slopes and valleys, cliffs, ravines and gorges; may prefer vicinity of streams, and distribution closely correlated to a milk-vetch–wormwood–Rosaceae (*Astragalus-Artemisia-Rosaceae*) vegetation community, including almonds (*Prunus dulcis*) and pistachios (*Pistacia vera*). More arboreal than *S. neumayeri* and often found in more wooded country; in Pakistan in areas with scattered junipers (*Juniperus*) and wormwood, although not in extensive tracts of juniper forest; in Iran recorded as breeding in rocky oak (*Quercus*) woods. Areas of exposed bare rock generally required, irrespective of density of local vegetation; in S Iran, found also in dry pistachio forest on stony ground where no rocky habitat available (nests also in tree holes). Forages also in dry streambeds and on roads, and in winter in C Asia descends to forests and orchards, and often found around human settlements. In C Asia occurs at up to c. 2600 m (400–2000 m in Kazakhstan, to 2000 m in Tien Shan, 1500 m in Karatau, and 800–1000 m in Dzhungarskiy Alatau); in Turkey to at least 2100 m, in S Iran at 2000–3000 m, and in Afghanistan at 915–3300 m; in Pakistan, found at 1800–2100 m N & C Baluchistan and to 2750 m in S Baluchistan, and in Ziarat descends to plains level at c. 300 m in winter. In areas where overlaps in range with *S. neumayeri*, generally found at lower elevations than latter, and in Elburz Mts (N Iran) the two species may be segregated by altitude, present species living at 915–1525 m.

Food and Feeding. Food in summer largely insects and snails (*Gastropoda*); from autumn to early spring mainly seeds, such as those of apricot (*Prunus armeniaca*), cherry (*Prunus*) and wild almond; young fed largely with insects and other arthropods, but c. 10% also on pistachio nuts. Usually singly or in pairs, the male and female of established pair moving about together and probably remaining on territory all year; after breeding, often in family parties of 2–3 individuals, and flocks of up to 16 recorded together. Forages on rock faces, on boulders and on ground, moving with jerky hops, stance often quite upright. Picks food items from cracks and elsewhere; captures aerial insects by flycatching, and recorded as taking fruits in pistachio orchards. Wedges seeds and snails in cracks and crevices, and smashes them open with bill. From late summer onwards stores snails and seeds in cracks and crevices, sometimes covering these with small stones; similar caches may be hidden under stones, behind loose bark or pressed into ground and covered with soil. Such stores perhaps an important resource during winter months.

Breeding. Season from late Feb/mid-Mar in S Tajikistan, SE Iran and Pakistan, from late Mar/Apr in Transcaucasia and Turkmenistan, and from late Apr in Kazakhstan (late first clutches in early May in many areas); some pairs double-brooded, especially at lower altitudes. Pair formation probably in early spring; rather territorial, disputes common at boundaries. Head feathers raised in display, making black eyestripe conspicuous. Nest, built by both sexes, a flask-shaped structure at variable height (some as low as 1 m above ground), constructed usually over a crack, cavity or hole in rock face, tree (especially in Iran and, possibly, Afghanistan), riverbank or building, hole a natural one, or excavated by birds themselves, or abandoned hole of bee-eater (*Meropidae*), roller (*Coraciidae*) or woodpecker (*Picidae*), cavity entrance walled up with "plaster" (a mixture of mud, saliva, excrement, resin, feathers, hair, cloth, insect fragments, even sweet papers), leaving small hole 3.5–5 cm in diameter or short conical entrance tunnel 4.5–15 cm long (tunnel less frequent, and shorter, than at nests of *S. neumayeri*), exterior of nest, as well as adjacent cracks, sometimes decorated with feathers and bright objects, interior of tree hollow often lined with mud; exceptional record of nesting in tree fork; nest can be small (c. 30 cm diameter), or in some cases very elaborate (e.g. hollow tree with every hole plastered over, leaving conical entrance tunnel), with several incomplete nests alongside the one in use, some weighing up to 32 kg; eggs laid in mud cup, sometimes lined with grass, feathers, fibres or hair; nest may be reused for several years in succession. Clutch 4–9 eggs, generally 5–7, white, usually sparsely speckled and blotched ochre and black, rarely purple-grey, markings sometimes concentrated at larger end, mean size 21.1 × 16.1 mm; incubation by female, fed on nest by male, period 12–14 days; chicks fed by both parents, mainly by male in first week, when female spends much time in brooding young, later fed mainly by female, one adult may roost with nestlings, blocking entrance with a plug of lining material; chicks leave nest at 24–26 days, after fledging stay in family party for long period, until mid-Aug/Sept.

Movements. Resident; perhaps some post-breeding dispersal from about Aug onwards, and limited altitudinal movement. In late autumn and winter may descend to lower altitudes, although this apparently very dependent on local conditions. In C Asia, those breeding at higher altitudes or in

more N areas descend from Sept onwards, although some remain in higher-lying breeding areas, especially on S-facing slopes; those breeding at lower altitudes move only in harshest weather, when recorded down to foothills of Kopet Dag, and wanderer once recorded in Karakum Desert. Little evidence of altitudinal movement in Pakistan, and those descend to lower slopes and valleys, and even to plains level.

Status and Conservation. Not globally threatened. Generally fairly common in suitable habitat. Common in Afghanistan and Pakistan; apparently scarce in Armenia. A few data on densities, e.g. c. 1 pair/10 ha recorded; in ravines 1–2 pairs/km, although seven occupied nests recorded along 600 m of a gorge.

Bibliography. Cramp & Perrins (1993), Dementiev *et al.* (1954a, 1970), Deshayes & Praz (1978), Dickinson *et al.* (2006b), Dolgushin *et al.* (1972), Grant (1975), Harrap & Quinn (1996), Leonovich *et al.* (1996b), Loskot *et al.* (1991), Matthysen (1998), Mlikovsky (2007), Roberts (1992), Roselaar (1995), Stepanyan (1990), Vaurie (1950b), Wassink & Oreeel (2007).

22. Velvet-fronted Nuthatch

Sitta frontalis

French: Sittelle veloutée **German:** Samstirnkleiber

Spanish: Trepador Piquirrojo

Other common names: Velvet-fronted Blue Nuthatch

Taxonomy. *Sitta frontalis* Swainson, 1820, Sri Lanka.

Sometimes placed with *S. solangiae* and *S. oenochlamys* in a separate genus, *Oenositta*. The three may form a superspecies and have at times been considered conspecific. Racial identity of Sumatran populations requires verification, and these have been variously ascribed to nominate, *saturator* and/or *velata*. Five subspecies recognized.

Subspecies and Distribution.

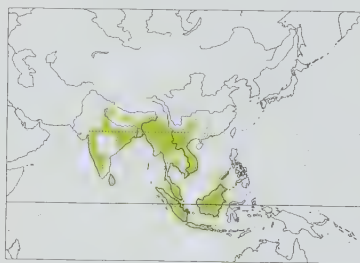
S. f. frontalis Swainson, 1820 – peninsular India, especially in hills (absent from large areas, e.g. N & NW, Gangetic Plain and Deccan plateau), Himalayan foothills from Kumaon E to NE India (S from Assam and Nagaland), Bangladesh, Sri Lanka, S China (W, S & SE Yunnan S to Xishuangbanna, C & S Guizhou, W Guangxi and W & S Guangdong), Myanmar, Thailand S to Isthmus of Kra (absent from C plains and much of NE), and Indochina.

S. f. saturator E. J. O. Hartert, 1902 – Malay Peninsula S of Isthmus of Kra (including Phuket, Penang and Singapore), Lingga Archipelago, Sumatra (including Simeulue I) and Bangka.

S. f. corallipes (Sharpe, 1888) – Borneo, including Maratua I (off E coast).

S. f. palawana E. J. O. Hartert, 1905 – Palawan and Balabac, in W Philippines.

S. f. velata Temminck, 1821 – Java.



Descriptive notes. 12.5 cm; 8.5–17 g (*frontalis*). A medium-small nuthatch with bright red bill (blackish in juvenile), yellow eye and eyering, black forehead and violet-blue upperparts. Male nominate race in fresh plumage (Jul–Jan) has lores, forecrown and narrow postocular stripe black; crown, upperparts and lesser and median upwing-coverts violet-blue, brighter and paler blue immediately adjacent to black forecrown; greater upwing-coverts blue-grey with diffuse violet-blue fringes, alula and primary coverts blackish, smaller feathers of alula and distal parts of primary coverts fringed violet-blue, tertials grey-blue (bluer on outer web), longest tertial with concealed blackish stripe along shaft, secondaries and inner primaries greyish-black, grading to grey-blue submarginally, with narrow brighter blue fringes, outer primaries blackish, P3–P4 fringed pale blue inward of emargination, P5–P7 fringed pale blue around emargination; central tail feathers grey-blue with violet-blue fringes, outer rectrices black, tipped grey-blue and on outer web fringed violet-blue (outermost fringed grey-blue), outer three feather pairs with slightly paler subterminal spot on inner web; cheek dull violet-blue, fading to lavender on ear-coverts and side of neck; chin and throat whitish, breast dull beige, flanks and belly to vent darker and drabber (although washed lavender), undertail-coverts dull beige, diffusely tipped lavender; axillaries whitish, anterior feathers tipped dull violet-blue, underwing-coverts black, longer under primary coverts and base of primaries whitish; in worn plumage duller and greyer above, and underparts slightly duller, pale grey-white with dull buff wash (less lilac); iris yellow, dull pale yellow to orange-red eyering; bill red, tip of upper mandible blackish; legs dark brown, soles orange-yellow. Easily distinguished from rather similar *S. solangiae* and *S. oenochlamys* by bill colour. Female is as male, but lacks black postocular stripe and has underparts, especially breast and belly, washed cinnamon-buff, with lilac tones reduced. Juvenile resembles adult, but bill blackish, iris brownish, upperparts slightly duller and greyer, chin and throat duller, underparts washed cinnamon-orange or orange-buff (slightly more orange-buff than adult female), undertail-coverts pale pinkish-buff with fine dark cinnamon-brown bars. Race *saturator* is darker and more lilac than nominate, with chin off-white, throat and male underparts pinkish-buff with lilac wash, female cinnamon-buff with lilac wash (slightly less pure lilac than male), legs brown; *corallipes* is similar to last but has legs and feet bright orange-red; *palawana* resembles nominate, but on average slightly darker and browner below, throat rather less extensively white, sexes rather similar in underpart coloration, male lilac-washed pinkish-buff (near female nominate), female cinnamon-orange (buffer with wear), legs and feet light brown; *velata* resembles nominate, but throat more extensively white (ear-coverts still lilac), male underparts paler and more washed out, more pinkish-buff, with reduced lilac and increased grey tones, female believed very similar to nominate.

Voice. Noisy. Common calls a single full, hard "chat", "chit", "chlit" or "chip" and a much thinner and more silbant "sip", "sit" or "tsit" (many intermediates), former often in rapid couplet as "chit-chit", or in short rattling series, "chit-chit-chit" or "chit-it-it-it..."; the two notes sometimes mixed, typical phrase "chip, chip, sit-sit-sit-sit-sit-sit-sit", and both variants given also in flight. Song a series 1.5–2 seconds in duration of "sit" notes, individual notes usually still distinguishable, and may become a fast, hard rattle.

Habitat. Wide variety of forest types, including tropical rainforest, swamp-forest, semi-evergreen, hill evergreen, mixed deciduous, dry dipterocarp; also pine (*Pinus*) and mixed pine-oak (*Pinus-Quercus*) forest, especially in Myanmar and Thailand, and in Sumatra noted in pine plantations; in Western Ghats of SW India almost exclusively in evergreen forest. Also in mixed bamboo jungle, overgrown rubber plantations and other cultivation with tall trees, shade trees in tea, coffee and cardamom plantations, mature mangroves and coastal casuarina (*Casuarina*) trees. Optimum habitat is more open evergreen types and moist-deciduous/mixed deciduous forest (known as "sal forest" in Indian Subcontinent); much lower densities in closed-canopy rainforest. Generally at low altitudes. In Indian Subcontinent from plains to c. 1500 m, occasionally to c. 2200 m (and recorded in Sikkim as high as 1980 m in winter); in Myanmar to 1830 m (in N only at 460–915 m), and in

Thailand to 1800 m (in N commonest above 830 m); in China noted at 340–680 m in Guizhou, 1170 m in SE Yunnan and 1500 m in W Yunnan (and reported at up to 1825 m); found at 180–1350 m in Vietnam and Laos, and recorded at Da Lat (in S Vietnam) at 930–1450 m; 200–400 m in Cambodia; in Malay Peninsula recorded to c. 1150 m, in Borneo to 2200 m, and in Sumatra and Java to c. 1500 m.

Food and Feeding. Food insects and spiders (Araneae). Found in pairs and in parties of up to six individuals, occasionally more, with up to 20 recorded together; often joins mixed-species foraging flocks. Very active. Forages on tree trunks, less often on small outer branches and least on main branches, generally in upper and middle storeys of tall forest trees; occasionally feeds in undergrowth and on fallen logs, but not seen to visit ground. Vigorous wing-flapping observed, apparently an attempt to flush insects from face of tree trunks.

Breeding. Season Apr–Jun in N India, Jan–May in S India and Sri Lanka, and in Myanmar Mar–Apr in N and Feb–Mar in S, May–Jun in China, Mar in N Thailand and Apr in Malay Peninsula, and Apr–Aug in W Java; nests found mid-Mar in C Annam (Vietnam) and Feb–May in Borneo. Nest, built by both sexes, a pad of moss (often mixed with feathers), lined with fur and feathers, placed 1–12 m (usually below 7 m) above ground in hole in dead branch or tree trunk, sometimes in abandoned woodpecker (Picidae) or barbet (Capitonidae) hole; selected hole usually small and is often enlarged by the birds themselves, but occasionally a large hole will be reduced or finished with “plaster” (presumably mud). Clutch 4–5 eggs in N India, 3–4 in S India and Java, 3–6 in Myanmar, one clutch of 3 recorded in Borneo, eggs white, variably (usually rather heavily) spotted and blotched brick-red and occasionally purple, mean size 17.2 × 13.2 mm; no information on precise incubation period; chicks fed by both sexes, no information on duration of fledging period.

Movements. Resident; few indications of altitudinal movement.

Status and Conservation. Not globally threatened. Generally common in Indian Subcontinent and SE Asia, and can be abundant in optimum habitat, but local in Bangladesh and scarce in N Vietnam (Tonkin). Somewhat less abundant in Malay Peninsula, Sumatra, Java, Borneo and Palawan, but still fairly common in most areas; e.g. in Borneo fairly common near coast and in submontane areas, such as on Mt Kinabalu and in Kelabit uplands, but scarce in intervening lowlands, and common in C Kalimantan. Scarce to rare in China. In China, first recorded in Hong Kong Apr 1989, since when observed with increasing regularity, especially in Tai Po Kau (breeding in 1993); initially thought to relate to individuals of captive origin, but in view of widespread occurrence may instead refer to previously undetected population.

Bibliography. Ali & Ripley (1983), Carey *et al.* (2001), Delacour & Jabouille (1931), Dickinson (2006), Dickinson *et al.* (2006b), Eames *et al.* (2002), Fischer (2006), Harrap & Quinn (1996), Law (1948), Lee Kwok Shing *et al.* (2006), Leven (1993), Matthysen (1998), Mees (1986), Meyer de Schauensee (1984), Price (1979), Quaisser & Dekker (2006), Robson (2000b, 2002c), Smythies & Davison (1999), Spierenburg (2005), Sultana & Khan (2000), Thomas & Poole (2003), Wells (2007).

23. Yellow-billed Nuthatch

Sitta solangiae

French: Sittelle à bec jaune **German:** Gelbschnabelkleiber **Spanish:** Trepador Piquigualdo
Other common names: Lilac Nuthatch

Taxonomy. *Calositta solangiae* Delacour and Jabouille, 1930, Loquih, near Cha Pa, north-west Tonkin, Vietnam.

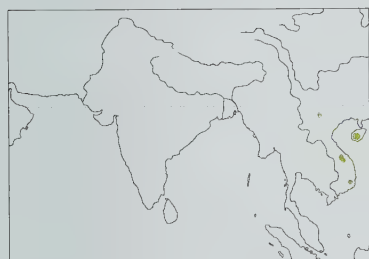
Sometimes placed with *S. frontalis* and *S. oenochlamys* in a separate genus, *Oenositta*. The three may form a superspecies and have at times been considered conspecific. Present species, however, occurs together with *S. frontalis* in Vietnam, overlapping in both range and altitude in NW Tonkin (Fan Si Pan Range) and S Annam (Da Lat Plateau). Relationship with *S. oenochlamys* more problematic, but Hainan race *chientfengensis* of present species may form link between the two (both are yellow-billed, whereas *S. frontalis* has red bill). Population of this species recently found on Kon Tum Plateau–Lo Xo pass area of Vietnam and adjacent SE Laos (Xe Sap region, in Xe Kong Province) of unknown race; study required. Three subspecies currently recognized.

Subspecies and Distribution.

S. s. solangiae (Delacour & Jabouille, 1930) – N Vietnam (Fan Si Pan Range, in NW Tonkin).

S. s. chientfengensis Cheng Tsohsin *et al.*, 1964 – S Hainan I, in S China.

S. s. fortior Delacour & Greenway, 1939 – Da Lat Plateau (Langbian Plateau), in S Vietnam (SC Annam).



Descriptive notes. 12.5–13.5 cm; 14–16 g (*chientfengensis*). A medium-small to medium-sized nuthatch with yellow bill, iris and eyering, black forecrown and violet-blue upperparts. Male nominate race in fresh plumage has lores, forecrown and postocular stripe velvety black, crown pale lavender-blue or lilac-blue, nape and upper mantle slightly paler greyish-mauve, some whiter feather bases visible (especially in centre of upper mantle), remainder of upperparts dull greyish-blue, longer uppertail-coverts blackish-grey with violet-blue tips; lesser and median upwing-coverts blackish-grey, broadly fringed violet-blue,

greater coverts black, broadly fringed violet-blue (dark centres concealed), alula and primary coverts black with narrow violet-blue fringes, tertials dull violet-blue (greyish-black base of inner webs concealed), secondaries and inner primaries black with violet-blue fringes, P6–P7 narrowly fringed pale blue around emargination, P3–P5 broadly fringed pale blue inward of emargination; central tail feathers dull violet-blue to grey-blue with blackish shaft streak, other rectrices black, T2–T5 fringed violet-blue on outer web (fringes broadening towards base) and tipped dull blue-grey, T6 similarly fringed and tipped dark grey (tips progressively broader from inner feathers to outer), subterminal white spot on inner web tiny on T2 and moderately well marked on T6; cheek, ear-coverts and side of neck light greyish-mauve, chin and throat off-white, underparts drab pale greyish; axillaries pale greyish-beige, underwing-coverts sooty black, base of primaries whitish; iris pale yellow, yellow eyering; bill lemon-yellow or golden-yellow, small black tip on upper mandible; legs grey. Female as male, but lacks black postocular stripe (sometimes a faint black line visible behind eye). Juvenile is very poorly known; bill of recently fledged birds on Hainan (race *chientfengensis*) reported as being dull yellow, but change from blackish bill at fledging to adult coloration may be rapid. Races differ mainly in plumage tone and in size: *fortior* is rather bigger than nominate, darker above, crown to upper mantle light greyish-mauve (tips of crown feathers washed violet-blue, whiter feather bases often contrastingly visible on nape and upper mantle), upperparts dull violet-blue, underparts pale greyish-beige with faint violet cast (especially on flanks);

chientfengensis is smaller than last, has upperparts more greyish-blue than nominate (crown and nape washed purple, mantle tinged lilac-rufous, ear-coverts and side of neck lilac-rufous), white terminal spots on tail less prominent, much paler below (chin and throat white, underparts below breast fulvous-rufous, darkening somewhat posteriorly), also bill tip more extensively dark (distal third of upper mandible blackish-brown). VOICE. Calls include “chit”, often doubled or in series, “chit-it” or “chit-it-it-it-it-it-...”, also “sit”, all very similar to calls of *S. frontalis*. Song a fast “sit-ti-ti-ti-ti-...”, 1–2.5 seconds in duration, slower and slightly lower in pitch towards end; resembles song of *S. frontalis* but perhaps faster and more “whinnying”.

Habitat. Hill evergreen forest, including relatively open, partially logged areas. In Vietnam, recorded at c. 1550–2500 m in NW Tonkin and at 1450–2100 m in S Annam (Da Lat Plateau); found at 800–1500 m on Hainan.

Food and Feeding. Food insects. Found singly or in small groups on Hainan; in Vietnam in groups of up to five individuals, in mixed-species foraging flocks.

Breeding. Adults feeding fledged young in C Annam on 5th Mar and on Hainan on 22nd Apr. No other information.

Movements. Resident.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Hainan EBA and in Da Lat Plateau EBA and in Fan Si-Pan and Northern Laos Secondary Area. Not recorded for many years in NW Vietnam, but recent records suggest species not as rare there as previously thought. Probably rather common on Da Lat Plateau, in S Annam (race *fortior*), where small numbers recorded since 1990 in surveys; records from Mt Bi Doup, Mt Lang Bian, Cong Troi and near Da Lat. Status of this species on Kon Tum Plateau, straddling Vietnam–SE Laos border, uncertain; fieldwork and further study required. Main threat throughout Indochina is deforestation, e.g. much of Da Lat forest being cleared by shifting cultivation, charcoal-burning activities and fuelwood collection, and these activities are increasing in intensity following government resettlement programmes. Discovered as recently as 1963 on Hainan I (race *chientfengensis*), and not uncommon in good forest; has been recorded from Diaoluoshan, Wuzhishan, Bawangling, Jiaxi and Jiangfengling. Remaining forests on Hainan, however, under threat, and in 1981 only 2420 km² of forest (7.2% of total land area) remained, although most of surviving forest likely to be at higher altitudes and thus suitable for present species. Despite this apparently large area, forest cover declined by 72% between 1949 and 1981, and the species’ future on Hainan is far from secure.

Bibliography. Anon. (2007i), Butchart & Stattersfield (2004), Cheng Tsohsin & Tan Yaokuang (1973), Cheng Tsohsin *et al.* (1964), Collar *et al.* (2001), Delacour & Greenway (1939, 1940), Delacour & Jabouille (1930, 1931), Dickinson (2006), Dickinson *et al.* (2006b), Harrap (1991), Harrap & Quinn (1996), King & Liao Weiping (1989), Lee Kwok Shing *et al.* (2006), Pui Lok *et al.* (2005), Robson (2000b), Robson *et al.* (1993a, 1993b), Stattersfield & Capper (2000).

24. Sulphur-billed Nuthatch

Sitta oenochlamys

French: Sittelle des Philippines

Spanish: Trepador Filipino

German: Schwefelschnabelkleiber

Taxonomy. *Dendrophila oenochlamys* Sharpe, 1877, Guimaras, Philippines.

Sometimes placed with *S. frontalis* and *S. solangiae* in a separate genus, *Oenositta*. The three may form a superspecies and have at times been considered conspecific. Possibly more closely related to *S. solangiae*, Hainan race *chientfengensis* of which may form link between the two species (both are yellow-billed, whereas *S. frontalis* has red bill). Geographical variation partly clinal, colour saturation and dominance of lilac tones in plumage increasing from N to S through islands. Six subspecies recognized.

Subspecies and Distribution.

S. o. mesoleuca (Ogilvie-Grant, 1894) – NW Luzon (W Cordillera mountains), in N Philippine Is.

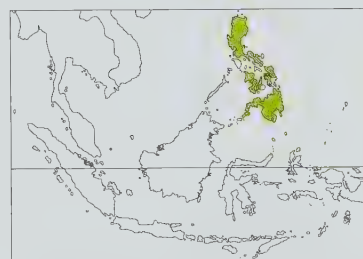
S. o. isarog Rand & Rabor, 1967 – Luzon (except NW).

S. o. oenochlamys (Sharpe, 1877) – WC Philippines (Panay, Guimaras, Negros and Cebu).

S. o. lilacea (J. Whitehead, 1897) – EC Philippines (Samar, Biliran and Leyte).

S. o. apo (Hachisuka, 1930) – Mindanao (except Zamboanga Peninsula), in S Philippines.

S. o. zamboanga Rand & Rabor, 1957 – W Mindanao (Zamboanga Peninsula), Basilan and East Bolod I.



Descriptive notes. 12.5 cm; 16.3–16.4 g (*isarog*). A medium-small nuthatch with yellow bill, iris and eyering, black forecrown, and violet-blue upperparts variably tinged lilac. Male nominate race in fresh plumage has forehead and forecrown velvety black, extending behind eye as narrow black eyestripe, crown violet-blue tinged mauve, nape and upper mantle vinaceous with slight lilac tinge and with pale buff feather bases extensively visible (forming pale “shawl”), lower mantle, scapulars, back and rump violet-blue, tinged grey; upwing-coverts violet-blue, inner webs of greater coverts black (mostly concealed), alula black, smaller feathers edged and tipped violet-blue, primary coverts black, outer web and tip violet-blue, tertials grey-tinged violet-blue, two longer tertials with extensive black streak along shaft and inner web (mostly concealed on folded wing), secondaries greyish-black with broad violet-blue fringes and greyer tips, primaries sooty black, inner primaries narrowly fringed lilac-blue distally, fringe broadening into duller grey-blue on outer webs and tips, outer primaries variably edged violet-blue on basal half; central tail feathers dull violet-blue with dark grey shaft streak, other rectrices blackish with violet-blue edging and broad dull violet-blue tip, tip progressively broader towards outermost feather, distal third of which dull violet-blue (blackish colour fully concealed when tail closed); anterior part of lores and cheek pale buff, grading to violet-blue on ear-coverts and pale buffish-lilac on side of neck, this colour extending to meet pale shawl on nape and upper mantle; chin and throat white, merging into pale cinnamon-orange underparts, lightly washed lilac on flanks and belly to vent; axillaries pale cinnamon-orange, underwing-coverts sooty black, base of primaries white; iris bright greenish-yellow to orange-yellow, orbital skin chrome-yellow or greenish-yellow; bill greenish-yellow; legs olive-green to brown. Female as male, but black eyestripe lacking or only faintly indicated (sooty, and most clear-cut, at rear), underparts on average slightly more orange-toned, with little of lilac wash. Juvenile resembles adult, but underparts more orange-toned, and may lack pale patch on nape/upper mantle. Races vary mainly in darkness of plumage colour: *mesoleuca* is palest, with ear-coverts violet-blue, nape and upper mantle pale pinkish-buff with lilac wash and often with very pale (even whitish) centre,

Bibliography. Dickinson (2006), Dickinson *et al.* (1991), Gonzales & Rees (1988), Harrap & Quinn (1996), Kennedy *et al.* (2000), Matthysen (1998), McGregor (1909), Parkes (1973), Rand & Rabor (1960, 1967).

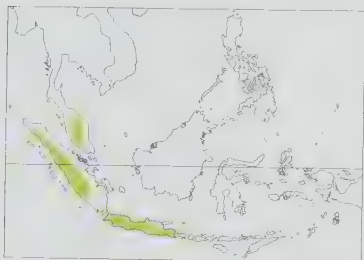
25. Blue Nuthatch

Sitta azurea

Spanish: Trepador Azur

Other common names: Azure Nuthatch

S. a. azurea Lesson, 1830 – E Java.



Food and Feeding. Food insects. Occurs in pairs or in parties of up to seven individuals, usually associated with mixed-species flocks; foraging parties restless and very vocal. Forages in middle and upper storeys of tall forest, sometimes also in smaller trees, usually on trunks and main branches. Spends much time in scanning, only occasionally making lobs at bark.

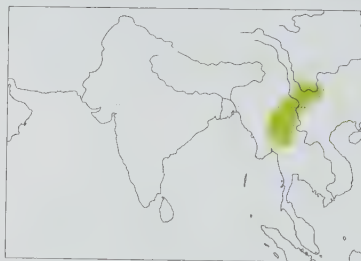
Bibliography. Dickinson (2006), Dickinson *et al.* (2006b), Harrap & Quinn (1996), Hellebrekers & Hoogerwerf (1967), Kuroda (1936), MacKinnon (1988), Medway & Wells (1976), Robinson (1928), Robson (2000b), Wells (2007).

26. Giant Nuthatch

Sitta magna

Spanish: Trepador Gigante

S. m. magna R. G. W. Ransay, 1876 – C & E Myanmar (S from Mogok hills, E from Menetaung range and Kalaw, to Mt Nattaung, in N Karen), adjacent S China (SW Yunnan) and NW Thailand



Food and Feeding. Food insects and berries. Usually found singly or in pairs, seldom in flocks (in spring), but in S China (Yunnan) recorded in autumn and winter in mixed flocks with other species of genus. Generally not so restless as the smaller nuthatches, but behaviour otherwise similar, and frequently adopts characteristic head-down pose. Forages mostly in pines, generally high up, only occasionally descending lower, on trunk and upper limbs.

Breeding. Poorly known. In Myanmar (S Shan State), a nest found in early Apr was a pad of material similar to that used by congeners, placed in natural hole c. 2 m above ground in tree trunk, entrance (barely large enough to admit adults) had been "rounded off slightly by the parent bird."

Class AVES

Order PASSERIFORMES

Suborder OSCINES

Family TICHODROMIDAE (WALLCREEPER)



- Medium-sized passerine with long, slightly decurved bill, long, broad and rounded wings, and large feet; strikingly coloured in crimson and black.
- 16.5–17 cm.



- Southern Europe and south-central and southern Asia.
- Mountains, rocky habitats, cliffs, boulder-strewn slopes and shady gorges.
- 1 genus, 1 species, 2 taxa.
- No species threatened; none extinct since 1600.

Systematics

Any species convergently similar to a European nuthatch (*Sitta*) or treecreeper (*Certhia*) has been associated with one or the other of these genera, and the scansorial species, those which forage by climbing on trees or rocks and cliffs, have often been united in one family. The Wallcreeper (*Tichodroma muraria*), formerly placed with the treecreepers in the family Certhiidae, was later included in the nuthatch family (Sittidae), there being significantly more support for the latter treatment from morphological and ethological criteria, which had been thoroughly compared and analysed in the literature. Data derived from DNA–DNA hybridization suggest that the Wallcreeper is, indeed, more closely related to the Sittidae than it is to the Certhiidae, but the discussion about its taxonomic relationships is not new, as G. A. Girtanner, of St Gallen, in Switzerland, was much preoccupied with the subject as early as the 1860s.

Morphological similarities between *Tichodroma* and *Sitta*, but in which *Certhia* differs from those two genera, include the plumage colour of the upperside, and the colour pattern and shape of the tail. The Wallcreeper and the nuthatches are blue-grey on the upperside, whereas the upperparts of the *Certhia* are brown and cryptically patterned, resembling bark, although the wing patterns of the three genera *Tichodroma*, *Sitta* and *Certhia* are distinctly different. The Wallcreeper and the nuthatches have a short, straight, square-ended tail, sometimes with small white tips or corners, whereas *Certhia* possesses an unmarked, long and graduated tail, which is used as a prop during climbing. In addition, the young of both *Tichodroma* and *Sitta* have long, grey natal down on the head, scapulars and back, while young *Certhia* species have down on the head only. In fact, it is only in the shape of its slender, slightly decurved bill that *Tichodroma* resembles the genus *Certhia* more than it does *Sitta*.

Among ethological similarities between *Tichodroma* and *Sitta*, including those evident from H. Löhrl's comparative study of certain behavioural characters of these two genera, as well as *Parus*, *Aegithalos* and *Certhia*, are the following. Regular wing-flicking is performed by Wallcreepers and nuthatches, admittedly for a different level of excitement by nuthatches, but is not performed at all by treecreepers. A characteristic pendulum movement of the head and body, which is absent from the behavioural repertoire of *Certhia*, is well documented for *Sitta*; Löhrl noted such swaying by *Tichodroma* only when a individual was leaving its nest after a feeding visit, and R. Gränitz recorded it once

when a Wallcreeper was perched and singing in winter. The habit of occasionally coming to the ground is common to the Wallcreeper and nuthatches alike, as is that of roosting in holes throughout the year; treecreepers, on the other hand, although they gather much nest material on the ground, are otherwise exclusively climbers, and they roost outside holes and crevices, in which they only nest. As mentioned later (see Breeding), the task of incubation is undertaken entirely by the female Wallcreeper, as is so also with the nuthatches, but both sexes of *Certhia* incubate; furthermore, both the incubation period and the fledging period of the first two genera are longer than those of *Certhia*. Apart from the complete adult post-breeding moult, both *Tichodroma* and *Sitta* have a variable partial moult in the spring, while *Certhia* has only the complete post-breeding moult. Further similarities between *Tichodroma* and *Sitta* relate to the threat postures and gliding display-flights during the breeding season.

Tichodroma is now generally considered to belong in a family of its own. For K. H. Voous, who noted its "extraordinary adaptations to extreme mountain conditions", the Wallcreeper was the sole species in the family Tichodromidae. It should be noted that the family name has frequently been spelt "Tichodromadidae", but there appears to be no justification whatsoever to support this spelling. The family comprises a single genus, *Tichodroma*, and just one species, *Tichodroma muraria*, which is itself often considered monotypic, as the two currently recognized subspecies, the nominate in the west of the range and *nepalensis* farther east, are poorly differentiated. Conversely, L. A. Portenko supported the separation of an additional subspecies, *longirostra*, occurring in the Caucasus area and northern and western Iran, and proposed also that the Central Asian population be regarded as representing a further race, *ognewi*. The differences of these forms from, respectively, the nominate race and *nepalensis* appear, however, to be too slight to warrant such an arrangement.

Support for the recognition of a distinct family Tichodromidae is provided by several physical features. First, the long, thin tongue of *Tichodroma* is divided (barbed) at the tip, but it lacks the bristles characteristic of *Sitta* and *Certhia*; second, the tarsus of *Tichodroma*, markedly slender for a climber, is covered anteriorly with a single long lamina, whereas the tarsi of *Sitta* and *Certhia* are distinctly scutellate. Wallcreepers also have rather long, slender toes, the front claws being sharply decurved, the conspicuously long hind claw less so. The leg of *Sitta* is short, and its foot is large and strong, with laterally compressed claws; the *Certhia* foot is short, with rather long toes and strong claws, that of the

hind toe being particularly long. *Tichodroma* differs distinctly from *Sitta* in its food-handling techniques. Unlike nuthatches, it takes only animal prey, and it deals with harder-bodied individuals by carrying them in flight to a level surface, where it dismembers them by beating them against the substrate. Nuthatches, on the other hand, wedge items in crevices or holes and hammer them to pieces with blows of the bill. Unlike some *Sitta*, the Wallcreeper does not store food. Neither nuthatches nor Wallcreepers use the foot for holding larger food items, although one female Wallcreeper did employ a comparable technique when collecting nest material (see Breeding).

In early work by C. G. Sibley, the biochemical behaviour of the Wallcreeper's egg-white proteins as revealed in electrophoretic patterns showed no resemblance to that of the Sittidae or the Certhiidae, and differed also from that of the tits (Paridae), the parrotbill genus *Panurus* (Paradoxornithidae) and the Australasian treecreeper genus *Climacteris* (Climacteridae). Data on DNA-DNA hybridization from studies by Sibley and J. E. Ahlquist indicated that the genera *Sitta*, *Tichodroma* and *Certhia* belonged to the kin group of the tits and, furthermore, supported the idea of an especially close relationship between *Tichodroma* and *Sitta* as "sister taxa", not close, but each other's closest relatives. As a consequence, these authors treated *Tichodroma* and *Sitta* as representing two monogeneric subfamilies, Tichodrominae and Sittinae, of the Sittidae within the superfamily Sylvioidea, and sharing a common ancestor with the other sylvioids some 40–45 million years ago. Some authors still prefer to regard the Wallcreeper as a monotypic subfamily of the Sittidae.

More recent molecular studies, by P. Alström and colleagues, were analysed and interpreted by A. J. Helbig in respect of the central European species. It was proposed that Sibley and Ahlquist's "parvorder Passerida" be divided into three basic groups, comprising five superfamilies and two separate families, the Regulidae and the Bombycillidae. In the first such group, the Paroidea, comprising the parid tits and allies, are linked with, and may be the sister-group of, the Sylvioidea, while the third group is the Passeroidea. It is the second group that is most relevant to the Wallcreeper; this embraces the superfamilies Certhioidea (Sittoidea) and Muscicapoidea, as well as the Regulidae and the Bombycillidae. Within the Certhioidea, there

is an apparently close relationship between the primarily Old World nuthatches, treecreepers and Wallcreeper and the almost exclusively New World gnatcatchers (Polioptilidae) and wrens (Troglodytidae). This relationship was first revealed only by molecular studies, but is now firmly corroborated through the work of Sibley and Ahlquist, F. H. Sheldon and F. B. Gill, and F. K. Barker and others.

Morphological Aspects

In build and in the coloration of its abundant, soft plumage, the Wallcreeper is perfectly adapted to its mountain environment. Living in inaccessible sites, it can be difficult to see, especially as its dusky-grey and black plumage may blend with the rocks. Those individuals which spend the non-breeding season, and in some cases even breed, at lower altitudes, including on buildings, may be easier to observe. Once the characteristic wing-flicking draws attention and, even more so, when the bird flies, typically with an erratic, flitting and skipping motion, the full elegance and beauty of its plumage, especially the black, carmine-red to pink and white of the wings, are revealed. The carmine-red colour is derived from the carotenoid pigment astaxanthin.

Of the total body length of 16.5–17 cm, the bill constitutes 2.3–4.2 cm and the tail 5.5–6.5 cm. The Wallcreeper appears about the size of a Eurasian Nuthatch (*Sitta europaea*) and thus larger than it really is, and it is therefore surprising that its body weight of 16.7–19.3 g corresponds to the average for a Great Tit (*Parus major*), which contrasts strongly with the large wings (see below). Young Wallcreepers exceed 20 g about a week before they leave the nest, but they lose the excess around the time of fledging.

Whereas the Wallcreeper's tail is short and square-ended, the wings are disproportionately large, long and rounded, reminiscent of those of a Hoopoe (*Upupa epops*) or a butterfly (Lepidoptera), and have a span of 27–32 cm. Wallcreepers are excellent short-distance fliers, but they look rather ponderous over longer distances; nevertheless, they do sometimes fly high over mountain valleys or passes when migrating or moving from one cliff face to another, and they can then give the impression of flying quite strongly. For one Slovakian observer, a Wallcreeper in "calm flight" along a rock face is reminiscent of a Spotted Nutcracker (*Nucifraga caryocatactes*) or a Eurasian Jay (*Garrulus glandarius*). F. A. Kipp devised a formula for determining the "hand-wing index" of birds, which is defined as the length of the hand, measured from the end of the outermost secondary (S1) to the wingtip, as a percentage of the total wing length. The figure for the Wallcreeper, 20–21%, does suggest that this species' wing is not well suited to active long-distance flight. Apart from the importance of the wings as a support when climbing, their unusual shape and the large wing area do, nevertheless, allow the bird to make skilful use of the updraughts characteristic of mountain regions to ascend to much higher altitudes. Flying with light wingbeats into the wind, the bird is quickly blown upwards with little effort on its own part and almost without moving the wings; not surprisingly, it may drift slightly off course, and it then corrects this by using active flapping flight to bring it back to its target. In an "investigative flight" described by M. Saniga (see Food and Feeding), the wingbeats appear exaggerated, the alternate spreading and closing of the flight-feathers causing considerable changes in the apparent size and the amount of visual flashing of the wings' bright colours. In order to descend from a great height to places at the foot of a cliff, the Wallcreeper closes its wings and holds them so tight to the body that it drops like a stone. It will then open its wings only just before landing, so that they act as a parachute and the bird can land safely after a slight upward swoop. The unusually large wings are especially well suited also to stopping this plummeting descent. A downward glide during which the wings are held up in a V-shape and the tail raised has also been reported. Saniga found that a Wallcreeper employing this gliding descent, usually when flying down to a nest with food or removing faecal sacs, resembled a falling leaf. Similarly, in Bulgaria in March, W. Baumgart observed how two individuals, separately, launched themselves from a rock face in



[*Tichodroma muraria nepalensis*, Dehra Dun, Uttarakhand, India.
Photo: Rajneesh Suvarna]

The family Tichodromidae comprises a single species, the Wallcreeper. Its closest relatives are probably the nuthatches (Sittidae), which share the Wallcreeper's scansorial habits. The Wallcreeper is morphologically adapted for ascending the cliffs and boulder-covered slopes that compose its habitat. Its strikingly long slender toes are complemented by strongly decurved front claws and a remarkably long rear claw. This foot structure enables the Wallcreeper to hop between rocky protuberances, thereby compensating for legs that are slimmer than those of fellow climbers, such as nuthatches and treecreepers (Certhiidae).

alarm when a Common Kestrel (*Falco tinnunculus*) came close, and then dropped like falling leaves for 6–7 seconds, with wings and tail fully spread; the prominent display or flashing effect of the colour pattern of red, white and black presumably confused or deterred the predator.

Its large wings also enable the Wallcreeper to hover. Moreover, they make it superbly agile and manoeuvrable in the air, especially when pursuing insects, allowing it to fly in curves and turns within a very small space. When inexperienced young captive Wallcreepers were first released into the aviary, the rear wall of which consisted of a large glass pane, Löhr's study window, not once did they collide with the glass. Practising their flying skills, the young would sometimes head for the glass at a speed that forced the observers on the other side to hold their breath, but the birds would always veer away within just centimetres of the obstruction. Such remarkable agility also means that, in the wild, Wallcreepers are able to evade most attacks by predators.

The characteristic wing-flicking is a striking feature of the Wallcreeper's behaviour, and the proportionately large size of the wings makes this action slower than in most other bird species. The constant flicking action can suddenly change an inconspicuous bird that merges perfectly with its background into a very conspicuous one, as the otherwise concealed white spots on the primaries flash and the red parts of the plumage are visible over some distance. This visual signal, which is important as the principal means of communication, is discussed in more detail later (see General Habits).

The black bill is long, slender, rounded, slightly decurved and sharply pointed. It is used for the purpose of extricating insects and other arthropods which have concealed themselves in holes and crevices, the very narrow head being often inserted deep into such cavities. Located near the thicker base of the bill, the nostrils are long and narrow and partly covered by a membrane above. The tongue, too, is long, thin and pointed, and is also divided, or "barbed", at the tip (see Food and Feeding). The eyes are black and are conspicuously positioned so as to allow the bird to focus both eyes simultaneously on a prey item adjacent to the tip of its bill. Löhr noted that a captive Wallcreeper looked rather like an owl (Strigidae) when staring straight at the observer.

Strikingly large feet are another characteristic feature. The black legs and toes are, however, relatively long and thin, something which surprised G. Mountfort when he saw a Wallcreeper in the hand in Pakistan, as he would have expected such a rock-climbing species to have short, sturdy legs like those of a nuthatch. The claws are strong and sharply decurved, the long hind claw, as long as or longer than the hind toe, being slightly less decurved than the others.

The Wallcreeper's method of climbing differs from that of other bird species. Although it may occasionally climb in the manner of a nuthatch, placing one foot higher than the other, it usually hops, with the feet held parallel, from one jutting rock to the next. The gait, on both vertical and horizontal surfaces, is mainly a short, jerky hop varied by sidling, creeping and walking. The species will walk for short distances in crevices and when entering the nest-hole, and also in order to retrieve small pieces when dismembering prey items (see Food and Feeding). Alternate walking and hopping also occur. It can jump up a step of about 20 cm without using its wings. When forced to climb up a vertical rock face and to cross relatively smooth walls without ledges or projections, however, the bird does bring its wings into play, whereby one wing may be twisted in a peculiar way. In some cases, a single rapid wingbeat is enough to support an ascending leap. These movements of the wings have nothing to do with wing-flicking. Saniga observed Wallcreepers which climbed upwards under overhanging rocks, often assisted by vigorous wingbeats. If the bird has to ascend quite a long way, it will take off from the rock face and fly upwards in a spiral. Frequent clinging to the wall between individual climbing phases is typical when a bird is moving over longer stretches.

Wallcreepers probably never attempt to land on a vertical rock face lacking structural features such as grooves, overhangs, ledges or the like. Captive individuals certainly did not try to land on a smooth vertical surface, but they managed to do so

easily on a house wall with roughcast rendering; even so, they would cling to the latter much more frequently than try to climb on it, something easily achieved without the need to use the wings by treecreepers and small nuthatch species. It is by no means rare to see a Wallcreeper slipping down on a smooth slab of rock, but the species very quickly makes use of its wings to stop itself from falling. The difficulty which a Wallcreeper has, and the ponderous and clumsy appearance which it can present, when trying to climb walls with a smooth surface were strikingly revealed in observations on a pair that nested in the wall of the castle Neuschwanstein, in Bavaria (see Relationship with Man). These two individuals certainly did not attempt to climb straight up the castle wall, but fluttered rather in a rectangular recess, moving alternately from one side to the other and thus ascending in a zigzag. They would always then cover the last stage in short flights. As the Wallcreeper clings to a cliff with the feet parallel and without being able to use its tail as a prop, it counterbalances by bringing its breast as close to the substrate as possible, thereby shifting its weight in the front part of its body towards the rock face, which the feathers sometimes touch. The long toes and claws help it to do this. Wallcreepers can also climb trees, but they do this only rarely (see Habitat).

In breeding plumage, the adult male's forehead, crown, upper ear-coverts and mantle are ash-grey, the head being slightly darker than the mantle, which may fade to whitish-grey with wear and thus contrast with the medium to dark grey or blackish-grey of the lower back, rump and uppertail-coverts, and the dark tail. The lesser and median wing-coverts are reddish-pink, and the greater wing-coverts and primary coverts are black-brown with a red-pink outer web. The outermost primary is blackish-brown. The other primaries are blackish brown-grey, with a red-pink basal half of the outer web and a whitish fringe along the tip; each of the outer primaries (except the outermost) has two large oval white spots on the inner web, but the inner primaries have only one white spot or none at all on the inner web; some birds also have rusty spots randomly distributed on the inner primaries. The inner web of the secondaries is unspotted or with one reddish-yellow or rusty spot. There is some variation, apparently not sex-related, in the number and size of spots on the flight-feathers. The white tips are sometimes absent, whereas in juveniles they tend to be broader. The tail feathers are slate-black with a grey tip, the two outermost rectrices having a white patch. The male's throat, cheek and chest are black, with some individual variation, and the rest of the underparts are grey, the undertail-coverts tipped white.

In breeding plumage the female resembles the male, except that the throat and chest are sometimes white, although usually with a dark grey or grey-black mottled patch of varying size on the lower throat or chest; this extremely variable feature, which is rarely almost as extensive as shown by the breeding adult male, is not age-related. Overall the female appears paler than the male, with much of her plumage slightly paler grey.

The sexes are indistinguishable in adult non-breeding plumage, which resembles that of the breeding adult female except that it is uniformly creamy white or white from chin to chest. Thus, the breeding male's large black bib and the small dusky spot of most females in breeding plumage are lost; the underparts are otherwise medium grey. The forehead and crown are light or medium grey with a faint buff-brown tinge, and a narrow off-white eyering is more obvious than it is during the summer.

Juvenile Wallcreepers are not unlike non-breeding adults, but appear darker ash-grey over the entire body plumage. The black bill is initially almost straight. In first-winter plumage, the forehead and crown are tinged brownish, later becoming grey.

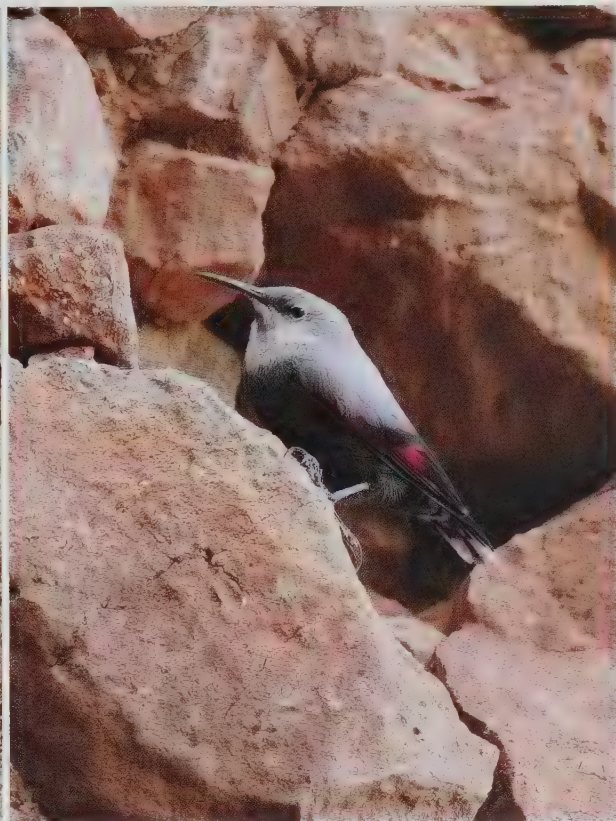
Geographical differences are rather slight. The eastern subspecies, *nepalensis*, differs from the nominate race only in being on average darker, with the upperparts slightly darker, more bluish-grey, and the belly sometimes darker grey or blackish. Its forehead and crown are often tinged yellow-ochre or buff-brown in winter, and the base of the tail feathers is more often tinged pink. In addition, the pale spots on the primaries and tail are on average larger than those of the nominate race, while the wing is on average longer and the bill shorter.

Flight-feather moult takes about eight weeks, and it may begin when the adults still have young in the nest. The female of a

When breeding, the male Wallcreeper has the chin, throat and breast black, but outside the breeding season both sexes have this same area mainly white. The breeding female's plumage is similar to this "unisexual" non-breeding dress, but with a variable grey-black patch on the throat. The right-hand bird might appear to be a breeding female, but the photo was taken in November: this bird has moulted into non-breeding plumage and simply happens to have a few dark feathers showing through on the throat.

[Left: *Tichodroma muraria nepalensis*, Xiahe, Gansu, China. Photo: Jussi Vakkala.

Right: *Tichodroma muraria muraria*, Mallos de Riglos, Huesca, Spain. Photo: Ferran López]



captive breeding pair, the young of which fledged on 6th and 7th July, shed the first primary on 30th June, and both adults had moulted the first pair of primaries on 1st and 2nd July. The female of a wild pair under observation in the Ötz valley, in Austria, also shed the first feather during the nestling period, which is rather unusual for a passerine. The speeding-up of the moult process, however, is to be explained by the fact that the onset of winter is often early in the mountains. During this moult of the remiges and rectrices, Wallcreepers do not undertake long flights but they tend, rather, to spend much time by mountain streams and on grassy ledges. Aviary-held Wallcreepers, likewise, completely abandoned their habitual "aerial play" during this period.

In the 1970s, as it had not been established whether all the small body feathers are shed during the spring moult into breeding plumage, Löhrl colour-dyed a Wallcreeper with a red pigment. It was subsequently revealed that the only feathers moulted were those of the throat, the breast and the front part of the upper head, with the forehead and sides of the head, and also some feathers on the upper back. The Wallcreeper thus moults only those plumage parts that change colour in the male and in at least some females when breeding plumage is assumed. Despite this, the pre-breeding moult of the small body feathers lasts for six weeks, that of one captive individual continuing from 8th February to 22nd March.

Post-juvenile moult begins about four weeks after fledging and is restricted to the body plumage, thus excluding the flight-feathers and the tail. The red parts of the plumage remain an intense red.

Habitat

The Wallcreeper is probably Eremian (of the Palearctic arid zone) in origin. It is found in temperate, boreal and steppe climatic zones and mountain regions of the south Palearctic, where it is often present near glaciers or just below the snow-line. It breeds mainly in rocky terrain in high and medium-altitude mountains from Spain eastwards to China, effectively replacing the Western Rock (*Sitta neumayer*) and Eastern Rock Nuthatches (*Sitta tephronota*) in cooler, higher and less sunny zones. Its preferred habitat is varied rocky regions, typically craggy and fissured, steep cliffs

and boulder-strewn slopes, very often with running water though this is not a precondition, and interspersed with grassy ledges that harbour insects and spiders (Araneae); other vegetation characteristic of this species' habitat, including moss patches, herbaceous plants, shrubs and trees, similarly attracts the invertebrates on which Wallcreepers feed. Breeding habitats in southern Greece, and some in Slovakia, conspicuously lack the waterfalls and streams typical of breeding sites in the Alps. The varied nature of the nesting territory, including the fact that it contains both sunlit and shaded parts, is a guarantee that sufficient food is available at any time of the day and in all types of weather (see Food and Feeding).

Nineteenth-century reports of Wallcreepers in trees have been confirmed more recently, albeit rarely. An individual was seen to forage successfully on a young arolla pine (*Pinus cembra*), staying on the trunk and/or jumping from branch to branch, and there are further observations of such behaviour in the former USSR and in Kashmir, where one also regularly visited the wooden walls of a houseboat. It has even been reported that Wallcreepers wintering at lower altitudes in Tajikistan frequently forage in orchards, but it is not clear whether they actually spend long periods on trees. In his Slovakian study, Saniga observed that Wallcreepers pursued by other species, such as the Common Swift (*Apus apus*), or overtaken by stormy conditions with downpours sought refuge in trees. In the same study, it was found that they will also perch in trees in order to preen, and that the first flight of fledgling Wallcreepers is often to a tree. The difficulties that the species may face when climbing on trees became clear when several of Löhrl's captive individuals, the aviary of which contained an old apple-tree trunk, sometimes got their long, curved claws briefly caught in its bark when they wanted to continue climbing or to fly off.

Breeding sites are on rock faces up to 900–1100 m high, the lower part of which may be open or densely wooded, and in the low rocky sides, up to about 20 m high, of shady, damp gorges carved out by mountain streams, where the nest may be constantly in spray, so that the ambient climate varies considerably. For those Wallcreepers breeding in gorges in Europe, Löhrl noted persistent foraging in rubble along streams and rivers, especially in poor weather conditions. The species will also nest on, and occasionally inside, a variety of buildings, including castles,

churches, mountain huts and barrages (see Breeding, and Relationship with Man). The geological formation is unimportant or, at least, is less important than is a markedly structured surface with overhangs, crevices, fissures, ledges and vegetation. Wallcreepers will occupy sites on cliffs both of limestone and of ancient crystalline rocks such as granite and the metamorphic gneisses, although limestone is sometimes reported as being preferred, as, for example, in Spain, Slovakia and Tibet, and may well provide a better supply of potential nest-sites.

Nor is there a fixed altitude. Breeding has been recorded in Spain at a mean of 1839 m, in France from 480 m to 2840 m, in Switzerland from 350 m in the canton of Ticino up to 3450 m, most sites lying between 1200 m and 2300 m, and in Austria between 450 m and at least 2500 m but mainly at 1000–2000 m. The small German population, in the Bavarian Alps, has an altitudinal range extending between 660 m and 2450, exceptionally to 2900 m, while Wallcreepers breeding in the Slovak West Carpathians have been found between 400 m and 1500 m in the Malá Fatra and at 650–1550 m in the Vel'ká Fatra, and pairs in southern Greece at 1900–2400 m. Most breeding sites in Turkey lie between 2300 m and 3100 m, and the majority in the Tien Shan are probably at 3000–3500, with extremes of 2800 m and 4000 m, the altitudinal limits in north-eastern Afghanistan being similarly at 2900–4100 m. This species breeds at up to 4700 m in the Pamir Mountains, and in the Himalayas in general Wallcreepers probably breed primarily above 3600 m and up to the permanent snow-line. They have been observed at up to 5100 m in the Tibetan region. Even at great heights, there are still refuges sufficiently warmed by the sun to create a favourable micro-climate for various nival (snow-adapted) insects on which Wallcreepers can feed. The Wallcreeper's wing shape is superbly well adapted to its typical mountain habitat, as the species can exploit the updraughts by sheer rock faces to ascend to higher regions much more rapidly than would ever be possible by using active flapping flight.

Typical haunts in winter are rock faces, including quarries and sea cliffs, earth and clay banks or cliffs, newly built road cuttings, and buildings such as churches, cathedrals and ruins. In Gilgit, in north Pakistan, Wallcreepers visit stone walls along roads, as well as buildings, in the winter months. In Nepal, they regularly visit horizontal gravel fields and rock debris by cliffs and, at low altitudes where rock faces and cliffs are absent, they come to banks and fields of gravel along rivers; at the other extreme, they have been seen to forage systematically on the gently sloping lateral moraines of glaciers at nearly 5000 m in the Khumbu Himal. A Wallcreeper's winter territory may comprise several small sections of rock face or quarry, but the territory-holding individual may intermittently cease foraging there and fly off to visit ruins, churches and similar buildings. Those migrating between their breeding and winter territories sometimes stop off on structures such as bridges and power stations.

Wintering Wallcreepers are found down to sea-level, as on some Mediterranean islands and in southern Turkey, and in the Indian Subcontinent they occur in the plains of India and Pakistan, and to 245 m in Nepal and 305 m in Sikkim. Sheer limestone cliffs favoured by this species in Anatolia, in central Turkey, are at 500–700 m on the edge of the steppe. On the other hand, Wallcreepers have been recorded at considerable altitude during the non-breeding season. For example, they have been observed at 1800–3200 m in Switzerland and, in the range of the subspecies *nepalensis*, at 1200–2400 m in the northern valleys of Pakistan, at 4000 m in Ladakh, up to 5730 m in Nepal, to 3600 m in Sikkim, and usually above 1000 m in Bhutan. In China, there are February records of *nepalensis* at 1400–2500 m in Sichuan and 2925 m in Yunnan.

General Habits

Breeding pairs of Wallcreepers are solitary and strictly territorial, and these birds are normally solitary also in winter, when the sexes are identical in plumage (see Morphological Aspects) and vigorously defend individual feeding territories, the size of which varies and/or is difficult to assess, against other Wallcreepers. A non-breeding territory may comprise a single rock massif or, not

uncommonly, a large quarry of 10 ha or more, or it may be more fragmented, taking in, for example, several quarries or parts of buildings. An individual wintering in a Belgian quarry at Poulseur frequented a rock face about 100 m long and 40 m high. In Switzerland, R. Hauri noted that Wallcreepers wintering in towns and on rocks had a focal point of activity and undertook set movements each day. Relatively long flights, covering up to at least 1.6 km, from the roost-site to visit quarries and buildings were reported by H. Stopper in Germany, while Saniga noted that dispersal from roosts in Slovakia was within a radius of about 4 km, and once 6 km. Winter site-fidelity has been proved in a couple of cases, and seems likely in others (see Movements).

In Hauri's study at Mitholz, in southern Switzerland, it was found that the occasional occurrence of a second individual in a winter territory invariably led to a dispute. When two to four or more Wallcreepers are reported as having been seen "together" in winter, it is not always clear how closely they were associated. On clay cliffs at the Shardara Reservoir, in southern Kazakhstan, as many as 15–18 Wallcreepers, single individuals and "pairs", were found during the course of two days in December. Before the juvenile moult, independent juveniles, possibly siblings, occur in loose groups, which keep separate from any adults that may still be present in the breeding area; they are generally solitary after one month, at the latest. There are four published reports of apparent flocks outside the breeding season in the western French Alps: these involved a group of six individuals in mid-August, and ten, dispersed over a few tens of metres, late in the same month; a flock of 48 which landed in an area 10–15 m across on a sunlit rock face on 10th December; and about 70 individuals, in two loose gatherings, on 11th November. In addition, 40–50 foraging Wallcreepers were observed above Ausserbratz, in the Austrian province of Vorarlberg, in October 1990. The well-known intolerance of this species towards conspecifics (see Breeding), however, may lead one to conclude that such reports are not credible, and U. N. Glutz von Blotzheim considered that, in future, similar reports should, in any case, be thoroughly investigated before publication.

Wallcreepers are generally fairly confiding both within and outside the breeding season, tolerating or being indifferent to the presence of humans. Nevertheless, when conducting prolonged observations on breeding birds in Austria, even from the opposite side of a gorge, C. Böhm found that they tended to hesitate before going to the nest or used a roundabout route to reach it. There are many reports from mountaineers of close encounters with this species, and individuals spending the non-breeding season in towns are often not shy. Indeed, the species is sometimes described as being tame, which may be especially true of vagrants. On the other hand, it will hide when it becomes aware of being watched.

During the daytime activity period, Wallcreepers appear to concentrate on the vital forms of behaviour such as foraging and, in the breeding season, searching for nest material, nest-building and the care of the young. Both wild-living and captive Wallcreepers often take long breaks, which usually begin with preening and then lead to complete rest. After such periods of rest, which can last for ten minutes or longer, the bird begins to stretch: the wings and legs are extended backwards, always one at a time, and then both wings are flicked upwards.

Saniga's detailed investigation of this species in central Slovakia confirmed the important role of the photoperiod in the timing of activity throughout the year. Wallcreepers go to roost relatively early, and they rise late. Saniga found the roosting period to be longer than that of other species sharing the same habitat, such as the Common Rock-thrush (*Monticola saxatilis*) and the Alpine Accentor (*Prunella collaris*). One aviculturist commented on the fact that captive juveniles apparently needed long periods of deep sleep. At an east-facing rock wall in Switzerland that was poorly illuminated by the sun, the bird entered its roost-hole an average of 7–8 minutes before sunset, whereas the average time on west-facing cliffs was 11 minutes after sunset. Of course, the weather and the degree to which the individual bird is sated also play a part. While solitary roosting is certainly the norm, there is a January report of five Wallcreepers roosting together under the roof of a building in Stans, in the Swiss canton of Nidwalden.



The plumage of the **Wallcreeper** is a beautiful combination of grey, black, white and carmine-red that serves both to conceal and to reveal. Its grey head and body with black countershading can make it surprisingly difficult to see against rocks and cliffs, but as soon as it flicks open its wings or flies, it immediately becomes strikingly visible. Irrespective of age or sex, the Wallcreeper has bright carmine-red coverts both above and below the wing. On the upperwing, this shock of colour extends onto the inner primaries and secondaries, in the form of fringes. An array of white spots on the flight-feathers further heightens the splendid show. The beauty of this combination is put to good effect by the Wallcreeper's erratic, butterfly-like flight, as it bounds and flits on disproportionately large, long and rounded wings, rather like a Hoopoe (*Upupa epops*). The wing shape and large surface area enable the Wallcreeper to take advantage of the updraughts prevalent in mountainous areas, which billow it upwards to higher feeding grounds using minimal effort on the bird's part.

[*Tichodroma muraria*
muraria.

Above: Leysin, Switzerland.
Photo: Eugène
Hüttenmoser.

Below: near Dazio Grande,
Ticino, Switzerland.
Photo: Rolf Kunz]



Wallcreepers are very demanding in their choice of a cavity for roosting. The hole should be inaccessible to predators, it must remain dry and it must provide protection from the wind; further, it must not freeze up in snowstorms. Most of the sites chosen for roosting are fairly small holes or crevices under rock overhangs. Holes recognized as favourable roost-sites are often used repeatedly for weeks, and one site on molasse cliffs in Switzerland was utilized by different individuals over several decades. At a mountain locality near Almaty, in south-east Kazakhstan, Wallcreepers descended in the morning but moved back upslope in the evening, presumably preferring to roost in secure sites higher up the mountain. According to Girtanner and F. C. Keller, Wallcreepers lie flat on the floor of their roost-hole when sleeping, but one of Löhrl's captive individuals, roosting openly on a brick high up on the wall of the aviary, slept in the same way as other species, sitting upright with the head tucked into the back feathers, and the ruffled contour feathers covering its feet; this posture had already been confirmed for another captive bird by O. and M. Heinroth.

This species readily sun-bathes when it feels secure. In the first of two different postures commonly adopted for sunning, the Wallcreeper sits upright, with its underparts exposed to the sun, usually closes its eyes and holds its head at an angle and sometimes also thrown back, with the throat feathers ruffled and lit by the sun; all parts of the plumage exposed to the sun are conspicuously ruffled. In the second posture, it spreads its large, colourful wings to the fullest extent and allows the sun's rays to penetrate its back feathers, the preen gland being fully exposed; the eyes usually remain open in this posture, while the head is often lowered and supported on the bill. For sunning, these birds will also cling to a rock face with the wings held open. The Wallcreeper's performance of dusting or sand-bathing, which frequently alternates with sunning and for which it prefers stones or rocks covered in a thin layer of sand, also differs from that of other birds. The individual lies flat on the rock, supports its head by resting the bill on the substrate, and makes alternate kicking movements of the feet to the side or at an angle to the rear. The jerky movements executed bring the body directly into contact with the rough sand, and the bird, supporting itself on its half-open wings, moves slowly forwards. Wallcreepers tend to increase sunning and dusting behaviour during the moult. For water-bathing, the species prefers water running downwards from a higher site, while bathing places in standing water are less favoured. A Wallcreeper will stand in the water, immerse its breast and allow the water to trickle over its back, this being accompanied by vigorous beating of the wings. Bathing in snow has also been recorded.

Preening is performed in the usual way. The Wallcreeper cleans its head by scratching, for which it uses the indirect method, the leg being brought up over the wing. On some occasions, however, the bird cleans its head by rubbing it against a stone.

Wing-flicking is a particularly striking and characteristic feature of this species' behaviour, and is often what draws an observer's attention to the bird's presence. Wallcreepers wing-flick at varying intensity, depending on whether they are alone or in twos, are searching for food or are resting. The wing-flicking is not tied to any particular situation and may well be, as is so with most other birds that perform it, an expression of excitement, comparable to, say, the tail-shivering of redstarts (*Phoenicurus*). Although Wallcreepers wing-flick when foraging, they do so also at other times, so that this action is not, despite the contrary view expressed earlier by A. K. Müller and more recently by Saniga, primarily a foraging aid. Even nestlings wing-flick as soon as they leave the nest, albeit for only a few seconds, but they do not flick their wings when in the nest. During wing-flicking, the otherwise concealed white spots on the primaries flash and the red parts of the plumage are visible over some distance. This visual signal serves as a substitute for contact calls, and thus plays an important role in the species' social behaviour as the principal means of intraspecific, and interspecific, communication. The speed and the direction of movement are an indication of the degree of excitement: the more excited the bird, the faster and more upward the wings are flicked.

At the approach of a terrestrial predator such as a stoat (*Mustela erminea*) or a pine marten (*Martes martes*) or beech

marten (*Martes foina*), a Wallcreeper will wing-flick at a faster rate and with the movement directed more upwards, this serving as a warning to the bird's mate. Should the predator vanish into cover, the Wallcreeper will fly to a place from where it is better able to keep the source of danger in view. At the approach of a man and his dog in a quarry near Hallein, in the Austrian province of Salzburg, where a male Wallcreeper was spending the winter, the bird flew down to a large stone on the ground and there watched the dog while wing-flicking; it then returned to the rock face. Löhrl witnessed an incident in which a female Wallcreeper that was dust-bathing on a sloping rock in full sun came within a split second of being seized by a stoat.

When an aerial predator such as a Eurasian Sparrowhawk (*Accipiter nisus*) or a Peregrine Falcon (*Falco peregrinus*) appears, wing-flicking first ceases completely. If the predator attacks, the Wallcreeper will fly up and seek to distract and confuse the hawk or falcon by performing skilful flight manoeuvres, the result of which is frequently that the raptor gives up; the action of drifting in the wind "like a falling leaf" is apparently also employed as an anti-predator strategy. Having thwarted such an attack, one Wallcreeper remained clinging motionless to the rock face for 14 minutes (see Morphological Aspects).

Saniga also observed that Wallcreepers sometimes suspended their climbing activity and the flicking movements of the wings and tail in order to look around for prey or for a new place in which to forage.

Voice

Compared with many other passerines, the Wallcreeper has only a small repertoire of vocalizations. On the breeding grounds, the expressive visual signals (see Morphological Aspects) act as a substitute for vocal communication over quite long distances in places where the voice could not penetrate because of the loud background noise of rushing water and wind. A study by J. Martens and G. Geduldig in Nepal showed that the Wallcreeper's song is not well suited to the environment of Himalayan torrents, and often it was only the highest note that was audible in such conditions. Indeed, movements of the bill or neck may be the sole indication that a Wallcreeper is singing. A male observed in the Spanish Pyrenees, clearly singing to advertise his territory, did so mainly away from the nest-hole during building and was audible at distances of up to 150 m, while two males in Switzerland were recorded as countersinging in July. Near the nest-hole, however, the song serves to attract a female and for nest-showing. In studies of captives, it was found that at a later stage in the breeding cycle, when the young were 12 days old, the male would utter the full song phrase several times daily from within the cavity.

Females also sing, mainly to advertise a winter territory, typically giving a shorter and faster phrase. An analysis of some recordings suggested that members of a pair may sing in duet, but this is one of several topics requiring further investigation.

The full song of the male Wallcreeper consists of an ascending series of melodious, piping and rather flute-like whistles, tending to be hoarse at the start; these are followed by a lower-pitched final note, which may be connected to the piping phrase or isolated. This song phrase is sometimes rapidly repeated over a period of several minutes. Both sexes will also utter an abbreviated version, the "warning song", when they are disturbed near the nest, and a similarly shortened version is given at times of low motivation, as well as at the beginning or the end of the song period. Males and females live in separate winter territories (see General Habits), and the advertising song given there is frequently incomplete, the lower final note being omitted. On the basis of a recording made in the Nepalese Himalayas, the song of the eastern subspecies *nepalensis* exhibits a similar pattern of low-pitched but ascending whistles, but apparently with a larger frequency range than that found in the song of European Wallcreepers.

Other songs, or vocalizations with a song-like structure, have been reported and, in some cases, tape-recorded, but a full analysis is still awaited. There are references to drawn-out, strained glissando whistles, one note typically rising and the next falling. Other components of such vocalizations may include twittering,

For a species that inhabits large territories with abundant background noise caused by strong winds and running water, communication tends to be more visual than vocal.

A **Wallcreeper** is thus more likely to become aware of the presence of a conspecific through seeing the bird flick its wings than by hearing its song. In fact, one study revealed that only the highest note of a Wallcreeper song was audible to the human ear above the sound of a rushing Himalayan river. Nevertheless, Wallcreepers appear not to be greatly deterred by such aural interferences and are fairly vocal birds. Both sexes sing, the female mainly doing so to defend a winter territory. The male's song, normally given while perched or climbing, is a series of clear, flute-like whistles that ascend in pitch until the final lower note. The female's song is shorter and quicker. When alarmed close to the nest-hole, either sex may give a curtailed version of the song as a warning. Wallcreepers are often vocal during courtship, birds uttering chirps that recall a Eurasian Tree Sparrow (*Passer montanus*); prior to copulation, the male sings for an extended period, his neck outstretched and wings drooped by his sides. Young Wallcreepers also sing, once they have completed their post-juvenile moult, their vocalizations gradually becoming adult-like over time.

[*Tichodroma muraria*
muraria,
 Leysin, Switzerland.
 Photo: Eugène
 Hüttenmoser]



throaty and other whistling sounds reminiscent of the Common Starling (*Sturnus vulgaris*), as well as obvious contact calls and threat calls. Short, more chattering-type songs are characteristic of, for example, high-intensity territorial excitement.

Young Wallcreepers first give a juvenile song, in which the final form is soon recognizable, after completion of the post-juvenile moult (see Morphological Aspects). They perhaps learn the song from the male when he sings at the nest in the second half of the nestling period. It is perfected from October onwards, being in the early stages a mixture of twittering sounds, especially from the female, and attempts to form the typical ascending series of whistles.

Wallcreepers sing mainly when perched or climbing. The male will sing also when in flight, particularly when performing the nest-showing display. Males deliver their full song in the period from May to July.

There are no specific excitement calls or alarm calls in the Wallcreeper's repertoire, a phenomenon that is probably a consequence of the species' solitary way of life. Reports of a "sharp alarm-call" are more likely to refer to the highest note of the song, which, as intimated above, may be the only one audible if the bird is some way from the observer and there is interference from background noise.

The contact call, which is restricted to the breeding season, is a short, quiet chirping or chirruping sound, rendered variously as "tsche", "chup" or "zui", "tui", "pli" or "touiht", and with some resemblance to the "tschirp" or "schilp" nest-call of the Eurasian Tree Sparrow (*Passer montanus*). Transcriptions suggest the existence of two variants, but there is no further evidence to support this. This call serves also as a feeding-call, being given by the male when offering food to the female or by either parent when encouraging the young to gape. Threat calls are given increasingly from the end of the chick-rearing period, as the frequency of the contact call fades. These are described as rolling and relatively impure, and they include a buzzing sound descending in pitch; another threat call rises and then falls in pitch, "chuit dweeoo", the latter part being reminiscent of the whistle made by a Eurasian Wigeon (*Anas penelope*). Directed at conspecifics, for example when uttered by the more aggressive member of a pair at a given moment, threat calls have the effect of maintaining or increasing the distance separating the individuals.

Even day-old chicks emit very faint and delicate, thin, high series of "psi" or "zi" sounds as food-begging calls. These steadily increase in volume and shrillness with age until they become so loud and screeching that they could theoretically betray the location of the nest. Juvenile contact calls, given just before and, more loudly, after fledging, are similar to or perhaps even identical to those of the adults.

Food and Feeding

At all times of the year, Wallcreepers eat only invertebrates, mainly insects in all their development stages and spiders, but there are no detailed studies of the diet of wild individuals. The species is typically solitary when foraging, and it is rare for pair-members to forage together.

Small items, such as wind-blown aphids (Aphidoidea) and, along streams, probably mainly chironomid midges, are picked up from the surface, whereas concealed items are extracted from cracks and crevices, and also from grassy and mossy patches, while the Wallcreeper is climbing, hopping and walking on rock faces. In Saniga's study in the mountains of central Slovakia, for example, these birds spent 85% of the foraging time in moving along rock faces. Wallcreepers will investigate horizontal fissures and vertical crevices by walking along the entire length of these, and hammering vigorously to loosen any obstructions, which it then removes with the bill. A foraging individual often pokes its head into a cavity so that it seems to disappear completely. During the non-breeding season, Wallcreepers foraging on the weathered limestone cliffs of a quarry at Rottenburg, in southern Germany, successfully extracted several leaf-cutter bees (*Megachile*) and a live peacock butterfly (*Inachis io*) from a deep crevice. In winter, especially, this species often carefully investi-

gates the roofs of cave-like hollows. It will also forage on the ground, notably above or next to a rock wall, and, particularly in rainy weather, visit scree under overhanging rocks or along the banks of streams, vanishing under large pebbles and between boulders and examining all manner of tunnels. Portenko reported individuals as perching on stones in mountain streams and catching freshwater shrimps (*Gammarus*), and in south-west Russia another one, which was fluttering about on a clay bank by the Sea of Azov, at times entered old nest-holes of European Rollers (*Coracias garrulus*), spending about nine minutes inside one of these. A pair of Wallcreepers nesting on a building in Switzerland, at some 900 m across a valley from the nearest rock faces, foraged among rubble and roots close by. Farther east, at the Ngozumpa and Khumbu glaciers, in Nepal, after the breeding season, G. Diesselhorst frequently saw what were probably juveniles of the local subspecies *nepalensis* as they systematically foraged in a fluttering motion on the lateral moraine's steep slopes of coarse till material. When searching for food on the ground, a Wallcreeper will sometimes turn over the leaf litter and small stones, using the closed bill for this purpose.

Being completely dependent on animal food, Wallcreepers make full use of the fact that some parts of their rocky habitat are in the sun and others in the shade. In the morning they first visit sunlit surfaces, later moving to shady places where insects, often still torpid, are easier to catch. At such times, foraging Wallcreepers will hurry from one shaded rock face to the next and overfly sunlit parts.

Insects, especially just after they have taken off, can be overtaken and caught in flight by these birds. Alternatively, a Wallcreeper will hover to glean them, as well as spiders and small molluscs, from rock walls and overhangs; ascending flights in pursuit of butterflies are usually unsuccessful. There is an exceptional record of a female catching exclusively flying insects near the nest for about two hours. In Slovakia, Saniga's study suggested that small insects are flushed by the bird's wing-flicking actions (see General Habits) and are caught immediately on the rock or in the air, such captures accounting for 5% of the bird's time spent in foraging; Wallcreepers also caught prey in longer flycatching sallies and by hovering, which accounted for, respectively, 7% and 3% of the foraging time. In late July, at 3450 m on the Vouasson glacier, in Switzerland, a single Wallcreeper was seen to fly above zygaenid moths, which were clearly numb and slow-moving at that altitude, and force them down so that they could be picked off the snow-covered ground; similarly, W. Wüst reported wind-blown moth larvae (of the family Arctiidae) being taken from the snow. Insects in a torpid state because of the cold are clearly vulnerable, and there are records of Wallcreepers taking such insects from plants, such as a young arolla pine, and from cracks in window frames.

Having been seized in the bill tip, impaled on the long and barbed tongue and drawn back through the almost closed bill, small insects are swallowed immediately. Moths taken for the adult's own consumption may, if not too large, be swallowed in their entirety, complete with the wings. In general, however, the Wallcreeper prepares large items before swallowing them or, especially, feeding them to the young. It may turn and shake the item in order to position it crossways in the bill and, after sideways beating against a rock, the duration of which varies depending on the size and toughness of the item, toss it back and swallow it with a forward-and-backward movement of the head, similar to the action of a Hoopoe.

When dealing with insects such as grasshoppers and crickets (Orthoptera) and noctuid moths, the Wallcreeper carries the prey to a horizontal surface, for example a quite large stone or a flat piece of ground, and there dismembers it. Holding the insect at the base of the wing or a large hind leg, it beats its victim against the substrate until the wing or leg breaks off. As the insect's body is propelled away in this operation, the Wallcreeper will immediately retrieve it and repeat the process with the other extremities. An individual in a southern German quarry took 2–3 minutes to deal with a peacock butterfly. Orthopterans are usually subjected to additional hammering with the bill tip in order to soften them up. Interestingly, when aviary-held captives received no prey items requiring the kind of preparation described, they would treat sub-

stitutes, such as small pieces of wood, in the same fashion. Spiders, harvestmen (Opiliones) and crane flies (Tipulidae) are swallowed or carried to the nest to be fed to the young whole.

Indigestible chitin fragments are regularly ejected as pellets, sometimes of considerable size. Those produced by three captive juveniles were rather dry, and were up to 2 cm long and 1 cm in diameter. Prior to ejecting a pellet, a Wallcreeper will suddenly become still, repeatedly open its bill, and then rapidly shake the head to flick the pellet away.

Wallcreepers drink regularly, by dipping the bill into water and then raising the head. They appear, however, to prefer sites where they can catch falling drops of water in the bill by holding up the head. Captives in aviaries always took fresh snow in preference to water provided in bowls, and they even carried snow to a bare stone in order to break it up and consume it in very small portions.

Especially for feeding to the young, Wallcreepers take small to very small insects, but also some larger items. The latter include in particular lepidopterans such as moths of the family Noctuidae, and also small tortoiseshell butterflies (*Aglaia urticae*), and these can sometimes be identified when they are carried to the nest. On the basis of information from European and Central Asian sources, the invertebrate diet incorporates damselflies (Odonata), stoneflies (Plecoptera), grasshoppers and crickets, earwigs (Dermaptera), hemipteran bugs, adult and larval Lepidoptera, and dipteran flies including crane flies, robber-flies (Asilidae), hoverflies (Syrphidae) and house-flies and kin (Muscidae), as well as ants and bees (Hymenoptera) and beetles of the families Curculionidae, Carabidae, Staphylinidae, Scarabaeidae and Elateridae; other items include spiders, harvestmen, ticks (Acari), woodlice (Isopoda), freshwater shrimps, centipedes (Chilopoda), and small molluscs. One Spanish study mentions that unidentified seeds were found in the stomach of a male Wallcreeper in September, but these may have been taken accidentally.

Breeding

Wallcreepers are monogamous, and the pair-bond is severed after the breeding season. Saniga recorded two cases of two females, the nests of which were about 800 m apart, apparently paired with the same male; he fed both females during incuba-

tion, but helped to feed the young at only one nest, while the other failed. Both sexes show an increased readiness to fight just before the onset of winter, and they are highly aggressive and intolerant of conspecifics outside the breeding season. Both defend individual winter territories, and the female is no less aggressive than the male in defence of hers. The sexes meet again when the birds return to their breeding grounds in the spring. There are quite frequent reports of roving single Wallcreepers or pairs in full plumage. These may be Wallcreepers which have failed to establish a territory in an area of high density and thus represent a reserve of potential breeders, or they are perhaps not yet old enough to breed. Such unpaired individuals sometimes associate with an established pair, but it is not clear how closely they do so.

Saniga studied a widely scattered and sparsely distributed population of 12–18 pairs in the Vel'ká and Malá Fatra mountains, in the Slovak West Carpathians, where there were 1–3 pairs at each locality. His use of individual colour-ringing revealed a high degree of site-fidelity and mate-fidelity, and also demonstrated that juveniles were faithful to the natal site. All of the marked breeding individuals for which there were repeated observations, the oldest ringed bird being eight years old, were found at the same breeding localities or within a radius of two kilometres. Two of four colour-ringed pairs bred at the same site in four consecutive years, and two other ringed pairs occupied the same breeding locality in five consecutive years. E. Bezzel's observations in the Bavarian Werdenfelser Land and a general summary for Bavaria by Wüst showed that some localities had been occupied over many decades. Wallcreepers in Slovakia exhibited a strong preference for particular nest-sites, the same crevice being used, albeit by different individuals, over the course of several years, in one case in nine years between 1979 and 2000, and in another in seven years between 1982 and 1999. In contrast, the more isolated localities were not occupied regularly every year. A "coercion" effect resulting from the limited supply of optimal nest-sites and the fact that Wallcreepers were typically site-faithful increased the probability of former partners meeting each other again before they met other possible partners. Solitary pairs, remote from the main population and thus presumably unaware of other pairs, proved to be members of a single family, the same adults or their offspring returning over several consecu-

One of the primary responsibilities of a breeding pair of **Wallcreepers** is to collect sufficient food to provision the growing offspring. This female, sexed by the black patch on an otherwise white throat and breast, is returning to her brood with a spider and a caterpillar. The large size of the prey items suggests that the offspring may be relatively well grown, as Wallcreepers mainly feed their young with small insects. The extensive territory of a Wallcreeper pair means that it is more efficient for a foraging adult to return to the nest with several prey items, rather than after each capture.

[*Tichodroma muraria*
muraria,
Leysin, Switzerland.
Photo: Eugène
Hüttenmoser]



tive years. Successful breeding was recorded in successive years, for one father–daughter pair that bred in 1997 and 1998 and for one brother–sister pair in 1998, 1999 and 2000.

Breeding territories are very extensive, both horizontally and vertically. They are adapted to fit the distribution of rocky areas, and their shape consequently varies. In the Austrian Tyrol, a pair in the Ötz valley, the only pair in the gorge of a mountain torrent, may serve as an indication of territory size: on the basis of the distance flown by the adults when feeding young, this territory was, in seven out of ten years of observation, about 800 m long. Elsewhere in the Ötz valley, the breeding pairs never flew less than 1000–1100 m along the course of the stream. It should be noted, however, that the rocks on the sides of the gorge range in height from only 10 m up to about 150 m. On limestone cliffs in the West Carpathians, Saniga found territories only 350 m and 400 m long and 25–30 m high. Several observers have confirmed that male and female Wallcreepers regularly forage in different areas, the female generally closer to the nest and the male often more wide-ranging.

In order to determine where the territory limits lie, it is essential to be able to distinguish between breeding pairs. Thanks to the marked individual variation in the dark breast patch of the females, this is usually possible without colour-ringing. Males are more difficult to distinguish individually, but even they often exhibit some variation around the edges of the black bib. Pairs are normally separated by a distance of one to several kilometres, as, for example, in Switzerland, where Hauri also considered territories to be probably contiguous over 10 km in the Lauterbrunnental, a valley which has huge cliffs on both sides. Shorter distances between pairs include 119 m in the Ötz valley and 350 m in the Italian Alps, while four simultaneously occupied nests on a more or less continuous rock wall in Slovakia were separated by distances of 800 m, 600 m and 600 m.

It is virtually impossible to determine the exact population density of this species. This is certainly subject to fluctuations but it appears not to have changed in the long term, although it is generally low, because Wallcreepers require a large home range when collecting food for their young. Recent studies indicate that the German population, restricted to the northern Alps, in Bavaria, is likely to consist of at least 100 pairs. Assuming an area of potentially suitable Wallcreeper habitat of about 635 km², out of a total study area of 1440 km², this would give a density of about 5.5–6 pairs per 100 km². In reality, however, the dispersion of breeding pairs depends on the composition of the rock faces and where they are situated, and it is correspondingly uneven. In the Bernese Alps, in Switzerland, the population has been estimated at 200–250 pairs within an area of 2895 km², or 0.07–0.09 pairs/km². Just to the north-east of there, in the Austrian Tyrol, the gorges of the Ache above Zwieselstein, including tributaries, hold a maximum of ten pairs in about 320 km², or 0.03 pairs/km², while in the Italian province of Brescia, on the southern edge of the Alps, 50–100 pairs were reported in 4749 km², the equivalent of 0.01–0.02 pairs/km².

Fights to settle territorial boundaries take place over the course of several days. Such fights are usually aerial and quite often involve three individuals, indicating that females also take part. Once territories are established and delineated, the boundaries are strictly respected, even if they happen to lie close to a later nest-site.

Simple gaping is the lowest-intensity form of threat. This is defensive, and is frequently directed by members of a pair to each other. It serves to maintain individual distance, and is often a sufficient deterrent even when used against larger and more powerful bird species. If a rival is in view at some distance, the Wallcreeper, if ready to attack, will adopt a threat posture similar to that of most nuthatches: the tail is raised and the wings are drooped so that the white spots remain concealed, whereas the red patches on the wings are very conspicuous. Should the rival approach, the wings are spread sideways or raised, the white spots again being concealed, while only the bright red shows up.

If the threat does not achieve the desired end, a fight may ensue. Löhrl never observed a true damaging fight, although he certainly witnessed hectic aerial tussles and chases, and attacks when birds were on rocks; in the latter case, when differences in the plumage pattern allowed the two individuals to be told apart, the

opponents kept on changing roles, one first attacking the other and then being attacked and fleeing. A captive male imprinted on humans regarded its keeper's hand as an opponent, something which did, at least, provide the opportunity to study Wallcreeper fighting behaviour at close quarters. At the moment of launching an attack, the bird lowered its tail, leapt on to the hand, gripped tightly with its claws, which often drew blood, and then hammered away with its closed or slightly open bill; it beat the wings vigorously throughout the attack. A captive Wallcreeper, while chasing another in flight, suddenly had its bill full of small feathers, indicating that it must have struck home and torn these from the other bird.

Interactions with other species take place from time to time. For example, Hauri saw two Black Redstarts (*Phoenicurus ochruros*) accompanying a climbing Wallcreeper and frequently catching insects in flight, these having probably been flushed by the Wallcreeper but not taken by it. This elicited no antagonism on the part of the latter, although Wallcreepers do sometimes chase, and are chased by, Black Redstarts, five of which were once seen to drive a Wallcreeper from a cliff face in Bavaria. Similarly, hirundines, especially Eurasian Crag Martins (*Ptyonoprogne rupestris*), frequently attack foraging Wallcreepers. In another instance, a Wallcreeper, intensively wing-flicking, and a Lesser Spotted Woodpecker (*Dendrocopos minor*) were about one metre apart low on a cliff when the woodpecker attacked; the Wallcreeper took off and hovered nearby, returning to the cliff as soon as the woodpecker had left.

Pair formation takes place after the Wallcreepers return from their wintering grounds, presumably at a nest-hole accepted by both pair-members. Taking off from the entrance to the cavity which he has selected, the male performs a nest-showing flight, alternating gliding and bouts of slow flapping, within a small area, this leading back to the hole after a number of sharp turns and steep ascents and descents. If a female appears, the male will nest-show, singing throughout the performance. Should she then approach, he will enter the hole while singing and continue to sing while inside it; otherwise, he will perform further circular nest-showing flights. Also typical of this period are variants of a head-up posture, which draws attention to the male's black bib, and changes from courtship to threat and chases; in addition, the male switches from nest-showing to courtship-flights, which are slower, but with rapid wingbeats.

As a prelude to copulation, the male sings persistently, with the neck extended forward and the wings drooped. He will then land next to the female, hold the wings spread to the side, and mount her, this accompanied by much vigorous flapping of the wings and attempts to seize the female's head feathers. Copulation is restricted to a period of a few days before and at the start of laying. In all observed cases, the initiative for copulation came from the male.

In Europe, egg-laying takes place from late April to mid-June, depending on the altitude. At 2000 m in the Austrian Tyrol, where the temperature is rather constantly cool, eggs were laid in the first half of June and, over a period of ten years, fledging always took place in the last third of July. Fledging dates noted by Hauri in the Bernese Oberland, in contrast, ranged from 5th July to 8th August, the latest following a severe winter. The breeding season in the Caucasus, and also farther east, in the Himalayas, extends from May to July, although mid-August observations at Mount Khoostoop, in Armenia, included sightings both of fledged young and of a pair still feeding young in the nest.

Because the nest has to be safe from intrusion by mammalian predators, the choice of a good site is obviously of crucial importance. At one nest under observation in the Ötz valley, two stoats demonstrated the ability of this predator to move about on steep rocks. Of 33 nest-holes known to Löhrl, only five were temporarily accessible to martens or stoats, and one of these five was preyed on. Nest-sites used by Wallcreepers include a cleft in a rock face, behind a rock or among boulders or scree, and similar fissures or cavities on or inside buildings, including church towers, ventilation holes and pipes. Nests sometimes have two entrances, one used by the male and the other by the female, or one serving as the entrance and the other as the exit. There is marked variation in the shape of the entrance and of the chamber, but the latter should apparently extend slightly to the rear and

downwards. In the few cases where this could be measured, the nest was about 60 cm from the entrance, but some nests were so far forward that parts of them were actually visible at the entrance. Most of the holes examined by Saniga were protected from above by an overhanging rock, and eleven nests lay 25–75 cm into their respective cavities. In the majority of cases, Löhrl found that the hole entrance did not lie immediately over a sheer drop but was somewhat set back, so that young close to fledging could run to meet their parents just outside the entrance. Such favourable nest-holes are not very common, and Wallcreepers will choose them even if this means nesting on the edge of their territory, suggesting that security against predators has precedence over defence against conspecific rivals.

Only the female builds the nest, although the male often accompanies her, and the main material used is moss, collected when dripping wet and being torn off in a downward-tugging movement. From the start, the material is densely matted together to provide good insulation, the main constituents being plant fibres, feathers, animal hair and wool, lichen, needles of the arolla pine, rootlets and grass. One nest was lined with feathers, hair and a small piece of mouse (Muridae) skin. The cup measures about 6 cm across and the rim is quite thick and solidly built. A female observed near Hecho, in northernmost Spain, picked goat hairs individually from a rock wall by a road and flew, carrying a small bundle of these, to her nest. Remarkably, she also selected discarded cigarette filters, which were abundant by the roadside, the apparent ease and frequency of the ensuing operation suggesting a familiarity with an unusual, man-made source of nest material: each filter was held down with one foot, the paper wrapping torn open, and the soft fibres gathered into a bundle for transport to the nest. The process of nest-building takes about five days, but lining material may still be added after that. The building method, which involves pushing and rotating movements in the mass of accumulated material, does not differ from that of other hole-nesters.

Wallcreeper eggs are conspicuously large in relation to the adult's body weight and are oval, the shell moderately glossy and milky white with well-defined brown-red to black speckling, these markings often concentrated at the broad end. Fifteen eggs had average dimensions of 21.3×14.3 mm, the maximum size being 22.7×15.7 mm and the minimum 19.2×14.3 mm; the shell weight was 0.137 g. The full, fresh weights of eggs laid by

captives were, in order of laying, 2.52 g, 2.52 g, 2.49 g, 2.41 g and 2.40 g; in another case, the weights were 2.55 g, 2.45 g and 2.50 g. The normal clutch consists of three to five eggs, and is laid at a rate of one daily.

Incubation is undertaken by the female alone, beginning with the penultimate egg. She is fed regularly by the male, and she will leave the nest and hurry to meet him while shivering her wings; she will sometimes also raise her wings and flap them in the manner of a food-begging juvenile. Should the female leave the nest independently for a break from incubation and the male then arrive with food, the male will sometimes venture as far as the nest, searching for his mate. He will then fly off, but return again immediately, and this process can be repeated several times, the male still having the same food dangling from his bill. It is only when the female is absent for a long time that the male finally eats the food that he has been carrying.

On the first day of incubation, the distribution of incubation stints and time spent off the nest is very irregular. For example, at the nest of a wild pair, two incubation stints each lasted 55 minutes and two breaks from incubation each 53 minutes. Overall, the average length of incubation stints on the first day was 29.5 minutes, while that of periods spent away from the nest was 20.4 minutes. Periods spent on the nest lasted between 9 and 55 minutes, and breaks ranged from 4 to 48 minutes. During the course of incubation, this situation gradually balances itself out. Over the last days before hatching, bouts of incubation fluctuated between 7 minutes and 29 minutes, and the breaks ranged between 3 minutes and 9 minutes. During an observation period of six hours, incubation stints lasted on average 6.6 minutes and breaks 5.9 minutes.

The incubation period of the Wallcreeper, both in the wild and in captivity, is around 19 days, with a range of 18.5–20 days, which is exceptionally long for a bird of this size. Both parents care for the young, but only the female broods them; for as long as brooding continues, which was up to 14 days in the case of a captive pair, the male brings most of the food. In two years in Hauri's Swiss study, the female reared the brood alone when the male was lost, and Saniga recorded four similar cases in Slovakia, females coping alone in three, while the male fed the young alone in the fourth. Males, because they tend to forage farther from the nest, are thought more likely to fall prey to raptors. The male

This male **Wallcreeper** is returning to the nest-site, its bill packed with invertebrates for its well-grown nestling. This species places its nest within a crevice or cleft in a rock, on a cliff or, occasionally, on an artificial structure. Wallcreepers are probably monogamous as a rule, although polygyny has been recorded. The pair-bond lapses after breeding, but partners often meet up again on their breeding grounds the following spring. Such mate-fidelity appears to result from a high degree of site-fidelity; it is not unusual for pairs to use the same nest-site for several consecutive years. Even juveniles tend to gravitate back towards their natal territories.

[*Tichodroma muraria muraria*,
Parque Natural de los
Valles Occidentales,
Huesca, Spain.
Photo: Luis Lorente]



usually feeds the young directly, but Hauri recorded a case in which a female frequently begged from her mate at the nest throughout the nestling period and then transferred the food to the young. The parents encourage the young to gape by giving the feeding-call (see Voice). Both sexes also keep the nest clean, dropping the nestlings' faecal sacs in flight or depositing them on a ledge at a reasonably long distance from the nest.

It would have been difficult to study the physical development of young Wallcreepers without the possibility of observing a captive brood. Newly hatched chicks have a covering of fluffy grey down on the head, scapulars and back. The gape-flanges are whitish and the mouth orange-yellow. Having opened to a narrow slit by day six, the eyes were fully open two days later. The sheaths of the innermost secondaries and of the body contour feathers opened on the twelfth day, and those of the primaries and rectrices opened when the young had reached 14 days of age. Apart from the area around the forehead, the rest of the plumage was already well developed. The young Wallcreepers had reached their maximum weight, over 23 g, at 19 days. That this was not just a factor associated with captivity was proved by the removing and weighing of a chick from a nest in the wild: it, too, weighed 23 g. This is above the weight of the adults, which is 17–19 g, but the weight of the young, on the day when they left the nest, had fallen to that of an adult Wallcreeper, and two days later it was 18 g.

From day 24, young at a site in the Ötz valley, in the Austrian Tyrol, which had been colour-ringed and were thus individually identifiable, left the nest to be fed, running towards the food-bearing parent. From day 25, they even emerged completely from the crevice in the rock. When sated, the young Wallcreepers went back into the nest and took up a position at the rear, the other brood-members having meanwhile moved to the front. Nestlings not receiving enough food would stay at the front. This carousel-like arrangement for feeding, which has been reported also for the hole-nesting Common Kingfisher (*Alcedo atthis*), was confirmed in studies of captive Wallcreepers. During an observation period of 3 hours 25 minutes, the colour-ringed young at the Ötz valley nest were fed 81 times: the "white-ring" chick received 24 feeds, the "red-ring" 20, the "yellow" 20, and the "green" 17 feeds. Bezzel noted the feeding rates at two nests in the Bavarian Alps, recording 30 morning visits, 14 of these by the male and six by the female, in 170 minutes at the first nest, and 14 morning visits by the male and six by the female, in 90 minutes at the second. At a nest with two young about 7 days old in Switzerland, 198 visits in 15 hours 25 minutes were by the male and 5 by the female. At the eastern extremity of the species' range, in Moravia, Bankovics made observations at a nest in the Hangayn mountains and recorded 14 feeding visits in 75 minutes, the male made 10 and the female 4. From observations by Saniga in Slovakia, the "working day" at the end of June may last for up to about 10 hours, with feeding visits between 03:30 and 20:30 hours.

Wallcreepers feeding young may range far from the nest and thus have to carry back the food over several hundred metres. To cope with this, a foraging individual will often gather several items together in its long bill. When it is gathering, the bird cannot, of course, take any food for itself. Consequently, adult Wallcreepers are frequently seen to be hastily picking up many items after they have made a feeding visit, but, as no larger item worth delivering to the nest is found, they start to bundle together food for the young. This gives rise to an uneven pattern of feeding visits, although the birds will, if there is a rich supply of food available close to the nest, change rapidly foraging at the latter site and carry each item separately to the offspring. For example, a male brought food eight times within 11 minutes and a female delivered food five times within 15 minutes.

Juvenile Wallcreepers are already unusually well developed at fledging. One day before they left, the Ötzal young were pecking at all manner of objects near the nest, and a prey item dropped during a feed was picked up and swallowed. In all cases observed by Löhrl, the fledging period was about 29, with a range of 28–30 days. Once they have left the nest, the young continue to be provisioned by both parents, each juvenile being fed until it is fully sated. They are probably independent some five or six days after fledging, although Saniga suggested a longer period of 7–

12 days. There is circumstantial evidence suggesting that the brood is divided, one parent caring for some of the chicks and the other attending to the rest, and the two partial-family groups may then move far apart. Even at this stage, however, juveniles will attempt to find food for themselves.

Captive young held temporarily in a box regularly gaped when the ventilation holes were blocked, which is the normal response to the darkening of the nest entrance that signals the arrival of a parent, but they adopted a "fright posture", with the bill pointed upwards, when the lid was removed in order to feed them. Wild nestlings will attempt to hide in the cavity or tunnel away from the nest when threatened, while fledglings in any surroundings spend much time hidden in a cleft or under a stone, and will use such a bolthole if danger of any kind presents itself. Adult Wallcreepers normally wing-flick and sing when in the presence of various predators, and they will also attack and chase Common Kestrels (see also Relationship with Man).

Wallcreepers are single-brooded, and doubt has to be cast on J. B. Baillly's claim, never confirmed, that early-breeding pairs in Savoie, in southern France, often laid again in early July, as such timing would involve problems with the completion of the adult moult and in finding sufficient food in a period of low night temperatures and often early snowfall. Compared with those bird species sharing the habitat, such as the Alpine Accentor and the Black Redstart, which are double-brooded, Wallcreepers require twice as long for a single breeding cycle. Baillly's report may have referred to late first clutches or replacement clutches, but even the latter have yet to be confirmed for wild Wallcreepers.

Data from central European countries illustrate the species' relatively high breeding success. In Switzerland, Wallcreepers bred successfully at Mitholz 14–15 times in 17 years; there was no breeding in years with long winters and much late snow. An average of 3.83 young fledged from 24 successful nests in Switzerland, and the corresponding figure for Slovakia, based on 36 nests and two pairs with fledged young, was 3.11. In a unique case in Vicenza, north-east Italy, in 2002, an unusually accessible Wallcreeper nest, close to the ground and in a wide, conspicuous fissure, was parasitized by a Common Cuckoo (*Cuculus canorus*). The adults repeatedly entered the nest, but re-emerged with the food, while the cuckoo chick, about nine days old, lay dead on the ground.

In Saniga's study in Slovakia, a wild female Wallcreeper was two years old in 1997 when she bred with her father, the age of which was unknown when he was ringed, in 1996. In addition, a two-year-old male, hatched in 1996, bred with his yearling sister in 1998 and also in the following two years. In captivity, female Wallcreepers have laid and attempted to breed at one year of age.

Movements

During the period 1982–2000, Saniga ringed a total of 46 Wallcreepers, 29 of them fledglings, in the Vel'ká and Malá Fatra mountains of central Slovakia. Of these 46, 26 were marked with individual combinations of colour rings. The colour-ringing enabled observations to be made which showed a high degree of site-fidelity of pairs to their breeding localities and natal philopatry (see Breeding). In Switzerland, an adult ringed at Chillon Castle in June 1947 was controlled there in July of the following year. Otherwise, very few Wallcreepers have been ringed, so that a summary of the species' movements must rely largely on visual observations.

This species is an altitudinal and, to some extent, a short-distance migrant, wintering mainly within the breeding range and adjoining areas. Some individuals, however, move up to several hundred kilometres from their nesting place and, in such cases, may even return to the previous year's wintering site, thereby surely disproving the idea, earlier proposed by Löhrl, that the species is not a migrant and that all long-distance movements are probably attributable to drift. In addition, there are a few observations of Wallcreepers on active migration. These include three in Bulgaria and one in the Ötz valley, in Austria, in March. Likewise, at Ulmethöchl, a migration watchpoint in the Swiss Jura, at least three and possibly five individuals migrated WSW singly and less than 50 m up in October 1967, and there are other Octo-

This female **Wallcreeper** is attending to the demands of a hungry fledgling. To attract its mother's attention, the youngster flicks its wings to reveal the stunning wing pattern. The typical clutch comprises 3–5 eggs, which the female incubates for 19 days. Both parents, particularly the male, feed the chicks during the nestling period, which lasts roughly four weeks. For the final four or five days before leaving the nest, the chicks develop sufficient confidence to venture to the nest entrance or even just outside. Once away from the nest, the young are fed by their parents for 5–12 days more before becoming independent.

[*Tichodroma muraria muraria*,
Leysin, Switzerland.
Photo: Eugène
Hüttenmoser]



ber reports for the eastern shore of Lake Constance and over the Thuner See, both also in Switzerland, and from the Chokpak Pass, in the western Tien Shan. Further, a Wallcreeper passing through at Heist, in Belgium, in November 1989 was seen shortly before a female of this species was discovered in Amsterdam, in the neighbouring country of the Netherlands (see Relationship with Man). Nevertheless, the possibility of occasional drift should not be excluded, bearing in mind that the Wallcreeper's mode of flight makes it extremely susceptible to this phenomenon. The species' spatial pattern of migratory behaviour most closely resembles that of the Water Pipit (*Anthus spinoletta*).

In the immediate post-breeding period, when families have broken up, many Wallcreepers first move to higher altitudes, adults before juveniles and ascending to up to 4500 m in Switzerland, for example. In Nepal, Diesselhorst found individuals at 3800–5000 m in September, and a juvenile is alleged to have been collected on 23rd July at about 6400 m in Ladakh, although doubt has been cast on the validity of this last report. In Slovakia in September–October, when there is typically fog up to 700–800 m, some Wallcreepers ascend above this, but move down again in the evening.

There are also winter records of this species at up to 2000 m, and even to 3200 m in Switzerland in February, and above 900 m in the coldest period, December–February, in Slovakia. Such individuals may be forced to come lower, commonly into valleys, by a lack of food. Most Wallcreepers, however, spend the winter months not within the narrower limits of the breeding area, but at lower levels. They are often seen in all months of the year on nesting cliffs at low and moderate altitudes and, although it is generally not clear whether the same individuals are involved, two ringed in central Slovakia in July did keep to the same territory throughout the year. Moreover, those remaining in the Slovakian mountains after breeding, up to about 25% of the population, tend to move only 4–15 km from the breeding site to the non-breeding locality.

Part of the Alpine population in south Europe probably spends the winter months in the southern and northern foreland of the Alps and in the Jura, but also farther afield. Wintering sites lie in all compass directions from the nesting sites, and the distance flown also varies considerably. Erratic movements may further confuse the picture. Regular wintering areas in France include the Vosges, the Jura, the Rhône valley, the Massif Central, and

westwards to the valleys of the Dordogne and Vézère. In Iberia, the species winters chiefly in lower parts of the breeding range, but also in the entire north-eastern quarter of the peninsula and on the Mediterranean coast south to Gibraltar; there have been occasional records in the Balearic Islands, although observations over the last 6–7 years suggest that the species is regular in Mallorca. The local population in Corsica descends to lower levels, and Wallcreepers are regular on cliffs of the west coast and at Cap Corse, these perhaps including individuals dispersing from Italy. They are regular in winter also on the coast of the former Yugoslavia, and in Cyprus, particularly in the Kyrenia range and on the south coast, where some remain for up to five months. The Wallcreeper occurs as a non-breeding visitor in small numbers in northern Iraq and Syria, and rarely, with variation between years, in Israel, mainly in the north. A recently fledged juvenile on Mt Hermon in June 1997 was probably from a local nest, which would represent the first breeding record for the area and a major range expansion to the south. Although there is no evidence that the Wallcreeper breeds in Lebanon, its regular occurrence at two sites in winter has been confirmed.

Remarkably, there were no fewer than ten records of vagrant Wallcreepers in Britain between 1792 and 1985. Other noteworthy occurrences are of individuals seen in Germany, north to Hamburg and Heligoland and east to Berlin; on Jersey; in southern Portugal; in Morocco and Algeria; on the Mediterranean islands of Malta, Sardinia and Sicily; and in Jordan, where two appeared in spring 1897. In addition, the species has been observed in a wide scatter of European towns and cities, as well as on the Black Sea coast of Romania, in Crimea and on the rocky coast of the Sea of Azov. Individuals wintering in Morocco would need to complete a journey, presumably from the Pyrenees, of some 960 km, while the sole record for Algeria, at Constantine, may have involved the crossing of 640 km of sea. It is possible that Wallcreepers breed in north-west Africa, but there is no proof.

A similar pattern of vertical displacement and winter wandering holds true for the eastern populations of the Wallcreeper in Kazakhstan and China, and in the Indian Subcontinent, where the subspecies *nepalensis* breeds mostly above 3300 m. In winter, it commonly reaches the foothills in suitable country and sometimes wanders considerable distances, up to 500 km, into the plains, in

the Indian Subcontinent reaching as far as such places as the Salt Range, Lahore, Ghazipur, Amritsar and Delhi. Nevertheless, there are winter records of Wallcreepers at elevations as high as 5000 m, and exceptionally 5730 m, in Nepal and 2895 m in Bhutan.

Winter site-fidelity was proved over two successive years, and likely over four, at a quarry in Rottenburg, in southern Germany, which is some 130 km from the nearest regular nesting places. A Wallcreeper was trapped and ringed there in the third successive year of the species' occurrence in the quarry, and this ringed individual then returned in the following year; after the last observation, no wintering Wallcreeper was present at the site for several years. Further indications of such fidelity over two years are provided through observations in Switzerland, in Belgium, in the Netherlands and, perhaps most astonishingly, at Cheddar, in southern England, where, in the 1970s, what was presumably the same male returned in winter to a quarry where it had spent the previous November–April period.

The timing of the autumn movement, apparently irrespective of the weather conditions, is regular and basically similar throughout the species' range, individuals occurring outside the breeding areas mostly from October to April. The birds disperse upwards from mid-July or late July to August, adults generally moving before the young. Hauri's study at Mitholz, in Switzerland, showed Wallcreepers to be rare in the breeding area from August to September, although they were frequently recorded at that time higher up the mountains. Similarly, and as mentioned at the start of this section, individuals have been recorded at high altitude in Nepal up to mid-September.

The main downslope movement takes place from late September or the beginning of October, independently of the onset of winter higher up, and most wintering sites are occupied by mid-November, arrival dates ranging from mid-September or October to November. At Rottenburg, the territory was first occupied between 20th and 30th October in five out of twelve winters. Captive individuals regularly displayed migratory restlessness in the first five days of October, and the subsequent aggression of pair-members meant that they had to be separated during the period from October to April.

Wallcreepers depart from their European winter territories in late February or March, occasionally not until April, and the breeding sites are generally reoccupied in April or May, but there are April records of individuals in Switzerland well above the breeding range, at 4500 m, for example. Arrival on the breeding grounds is not necessarily the same thing as arrival in the breeding locality; in the Ötz valley, in Austria, returning Wallcreepers apparently linger on south-facing cliffs near breeding sites until the snow has cleared, which usually happens in early May. In addition, heavy snowfall in spring may force the birds to descend to lower levels. For example, large numbers were noted in a village in the foothills of the Talasskiy Alatau mountains, in Kazakhstan, in early April. Many such individuals are in poor condition and some may perish. Stragglers occur exceptionally outside the breeding areas in May or even during the breeding season.

Relationship with Man

Birdwatchers speak of the Wallcreeper as being beautiful, flamboyant, near-mythical, completely unique, one of the most remarkable and spectacular birds in the world, and the spectacular nature of its habitat clearly adds to the fascination. In Switzerland, E. Hüttenmoser's wonderful photographs result from an impressive ability to scale cliffs and to get close to Wallcreepers in their breeding habitat, while vagrants turning up in more easily accessible places, such as the south coast of England or the Dutch city of Amsterdam, not surprisingly attract large numbers of admiring birdwatchers. Visits to regular wintering sites such as that described by H. Harrop and G. Jenkins in southern France are another possibility.

The Wallcreeper's large wings, with their exquisite pattern and rounded tips, and the bird's mode of flight evoke the Hoopoe or even a butterfly, and mountaineers who know the species indeed often refer to Wallcreepers as "butterfly-birds". How apt, then, that a Wallcreeper wintering at Rottenburg, the ringing of

which confirmed its winter site-fidelity (see Movements), should have been caught in a butterfly net. One of the Wallcreeper's Chinese names means "rock flower", and poetic names in German include *Fliegende Alpenrose* and *Fliegender Almrausch*, both of which allude to the pink-red blooms of the alprose or alpine rose (*Rhododendron ferrugineum*).

On a different note, Wallcreepers were said to inhabit old cemeteries and to nest in human skulls, and the French even called them *oiseaux des cimetières*, referring to just that thought. It was also said that the bird's startling carmine wing-coverts, which gave rise to the earlier scientific name of "*phoenicoptera*", had been "taken from the Cardinal's robes". Portrayed on the postage stamps of at least a dozen different countries, the Wallcreeper has given its generic name, *Tichodroma*, to the journal of the Slovak Ornithological Society/BirdLife Slovakia, founded in 1987, while the Italian Gruppo Piemontese di Studi Ornitologici "F.A. Bonelli" has an attractive Wallcreeper logo.

Wallcreepers are not well known generally. They often live in extreme and inaccessible habitats, but they can be difficult to watch and are easily overlooked, sometimes because of their rarity, even near busy tourist routes. In the Austrian Tyrol, Böhm, a biologist at the Alpenzoo, at Innsbruck, considers the species to be not especially rare, but she believes that rambles do not really use their eyes and thus seldom find a Wallcreeper of their own accord. If a wintering individual was seen on a church in Innsbruck in the winter, or in one of the gorges of the Inn valley in the summer, it was almost invariably taken to be an escaped exotic. Then, once most local people had got to know the species at the Alpenzoo, the number of reports of wild Wallcreepers increased.

Wallcreepers are frequently found in impressive mountain landscapes, but they have also bred or wintered on a number of remarkable buildings, too. J. Hornskov found a pair breeding in a crack in the wall of the Potala Palace, in the Tibetan capital, Lhasa, in 2007, and F. Ludlow often saw this species on the Potala and Chagpori, and in the neighbouring hills, in the summer. In its European breeding range, special nesting sites include the Neo-Romanesque, fairytale Neuschwanstein, the most famous of three castles built for the "mad" King Ludwig II of Bavaria (1845–1886), which also featured in the children's film "Chitty Chitty Bang Bang". Another is the Swiss Castle of Chillon, dating mostly from the late twelfth and thirteenth centuries, which is located near Montreux, on the eastern shore of Lake Geneva. It was the setting for Lord Byron's narrative poem "The Prisoner of Chillon", written in 1816, and Wallcreepers bred there in a castle room in three years in the 1940s. In the first year, the room was "in use", by military engineers, but not open to the public; the birds entered through a broken windowpane and their nest was at 5 m on a beam. Four young fledged in two of the three years, and the observer, A. Chatelanat, once moved two young back close to the nest to prevent their falling into the lake. No breeding has been recorded on buildings in Switzerland in recent years.

Outside the breeding season, Wallcreepers have been observed, most fittingly, on the Great Wall of China, and on a famous Moghul monument and World Heritage Site, Humayun's Tomb, in New Delhi, India. Wintering individuals have also graced such French architectural gems as Notre Dame Cathedral, in Paris, the Palace of Versailles and Chartres Cathedral. In Greece there are records at Delphi and the Acropolis of Athens, and in Hungary, where the Wallcreeper is a rare but annual passage and winter visitor, the widely scattered traditional sites include both the cathedral and the television tower in Pécs. A female wintering in Amsterdam, in the Netherlands, roosted behind pink neon letters high up on the Free University building, one of the tallest in the city.

A Wallcreeper that reached Finland in October 1941 would have been a notable record of vagrancy, but it turned out to have been an involuntary stowaway in an aircraft. It was found hiding in a wooden box with holes at one end, and it had probably gone to roost there in Silesia, in Poland, on the previous evening. During its stay of about a month at Pori airport, it climbed about on the walls of buildings.

So far as is known, only the Löhrls and one private aviculturist in the German town of Heidelberg have succeeded in breeding Wallcreepers in captivity. A single attempt at the Alpenzoo, in Austria, in 1965 failed. At St Gallen, in Switzer-

Wallcreepers go to considerable lengths to protect their broods from predators. An overhanging rock usually offers protection to the nest-cavity. The nest itself, a rough cup of damp moss and plant fibres, tends to be placed deep within the crevice, as far as 75 cm from the entrance. There are normally two access points, enabling the adults to enter and leave separately. A nest placed at the very entrance to a crevice is thus something of an exception to the rule.

[*Tichodroma muraria muraria*.

Left: Oetz Valley, Obergurgl, Austria.
Photo: Ambros Aichhorn.

Right: Kundler Klamm, Tyrol, Austria.
Photo: Manfred Loner]



land, Girtanner, a pioneer of Wallcreeper study, was the first to keep these birds, and it is astonishing that A. Brehm, who purchased several from Girtanner, had to pay 80 Marks for each of them well over 100 years ago. The old Berlin Aquarium "Unter den Linden", where Brehm was Director from 1869 to 1874, held a large collection of birds, as well as fishes and reptiles. All the animals, together with porcelain information plaques, among them an attractive one for the "Alpine Wallcreeper", were transferred to Leipzig Zoo when the Berlin Aquarium closed, in 1910. A Wallcreeper, alongside many other native animals, was on show to the public in the great State Exhibition at Innsbruck in 1893, and another was found exhausted on the glass roof of Innsbruck's only multi-storey building around 1930, but it survived for only a few days in the care of an amateur bird-fancier. E. H. Zollikofer, of Ellikon, in Switzerland, reared and exhibited Wallcreepers, and one of his birds was kept for two years and described and illustrated by the Heinroths. Zollikofer's birds several times built nests and laid, and in two cases the eggs hatched, but the young were ejected shortly after hatching.

The Löhrls first acquired a young male Wallcreeper for rearing in 1964. This bird lived in an aviary for five years and was imprinted on humans (see Breeding). Then, under licence from the State Government of Tyrol, in Innsbruck, two young were taken from each of two nests at different sites, Obergurgl and Vent, in July 1968. The rock-climbers were A. Aichhorn of Salzburg, a highly experienced and careful mountaineer of proven quality, and a climbing companion called Feuerstein. Aichhorn ringed a brood of Wallcreepers for Löhrl and was generally a great help, having an outstanding knowledge of Alpine birds. In the 1960s, he was working on his dissertation about White-winged Snowfinches (*Montifringilla nivalis*), but his fieldwork also gave him the opportunity to conduct extensive observations on breeding Wallcreepers, as both species were present in the same habitat.

At the first nest, on the Hohe-Mut-Bach, near Obergurgl, two young were already at the nest entrance, waiting to be fed, on 19th July. The fact that they went back into the hole after a feed and sometimes spontaneously so suggested that they would not fly off when disturbed, and this did, indeed, prove to be the case, although they were later judged to have been within a day or two of fledging. When the ropes were in place 2–3 m from the hole, the young remained inside. The male Wallcreeper was very agitated and, without bringing food, twice looked into the hole while preparations were under way for the descent. Although it looked

tiny from a distance, Löhrl had judged the size of the nest-hole correctly by observing how much space was left when one of the adults entered. Aichhorn was able to thrust his whole arm into the cavity up to the shoulder, and in fact needed to in order to reach the nest and young. The hole descended steeply, but without passages leading off to the side, so that the nestlings had nowhere to escape to.

The nest on the Ramolbach, at Vent, was in a long crevice and contained four young probably 5–6 days before fledging and thus still being fed in the nest. Following a familiar pattern, the male was extremely wary, but the female not at all so. When the climber was busy at the nest, both adults approached and flew past very close, the food-carrying female coming to within 2 m. She also gave the usual warning song (see Voice). This nest was suspended in the middle of a crevice about 1 m long, which became narrower but continued underneath the nest and evidently had many branches, so that it proved very difficult to extract just two of the four nestlings when they abandoned the nest.

It was again thanks to Aichhorn's climbing and other skills that the Alpenzoo, in Innsbruck, acquired some young Wallcreepers in 1962, thereby becoming the only zoo in the world to have the species in its collection. Extricating the young from a nest in a rock crevice about 80 cm long on the side of a gorge at Obergurgl was an extremely difficult undertaking. Two ladders, which had to be firmly anchored in the glacial stream running through the gorge, were used as a means of gaining access to the nest.

One female Wallcreeper was found stunned by the shock wave produced when a threatening avalanche was detonated as a precautionary measure in January. Brought to the Alpenzoo, she adapted to life there relatively easily and reached the impressive age of 14, while another bird, a male, was a good 12 years old, and neither of them showed any obvious signs of old age. Two males at the Alpenzoo in 2007 were then five years old.

In 1970, of the Löhrls' three surviving birds, the female from the Vent nest paired with the male from Obergurgl, laid five eggs and started to incubate, but she gave up the breeding attempt when she began to moult heavily. The same pair bred successfully in 1971, and the two young that survived were completely hand-reared and then released back into the aviary. Importantly, this successful breeding enabled Löhrl to present the first exact information on the incubation and nestling periods, and also on the development of young Wallcreepers, and in general to study the way in which the captive birds behaved towards each other

through the year, thus clarifying many aspects of the species' biology. In 1972, two breeding attempts by the same pair failed, but intensive observations of colour-ringed wild young were especially valuable. Some Wallcreepers were taken to the Alpenzoo in 1972, the last given to a bird-fancier in 1973, although a captive-bred female was acquired in that year, mainly for the purposes of studying the spring moult.

The low numbers and sparse distribution of the Wallcreeper, together with the fact that it is difficult to keep in captivity, have generally discouraged attempts to turn it into a bird for the cage or aviary. There were, however, rumours that the female wintering in Amsterdam from November 1989 to April 1990 and from November 1990 to April 1991 was one of a number that had escaped shortly before at Schiphol airport. In support of its view that the bird was of wild origin, the Dutch Rarities Committee emphasized that a Wallcreeper had flown past at Heist, in neighbouring Belgium, on 5th November 1989; the Amsterdam female had returned for a second winter; and there was no documentation for the alleged Schiphol birds. Large numbers of Plumbeous Water-redstarts (*Rhyacornis fuliginosa*), often labelled "Rotskruiper", the Dutch name for the Wallcreeper, are imported, whereas the Wallcreeper is unknown as a cagebird in the Netherlands and is never offered for sale in the trade.

In the 1960s, the Alpenzoo went to considerable expense, to the amount of what would today be the equivalent of about 4500 euros, to build an aviary of three sections where Wallcreepers could be kept, and seen by visitors, in conditions as close as possible to those of their natural habitat, thus fulfilling a long-held dream of former Director, H. Psenner. Hence, consideration had to be given, both by the Alpenzoo curators and Löhrl, to providing suitable rocky surfaces with crevices, in part planted, on which the birds could climb, constant running water for bathing, places for roosting, dusting and sunning, and to which to escape and, more generally, the possibility of separating the birds when they are at their most quarrelsome outside the breeding season (see Breeding). It is important also that Wallcreepers have sufficient room in which to fly about, and glass is not a problem since they quickly recognize it as an impenetrable barrier, while visitors to the Alpenzoo, admiring "rare" native birds with beautiful plumage, find it easier to take photographs.

While providing the correct conditions is important, so, too, is a suitable diet. Such items as crushed and dried insect "meal", hard-boiled egg yolk, mealworms and, rather successfully at the Alpenzoo, a mixture of quark (curd cheese) and finely minced ox heart have been offered to captive Wallcreepers, but Löhrl and the Alpenzoo staff recognized that it is essential to give the birds live insects and spiders, particularly during the moult, for their general wellbeing and in order to prevent the glorious carmine-red of the wing-coverts, derived from the carotenoid pigment astaxanthin, from fading to an unattractive grey-pink, as happened with the Heinroths' captive. Light traps have been used as a means of attracting all kinds of insects to the aviaries and, at dawn, these will hide in cracks and crevices, thus allowing the Wallcreepers to forage naturally by probing and extracting prey items as they move about on the rocks, which also helps to ensure that the bill does not grow too long.

At the Alpenzoo, the food provided is live insects, including crickets, adult and larval pyralid and other moths, ant pupae and the quark-meat mixture referred to above. Hand-rearing proved to be relatively uncomplicated when young Wallcreepers were given a mainly insect diet with calcium every 20 minutes during a day of 12–14 hours. Some insects, such as caddis flies (Trichoptera), certain tiger moths (Arctiidae) and foul-smelling bugs, were completely rejected by Löhrl's captive birds; the adults took blowflies (Calliphoridae), but never fed them to the young. They readily took earwigs, too, not bothering about the insect's threateningly raised pincers. When an eyed hawkmoth (*Smerinthus ocellata*) was attracted by the light and entered the aviary through the small-mesh wire netting, it was later discovered by the male Wallcreeper, which seized it and carried it to a stone for treatment (see Food and Feeding). The moth managed to free itself and save its life by opening its wings to reveal the blue-and-black "eyes" on a pink background, which caused the Wallcreeper to retreat in alarm and hop around it in a wide arc, not daring to touch it again.

Status and Conservation

Owing to its typically large territory and strict habitat requirements, the Wallcreeper breeds at low density over much of its range. It has a fragmented distribution in mountainous areas of central and southern Europe, which is less than half of its global breeding range. As it is exceedingly difficult to survey and census breeding Wallcreepers, much remains to be clarified about the species' status and distribution, particularly farther east.

There is little detailed and up-to-date information for southern parts of the former USSR. G. P. Dementiev and N. A. Gladkov's assessment of this species as rare in the Caucasus and Transcaucasia and in Turkmenistan, where A. K. Rustamov confirmed breeding only in the Kopet-Dag, is apparently supported by recent surveys, at least in Armenia and Azerbaijan, although there is a contrastingly rather high population estimate for the Russian north Caucasus (see below). In Kazakhstan, the Wallcreeper is restricted to the Tien Shan, where it has been described as relatively common in the Trans-Ili Alatau around Almaty, and the Saur Mountains, while another, more cautious assessment for the country was that it was a rare resident. Scant and old information suggested that it was a common breeder in Kyrgyzstan, and widespread but only locally common in Tajikistan. Both E. V. Kozlova and more recent German literature indicate that the Wallcreeper is common in the Gobian Altai of Mongolia.

Further summaries indicate that the Wallcreeper is locally common, especially in winter, in Afghanistan and the Himalayas, but somewhat scarce in southern Tibet, although C. Vaurie considered it widespread and abundant in that region. It is believed to be uncommon and sporadic in China, in the extreme west, the Qinghai-Xizang plateau, the Himalayas and some central and northern parts, while individuals visit much of the south and east of the country in the non-breeding season. Using subjective assessments of abundance, some authors considered the species to be a common resident in the north of Pakistan, including in winter throughout the Gilgit main valley, fairly common and widespread in winter in Nepal and fairly common but local in India, and a common winter visitor and possibly resident, though its status is not well known, in Bhutan.

The relatively small European breeding population, estimated at 38,000–100,000 breeding pairs in or around the year 2000, was adjudged stable in the period 1970–1990, and probably remained stable in most of its range in the following decade, although trends were not available for key populations in Spain, which held 9000–12,000 pairs, and France, with 4000–20,000 pairs, in that period. There was previously some uncertainty about the Wallcreeper's status in Corsica, but breeding, which is probably regular, was confirmed for the island in 1978, and the population is thought to number several tens of pairs; the first observation was in 1912, but the species may well have been present there for longer.

An earlier estimate for Europe, excluding Turkey, was of 14,000–20,000 pairs, more than 60% of which were in the Cantabrian Mountains and the adjacent Spanish Pyrenees. Also in the Pyrenees, there are 4–8 pairs in Andorra and, moving east through the Alps, an estimated 500–1000 breeding pairs are found in Switzerland, where the Wallcreeper is widespread in the Alps, 20–40 pairs in Liechtenstein and 700–1400 in Austria. It is considered to be not very rare in the Austrian Tyrol, where Wallcreepers can be found in every one of the "better" gorges. It is a rare but regular breeder in the north Bavarian Alps of Germany, with a population of 100–200 pairs, although earlier estimates were much lower. In the Jura, on the Switzerland-France border, 81 certain, probable or possible breeding sites were recorded between 1956 and 1994, and the estimated total population is 63–99 pairs. Italy, where Wallcreepers breed in the Apennines, is a stronghold, with 2000–6000 pairs. Small-scale fluctuations between years characterize the Alpine population, but no long-term changes are evident. Local population decreases and the desertion of traditional breeding areas in recent years in the Alps and Pre-Alps, and also in the Polish Carpathians, may be due to very wet conditions in spring and poor summer weather, which bring low breeding success, as well as difficulties for observers monitoring the species.

Whereas many Wallcreepers breed on steep rock faces that may be 1000 m or so high, some pairs nest on the rocky sides of gorges no more than 20 m high. Such dark and damp nest-sites are prevalent in the Himalayas, for example, where raging mountain streams liberally cover the nest-site in spray. Wallcreepers breeding alongside rivers often use the watercourse as foraging grounds. Particularly during rain, they search for small invertebrates such as chironomid midges that linger around the water surface.

[*Tichodroma muraria nepalensis*,
Corbett National Park,
India.

Photo: Gertrud &
Helmut Denzau]



Some 30–50 or possibly 60 pairs live in the Slovak Carpathians, while the species is a very rare and local breeder on the Polish side of the same mountains, most of the total of 15–20 pairs being in the High Tatra, where there may be some overlap with Slovakia. It is rare in the Czech Republic, occurring mainly in winter and in the east, with no proof of breeding, and in Ukraine there have been no breeding records for many years. Among a number of south-east European countries with Wallcreeper populations, Romania has 1200–1500 pairs, and the others include Bulgaria, with 250–400 pairs, Slovenia, with 200–300, Croatia, with 1–10, Serbia and Montenegro, with 45–60, Macedonia, with 50–100, Greece, which has 100–300 pairs, and Albania, with 10–100. The scattered breeding areas in Turkey are thought to hold between 5000 and 25,000 pairs. In the region of the Caucasus and Transcaucasia, some 15,000–30,000 pairs are estimated for Russia on the north side of the main Caucasus range; the species is known to breed in Georgia, but there are no population counts or estimates for that country, and it is considered rare in Armenia, with 150–200 pairs, and in Azerbaijan, with 100–1000 pairs.

Living in extreme, often inaccessible habitats, Wallcreepers are little threatened by humans. The species is listed as protected on Appendix III of the Bern Convention, and its European Threat Status is provisionally evaluated as “secure”. It is abundantly clear, however, from the cases cited by U. A. Corti for part of the Alpine population, that many were shot in the nineteenth century and the early part of the twentieth century for collections and as trophies, and also in order to find out what the birds were. Two days after one was shot near Krems, in Lower Austria, a boy was seen to be sporting one of the bird’s wings as a hat decoration. In Europe and, even more so, farther east, there is a general lack of data on population size and trends, and the number and distribution of nest-sites. Large-scale censuses are difficult because of the habitat inaccessibility already alluded to, and because the birds are often not so conspicuous as may be thought. In the Austrian Tyrol, one pair bred just a few metres above a regular hiking route through a gorge, but it was not disturbed by the walkers and the nest-site was finally lost to erosion. Wallcreepers wintering in towns and villages are generally not disturbed there, either.

Despite feeding exclusively on insects and other invertebrates, and generally not undertaking long-distance movements, the Wallcreeper manages to survive by producing a single brood of, in most cases, few young. This suggests that the mortality rate is very low, and Löhrl’s study certainly found nest losses to be ex-

remely rare. Predation, by mustelids and raptors such as the Eurasian Sparrowhawk, probably has an impact only on small isolated populations.

Hitherto, humans appear to have had little or no influence on Wallcreeper numbers. Nevertheless, being a habitat specialist, needing a varied range of invertebrates and having a small population restricted to the Bavarian Alps, the species is considered potentially threatened in Germany and has been placed on that country’s Red List. If various illegal and uncontrolled human leisure activities continue to increase strongly, then this conservation status may prove to be useful.

Freestyle rock-climbing has increased hugely in the Wallcreeper’s extremely vulnerable habitat in the Bavarian and Austrian Alps. The climbers can cause disturbance not only by their mere presence, but also by the senseless practice of meticulously cleaning cliffs through the removal of natural vegetation growing on ledges and through other interventions, for the benefit of the sport. This needs to be carefully monitored, as it represents a threat to traditional summer territories with their small number of suitable nest-sites, and to winter territories, too. For France, G. Rocamora and D. Yeatman-Berthelot considered that there were no particular threats to the species’ habitat, not even rock-climbing outside the breeding season, but above all the population status and trends are poorly known and more data on this and on the species’ distribution are needed. With this in mind, the hope has been expressed that amateur birdwatchers with a head for heights might be encouraged to conduct the necessary surveys, while mountaineers sympathetic to ornithology would probably be able to provide useful supplementary information. Global warming and the consequent “greenhouse effect” could be a serious longer-term threat in reducing the natural range and population of a high-mountain species.

Canyoning, known in America as canyoneering, involves travelling in canyons or gorges by using a variety of techniques. These can include walking, scrambling, climbing, jumping, abseiling and/or swimming, and newly established hiking routes through gorges, with specially erected ladders and artificial platforms, are quite likely to impinge on breeding Wallcreepers and may represent a serious cause of disturbance. Wallcreepers visit road cuttings in India, and have thus joined the list of birds that benefit from human activities. On the other hand, some observers have frequently seen them flitting away just ahead of a vehicle, so that it is quite possible that a few may be hit by cars or buses.

PLATE 5

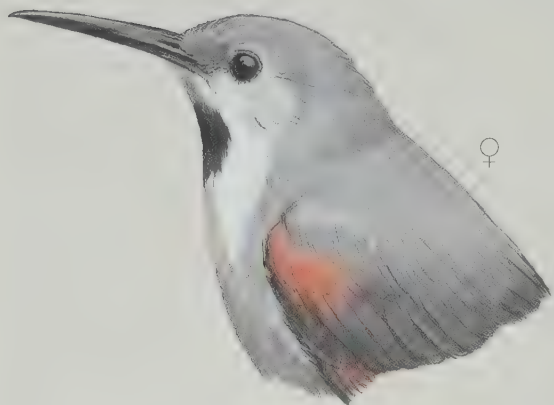
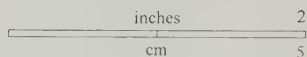


PLATE 5

Family TICHODROMIDAE (WALLCREEPER) SPECIES ACCOUNTS

Genus *TICHODROMA* Illiger, 1811

Wallcreeper

Tichodroma muraria

French: Tichodrome échelette

German: Mauerläufer

Spanish: Treparriscos

Other common names: Red-winged Wallcreeper

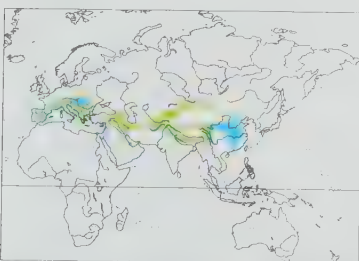
Taxonomy. *Certhia muraria* Linnaeus, 1766, southern Europe.

Sometimes treated in a subfamily of the nuthatch family (Sittidae), but differs distinctly in various morphological features and also in several aspects of behaviour. Geographical variation only slight; race *nepalensis* considered insufficiently differentiated by some authors, who treat species as monotypic. Other proposed races are *longirostra* (mountains of Iran) and *ognewi* (Tashkent, in Uzbekistan), synonymized with nominate and *nepalensis*, respectively. Two subspecies currently recognized.

Subspecies and Distribution.

T. m. muraria (Linnaeus, 1766) – breeds in mountains of S & E Europe (Spain and S France E, including Corsica, to Italy, Balkans, Caucasus, S & E Turkey) E to N & W Iran (Zagros Mts, Elburz Mts).

T. m. nepalensis Bonaparte, 1850 – mountains from Turkmenistan and E Iran (Kerman and Khorasan) E to Kazakhstan (Tien Shan), W Mongolia (Mongolian Altai, Gobi Altai) and, in S, to Himalayas and N. C & E China (N & E Tibetan Plateau E, discontinuously, to Hebei and W Liaoning, and to Yunnan).



Descriptive notes. 16.5–17 cm; 16.7–19.3 g (nominate), 13–20 g (*nepalensis*). Unmistakable in all plumages, but small, roughly the size of Eurasian Nuthatch (*Sitta europaea*); long (2.3–4.2 cm), thin, slightly decurved bill, and strikingly patterned large, broad, round-ended wings. Male nominate race breeding is medium grey above; lesser and median upperwing-coverts carmine-pink, also red-pink partially on alula, primary coverts and greater coverts, with inner greater coverts much duller; underwing-coverts and axillaries pale red-pink; flight-feathers dark grey with carmine-red bases of outer edges and sooty-black ends, two

white spots (small inner and large outer) on each of four long outer primaries (wing pattern striking in flight, also when wing-flicking at rest); tail black, tipped grey, white on outermost feathers; chin to breast black, extent rather variable, rest of underparts dusky grey; iris dark brown; bill and legs black. Female breeding is similar to male, but generally has lower throat to upper breast greyish-white with mottled black patch of variable size. Non-breeding plumage of both sexes is paler grey above, chin to breast whitish without dark throat patch. Juvenile is like non-breeding adult, but more uniformly grey, tinged brown on throat, with bill shorter and straighter. Race *nepalensis* has longer wing but shorter bill than nominate, on average larger white spots on wing and tail, is darker grey above and below, yellow-ochre or buff-brown tinge on head, more often tinged pink at base of tail. **VOICE.** Vocal all year. Song (in Europe) consists of ascending clear whistles with lower end note, latter either directly in same sequence or well separated from main strophe (or may be omitted, mainly at start or end of breeding season and during winter). In Himalayas (race *nepalensis*) song described as rich whistled notes, often gently rising or even level, followed by higher-pitched

but falling end note. Also short trills and warbles recorded. Both sexes sing, female mainly on winter territory. Contact calls whistled chirps, somewhat reminiscent of “tschirp” or “schilp” of Eurasian Tree Sparrow (*Passer montanus*); also described as repeated “pli, pli, pli” notes, and “tsche”, “chup” or “zui”, “tui” and “touiht”; similar calls uttered during feeding of nestlings and for signalling position of fledglings for feeding parents. No specific excitement or alarm calls recorded, probably owing to solitary way of life. Outside breeding period, song (given by both sexes) apparently serves mainly to advertise territory.

Habitat. Varied rocky regions, typically including steep, rugged cliffs and boulder-strewn slopes, and damp, shady gorges in mountains, with holes and crevices for nesting and roosting; rocks generally interspersed with grassy ledges, other vegetation including herbaceous plants, moss, shrubs and trees, and running water often present. Characteristic mix of sunlit and shaded areas important for foraging. Similar rocky habitats favoured in winter at lower levels include quarries and sea cliffs, also earth and clay banks and buildings, and recorded even in cities. Altitudinal range in Europe (e.g. in Switzerland) 350–3450 m; mostly 2300–3100 m in Turkey, and 2800–4000 m (majority probably at 3000–3500) in Tien Shan; largely above 3600 m in Himalayas (but down to 1500 m in winter), and recorded to 5100 m in Tibetan region.

Food and Feeding. Diet mainly small and some larger insects, including adults, larvae and eggs, also spiders (Araneae) and some other invertebrates. Recorded prey include damselflies (Odonata), stoneflies (Plecoptera), grasshoppers and crickets (Orthoptera), earwigs (Dermaptera), bugs (Hemiptera, including aphids), adult and larval Lepidoptera, dipteran flies (e.g. of families Tipulidae, Asilidae, Syrphidae and Muscidae), ants and bees (Hymenoptera), and beetles (of families Curculionidae, Carabidae, Scarabaeidae and others); spiders and harvestmen (Opiliones) important, but ticks (Acari), woodlice (Isopoda), centipedes (Chilopoda) and small molluscs (Gastropoda) also taken. Usually forages alone. Progresses mainly with short, jerky hops, sometimes with sidling, creeping and walking; on vertical surfaces sometimes makes upward leap accompanied by single rapid wingbeat. Takes prey from surface of rocks or among vegetation on ledges; also investigates holes and tunnels of various kinds, and extricates prey from cracks and crevices. Some prey taken in flight. Occasionally searches for food on ground, sometimes turning over leaf litter and small stones, using the closed bill for this purpose. Larger items usually carried to a large flattish stone or other flat area and beaten against substrate until dismembered.

Breeding. Season Apr/May–Jul/Aug in Europe, depending on altitude, and mainly May–Jul farther E, e.g. in Himalayas; single-brooded. Probably monogamous. Solitary and territorial breeder; home range often extensive, both horizontally and vertically. Nest of moss, plant fibres, rootlets and grass, with hair, wool and feathers densely matted together, sometimes as lining, for insulation, placed in cleft in rock (sometimes up to 80 cm inside hole), between or behind rocks or boulders, sometimes on or inside building. Clutch 3–5 eggs, pointed oval to pear-shaped, white with some small dark red to blackish spots, average dimensions 21.3 × 14.3 mm; incubation by female, period c. 19 days; chicks fed by both parents, male bringing most of food, nestlings come to nest entrance and even outside crevice at 24–25 days, nestling period c. 29 days; juveniles fed by parents for several days after leaving nest, probably independent c. 5–6 days after fledging, possibly not until 7–12 days after. Breeding success relatively high: average 3.83 young fledged from 24 successful nests in Switzerland, 3.11 from 36 nests (and two family parties) in Slovakia. Scant data suggest that some females first breed at 1 year, earliest for male 2 years.

Movements. Short-distance and altitudinal migrant throughout most of range. Most winter within or close to breeding range, some move up to several hundred km and may show fidelity to wintering site; extends to plains of N Indian Subcontinent, and fairly regular in non-breeding season in S & E parts of China; one winter record in extreme NE Myanmar. Following upslope dispersal after breeding, main autumn movement to lower levels late Sept or early Oct and arrival in winter quarters Oct–Nov; return from late Feb or Mar–Apr, although snow conditions may delay arrival at nesting locality. Has straggled to England, Channel Is (Jersey), N France and N Germany (including Heligoland and city centre of Berlin), Low Countries, Portugal, islands in Mediterranean, NW Africa (Morocco, Algeria), Iraq, Syria and Jordan.

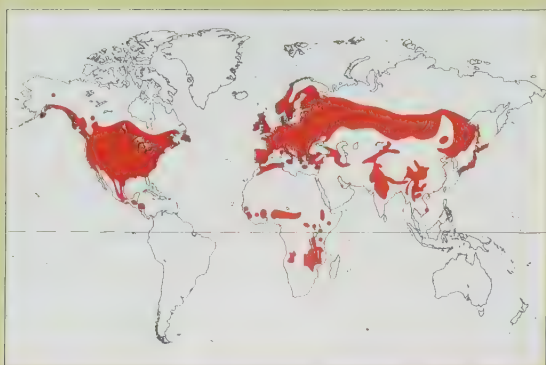
Status and Conservation. Not globally threatened. Locally fairly common. Because of its sparse distribution, often in inaccessible montane habitat, and elusive, inconspicuous nature, this species’ precise distribution, population and trends are not well known, particularly in E parts of range. In Europe 38,000–100,000 breeding pairs estimated, with key populations in France (4000–20,000), Spain (9000–12,000) and Italy (2000–6,000); farther E, 5000–25,000 pairs estimated for Turkey, 15,000–25,000 in Russian N Caucasus. European population considered stable during 1970–1990, probably also 1990–2000, thus provisionally evaluated as secure. Protected in most European countries, but listed as “critically endangered” in Poland, “vulnerable” in Liechtenstein and “near-threatened” in Slovakia; red-listed in Germany. Development of mountain regions and considerable increase in human leisure activities, especially rock-climbing, cause disturbance and threaten habitat in breeding and wintering areas.

Bibliography. Abdusalyamov (1973), Adamian & Klem (1999), Alexander (1971), Ali & Ripley (1998), Andrews (1995), Anon. (2007i), Augst (1985), Bailly (1854), Bankovics (1977, 1983), Barker, Barrowclough & Groth (2002), Barker, Cibois *et al.* (2004), Bashta (2005), Bauer *et al.* (2005), Baumgart (1970, 1995), van den Berg & Bosman (1999), Bergmann & Helb (1982), Bergmann *et al.* (2008), Bernis & Maluquer (1955), Bevacqua (1983), Bezzel (1967, 1993), Bock (1994), Burfield & van Bommel (2004), Butchart & Stattersfield (2004), Cambi & Micheli (1986), Chatelanat (1943, 1945), Cheng Tsohsin (1987), Choudhury (2004), Corti (1952, 1959), Cramp & Perrins (1993), Crewe (2007), De Franceschi (1983), Dementiev *et al.* (1954a, 1970), Desmet (1981), Dicapi & Maestri (2004), Dickinson (2003), Diesselhorst (1968), Dolgushin *et al.* (1972), Dorka (1973, 1976), Dubois *et al.* (2000), Dvorak *et al.* (1993), Elias (1970), van der Elst *et al.* (1990), Érard & Étiéhopar (1970), Erokhov & Belyalov (2004), Fesenko & Bokotey (2002), Flint & Stewart (1992), Gantlett & Millington (1992), Gauthier-Clerc (1991), Gavrillov & Gavrillov (2005), Gavrillov & Gistsov (1985), G  roudet (1987, 1994a, 1994b), G  roudet & Gauthier-

Clerc (1994), Girtanner (1864, 1868), Glutz von Blotzheim (1962), Gorman (1996), Gr  nitz (1965), Greenway (1967a), Grimmett *et al.* (1998), Halfer (1993b), Hagemejier & Blair (1997), Handrinos & Akriotis (1997), Harrap & Quinn (1996), Harrop & Jenkins (2006), Hartert (1905), Hauri (1970, 1978, 1988), Heinroth & Heinroth (1926), Hern  ndez, Alegre *et al.* (1993a, 1993b), Hern  ndez, Salgado & Alegre (1993), H  lzinger (1989, 1997), H  ttenmoser (1989), Isenmann (1988), Ivanov (1969), Karakas & Biricik (2005), Kasperek (1992), Keller (1885), Kharchenko (1965), Kipp (1959, 1961), Kostin (1983), Kottek (1965), Kovshar (1966), Kozlova (1933), Kren (2000), Lebreton (1981), L  hrl (1964, 1967a, 1967b, 1970, 1971, 1974a, 1974b, 1975, 1976, 1985c, 1988, 1993b), Ludlow (1950), MacKinnon & Philipps (2000), Maire (1987), Malle (2006), Manuel (1949), Martens & Eck (1995), Martens & Geduldig (1990), Mauersberger *et al.* (1982), Maumary *et al.* (2007), Meinertzhagen (1927), Moss (2007), Mountfort (1962, 1969, 1971), M  ller (1962, 1965), Murr (1938, 1950), Neunh  ffer (1980), Noll (1956, 1957), Pek & Fedyanina (1961), P  llinger (1992), Pellow (1971), Piechocki & Bolod (1972), Portenko (1954), Portenko & Vietinghoff-Scheel (1974), Porter *et al.* (1996), Potapov (1966), Psenner (1984), Psenner & Thaler-Kottek (1969), Purroy (1997), Rabbits & Vinicombe (1978), Ramadan-Jaradi & Ramadan-Jaradi (1999), Ramadan-Jaradi *et al.* (2008), Rasmussen & Anderton (2005b), Ringleben (1955), Roberts (1992), Rocamora & Yeatman-Berthelot (1999), Rustamov (1958), Saniga (1993, 1995a, 1995b, 1995c, 1995d, 1999, 2000, 2001, 2002, 2003, 2004), S  p  r (2003), Sardin (1984), Sch  fer (1938), Schmid *et al.* (1998), Schonert (1996), Sheldon & Gill (1996), Shirihai (1996), Sibley (1970, 1996), Sibley & Ahlquist (1985a, 1990), Sibley & Monroe (1990, 1993), Sibley *et al.* (1988), Smith, K.D. (1972), Snow & Perrins (1998), Sommarberg (1975), Sorbi (1987), van de Staaij & Fokker (1991), Stepanyan (1990, 2003), Stickney (1997), Stopper (1988), Svensson *et al.* (1999), Thaler-Kottek (1988), Thibault (1983), Thibault & Bonaccorsi (1999), Tian Yingzhou *et al.* (1995), Uhl  g (1983), Vaucher (1945), Vaurie (1950b, 1957b, 1959, 1972), Voous (1960, 1977), Walter (2005), Whistler (1944), Wiegant *et al.* (1997), Witherby *et al.* (1938), Wolters (1979), Wooldridge (1985), W  st (1986), Yanushevich *et al.* (1960).



Class AVES
Order PASSERIFORMES
Suborder OSCINES
Family CERTHIIDAE (TREECREEPERS)



- Small passerines with medium-long stiffened tail, short rounded wings, longish, slender, decurved bill, and intricately marked, highly cryptic plumage.
- 11–15 cm.



- Palearctic and Oriental Regions, one species in Nearctic and one in Afrotropics.
- Forest, woodland, parks and gardens.
- 2 genera, 10 species, 48 taxa.
- No species threatened; none extinct since 1600.

Systematics

The family Certhiidae comprises two genera. *Certhia* was established in 1758 and *Salpornis* in 1847. The various members of the genus *Certhia* are clearly very closely related to one another, and they form the subfamily Certhiinae. Indeed, so close are they in appearance that there was, until recently, general agreement among taxonomists that there were only five or six species. In recent years, however, the American representative of the genus, the American Treecreeper (*Certhia americana*), also commonly known as the “Brown Creeper”, has been generally afforded species status, and two additional “cryptic” species, Hodgson’s Treecreeper (*Certhia hodgsoni*) and the Manipurese Treecreeper (*Certhia manipurensis*), have been revealed. Furthermore, a totally new taxon has been discovered in south-central China, and this has been named as the Sichuan Treecreeper (*Certhia tianquanensis*). This was initially thought to be a species of the widespread Eurasian Treecreeper (*Certhia europaea*), but the two have been found to occur sympatrically without interbreeding. In addition, its morphology and vocalizations indicate that the Sichuan Treecreeper is a separate species. This is supported by genetic studies, which further suggest that the Rusty-flanked Treecreeper (*Certhia nipalensis*) is its closest relative.

The second genus, *Salpornis*, is monospecific. The single species, the Spotted Creeper (*Salpornis spilontus*), resembles the *Certhia* treecreepers in build and general coloration, and the genus has commonly been placed in the family Certhiidae. Nevertheless, it lacks the stiffened tail feathers characteristic of *Certhia* and, because of this, it has alternatively been treated as forming a subfamily of the nuthatches (Sittidae) or as a monospecific family, Salpornithinae. Data on DNA–DNA hybridization suggest, however, that *Salpornis* is the closest relative of *Certhia*, and it seems reasonable, therefore, to place it in the family, Salpornithinae, of Certhiidae. *Salpornis* is one of a small group of passerines that occur disjunctly in Africa and south Asia. The trend in recent times has been to separate these disjunct populations as distinct species, and this course of action could well be appropriate with *Salpornis*. Moreover, variation within *Salpornis* in Africa alone is such that one or more distinct species could be involved. At the time of writing, new results into the biometrics of selected morphological characters, some structure and sequences of cytochrome *b* is about to call for specific recognition of the African and the Asian populations. This study supports treatment of the Spotted Creeper as a separate

family, most closely but still loosely related to the Wallcreeper (Tichodromidae).

Certhia is well defined as a genus, but two questions have faced taxonomists. The first concerns which other, similar-looking genera should be placed with *Certhia* in the family Certhiidae, and the second is that of the relationships of this family, however defined, to other passerine genera.

Salpornis has been discussed above. In addition, owing to their outward similarities, at least on the museum bench, two other families were long associated with the Certhiidae. These are the rhabdornis (Rhabdornithidae), which are often referred to as the “Philippine creepers”, and the Australasian treecreepers (Climacteridae), sometimes called the “Australo-Papuan creepers”, which were either placed within Certhiidae or placed next to it in taxonomic sequence. Rhabdornithidae has long puzzled tax-



Subdivision of the
Certhiidae

[Figure: Ian Lewington]

The family Certhiidae takes its name from treecreepers of the genus *Certhia*. Treecreepers have a highly specialized niche, foraging for small invertebrates on tree trunks and branches, to which *Certhia* morphology is supremely adapted. Short legs enable the bird to stay close to the trunk, as illustrated by this **Bar-tailed Treecreeper**. Long toes and strong claws give it good grip, while the slender, decurved, fine-tipped bill is well suited to probing fissures in the bark.

[*Certhia himalayana yunnanensis*, Chengdu Botanical Garden, Sichuan, China. Photo: Dong Lei]

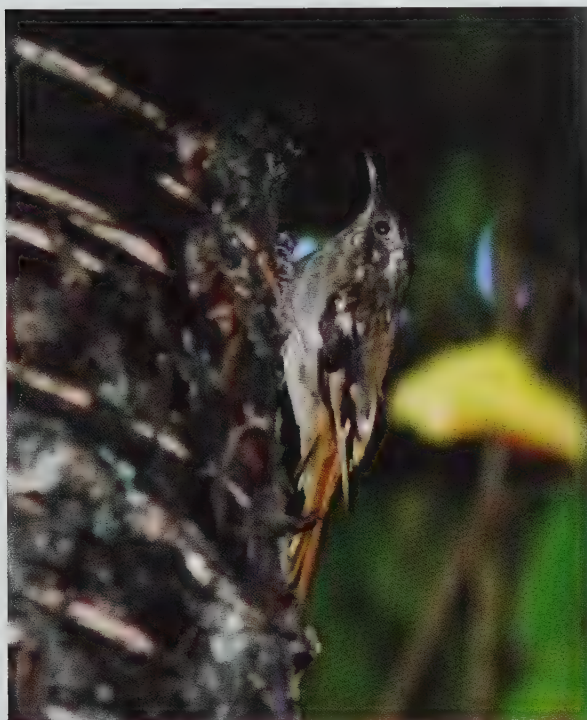
onomists. In terms of behaviour, diet and vocalizations, the poorly known rhabdornis are clearly not close to Certhiidae, but the most recent genetic evidence does, at least, place them in the same superfamily, Muscicapioidea. The Climacteridae, on the other hand, are members of an ancient radiation, the “basal Corvida” (see below), and seem not at all closely related to Certhiidae.

In a broader context, the certhiid treecreepers have always been closely associated with the nuthatches, and these two families had, in turn, been placed close to the tits (Paridae) and the long-tailed tits (Aegithalidae), despite differing in many aspects of structure, plumage and behaviour. Studies based on DNA–DNA hybridization have, however, indicated that the Certhiidae are close relatives of the gnatcatchers and gnatwrens (Poliophtilidae), the wrens (Troglodytidae) and the nuthatches. In 2006, K. A. Jönsson and J. Fjeldså reviewed 99 molecular-genetic studies in order to construct a tentative “supertree” of relationships among all passerine birds. In the new arrangement, the oscine passerines are divided into parvorders as the “Basal” and “Crown” Corvida and the Passerida. The Passerida is then divided into three superfamilies, Muscicapioidea, Passeroidea and Sylvioidea. There appears to be a general consensus among modern taxonomists on all these major branches. Jönsson and Fjeldså placed the Certhiidae, together with the Sittidae, the Poliophtilidae and the Troglodytidae, as a single clade within the superfamily Muscicapioidea, while the Paridae and the Aegithalidae are far removed in the superfamily Sylvioidea.

At the species level, a number of changes have been made over the decades, largely on the basis of the findings of molecular-genetic analyses. Thus, as intimated in the opening paragraph, the American Treecreeper and the southern Asian Hodgson’s Treecreeper have in the past been treated as subspecies of the widespread Eurasian Treecreeper, but both exhibit vocal and genetic differences from the latter and are, therefore, better considered two separate species. Most interestingly, recent genetic evidence, based on the cytochrome *b* gene, indicates that the American Treecreeper’s closest relative is, in fact, the Short-toed Treecreeper (*Certhia brachydactyla*). In the Himalayan region and South-east Asia, the Sikkim (*Certhia discolor*) and Manipur Treecreepers were formerly treated as one species, then usually called the “Brown-throated Treecreeper”, but they are now separated on the basis of vocal and genetic evidence. Some uncertainty remains, however, as individuals from Nagaland and western Manipur, in north-east India, are sometimes placed with the Manipur Treecreeper, but their plumage features indicate clearly that they belong with the Sikkim Treecreeper.

Climbing vertical tree trunks is no mean feat, but a specially adapted tail makes the task a good deal easier. The twelve tail feathers are noticeably rigid in *Certhia* species such as this **Sikkim Treecreeper**, and the tough central shaft extends beyond the feather tip. This enables the treecreeper to support itself on its tail tip as it ascends the tree, just like a woodpecker (Picidae). Other adaptations include short, rounded wings which befit birds that usually only need to fly short distances between trees.

[*Certhia discolor*, Gaoligongshan National Park, western Yunnan, China. Photo: Christian Artuso]



Intraspecific variation has led some taxonomists to suggest that several additional species should be recognized. Hodgson’s Treecreeper displays marked geographical variation. In particular, the ranges of the nominate race and the subspecies *mandellii* abut in the Himalayas of northern India, but there is no evidence of intergradation between them. As well as differing morphologically, these two taxa appear to differ genetically to a sufficient degree that each may merit species status. The third and final subspecies currently included within Hodgson’s Treecreeper, *khamensis*, is morphologically much more similar to *mandellii*, although it does seem to exhibit a significant, albeit smaller difference in cytochrome *b*. The Short-toed Treecreeper varies only slightly in size and coloration, and the variation appears to be clinal in pattern. Nevertheless, European and north African populations have been found to exhibit moderately well-marked genetic differences, in addition to some vocal differences, and it may well be that the north African taxon *mauritanica* represents a separate species. Further study may help to clarify the situation.

Finally, the Spotted Creeper, although revealing only relatively slight geographical variation in plumage, does exhibit distinct vocal differences. The differences in voice between, on the one hand, the Indian and West African individuals and, on the other, the southern African populations may be sufficiently great to justify treatment of these two groups as separate species. Again, however, more information is needed, for example on the vocal characters of Spotted Creepers in Ethiopia.

Morphological Aspects

Within the Certhiidae, the members of the genus *Certhia* form a well-characterized group of extremely homogenous species. The very specialized niche that the genus occupies, that of gleaning small invertebrates from the trunks and branches of trees (see Food and Feeding), appears to provide limited options for divergence.

The bill is very slender, laterally compressed, sharply pointed, of short to medium length, and slightly to distinctly decurved. It is clearly an adaptation for probing narrow gaps and crevices in bark and extracting small items of food. The nostrils are positioned near the base of the bill, free of feathers but protected by a membrane, and the rictal bristles are rudimentary. The tongue is long, narrow and horny, with some bristles at the tip. The legs are short, with fairly long toes and strong claws, the claw on the hind toe being particularly long, and the tarsus is distinctly scutellate.



At a quick glance, *Certhia* treecreepers might appear to be mainly rather dingy brown birds. Closer examination, however, reveals the subtle beauty of this genus, as exemplified here by the **Eurasian Treecreeper**.

The upperparts of all nine species are intricately patterned, with pale streaks, spots, tips and fringes, and contrasting dark bars and chevrons. The resulting combinations of browns, buffs, whites and silvers are remarkably similar across the genus, but slight differences are often important for distinguishing the various species. These upperpart patterns are highly cryptic, providing effective camouflage against the open tree trunk.

In contrast, the underparts are usually unmarked and pale, being noticeably white in the more northerly species, but usually darker in southern taxa.

The pale underparts are thought to play an important role in mate-attraction, being prominent during the male's display flight. Note the remarkably long hind toe, an adaptation to the treecreeper's lifestyle of vertical ascents.

[*Certhia familiaris*
familiaris,
Helsinki, Finland.
Photos: Markus Varesvuo]



[*Salpornis spilonotus*.
Photo: Peter J. Ginn]

Tree creeper wings are short and rounded, with nine secondaries and ten primaries, the outermost primary being significantly reduced. The flight of these species is undulating, rather weak, and usually over short distances only. The twelve tail feathers are stiffened, with robust shafts that project at the tips, and the bird uses its tail as a prop as it climbs, exactly in the manner of woodpeckers (Picidae). This limits its climbing options and, like woodpeckers, tree creepers are unable to move downwards head first on a tree. At first sight, tree creepers would appear to lack the extra-robust feet and legs of nuthatches and the appropriate musculature for clinging on with the feet alone, but this is not so, as they can forage along the underside of branches, where the stiffened tail cannot help them to overcome gravity. It may well be that it is simply a question of balance, and that the placement of the legs makes the whole bird top-heavy if it attempts to walk downwards.

The plumage of tree creepers is thick, long and soft, and beautifully and intricately marked. The upperparts are basically brown with numerous buff spots and streaks, as well as some darker and more blackish chevrons and bars, and all nine species have a paler supercilium, although this may be rather muted. Highly cryptic, the coloration of the upperparts provides excellent camouflage against the bark of a tree. The underparts are much plainer and paler, whitish in the species with a more northerly distribution, but tending to be browner in southern taxa. The pale underparts are noticeable during display-flights in courtship (see Breeding). In the genus *Certhia*, the male and the female are identical in plumage, and the juveniles differ very little from the adults, merely tending to have slightly duller, looser and "shabbier" plumage with a few fine dark scallops or spots on the underparts.

Adults undergo a complete post-breeding moult, but unlike all other passerines, which replace the tail feathers "centrifugally", from the centre outwards, tree creepers retain the central pair of rectrices until all the others have been replaced. This enables them to maintain the usefulness of the tail as a support throughout the moult, the moult strategy thus being similar to that used by woodpeckers. Juveniles have a partial moult into first-winter plumage, involving some wing-coverts and, for some species, also the tertials or the tail.

So homogenous are tree creepers in their appearance that they present a considerable identification challenge in places where two or more species occur together. In parts of Europe, for instance, the Eurasian Tree creeper and the Short-toed Tree creeper are extremely difficult to distinguish from each other, even in the hand, and their vocalizations (see Voice) are by far the most reliable identification feature. The tree creeper species found in the Himalayas and south China are more distinct, but they had been poorly treated in the identification literature until the 1990s and many historical data, if based on field observations, must therefore be treated with some scepticism.

The Spotted Creeper, which is placed in its own subfamily (see Systematics), differs from *Certhia* in one important respect. Its tail feathers are not stiffened and it therefore climbs without using its tail as a support, which is the reason why it has sometimes been treated as a subfamily of the nuthatches (see Systematics). Its mode of locomotion, however, resembles that of *Certhia*, and there are no reports of Spotted Creepers moving head first down a tree. In contrast to the difference in the tail feathers, *Salpornis* shares with *Certhia* intricately marked, dark upperparts and a pale supercilium, and it, too, has paler underparts, although these are rather heavily barred darker and have paler spots. As with *Certhia*, the bill is laterally compressed and distinctly decurved, with the nostrils near the base; there are no rictal bristles. The tongue is long, narrow and horny, and has about five bristles at the tip. The tarsus is thick and short, with transverse scales in front, and the foot is large, with rather long, spindly toes and long, sharp, strongly curved claws, the hind claw especially so. There are twelve tail feathers, nine secondaries and ten primaries. The outermost primary is significantly reduced, but the wings, unlike those of *Certhia*, are rather long and pointed.

Habitat

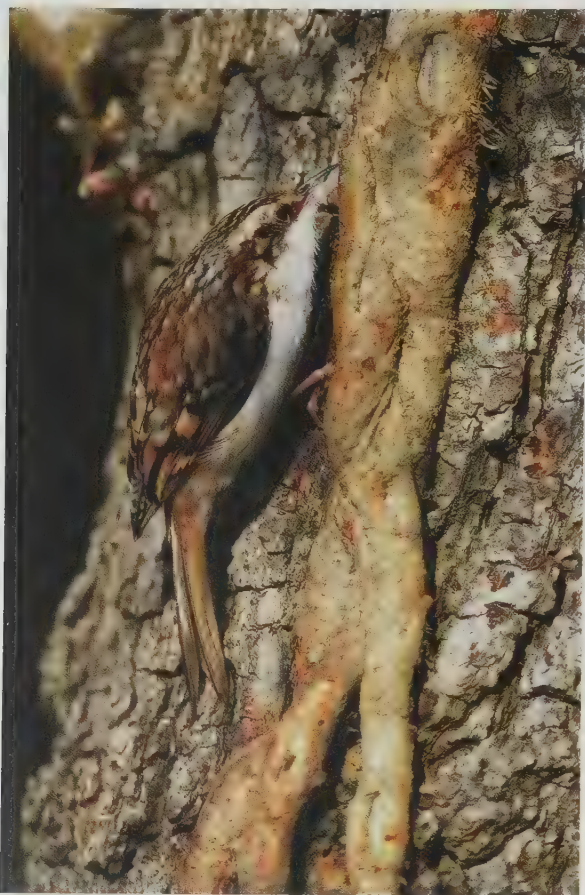
All members of the family Certhiidae are closely tied to forest or woodland, where they forage almost exclusively on the trunks and larger boughs of trees. Coniferous and broadleaf, evergreen



Apart from feeding as family parties for a few weeks at the end of the breeding season, tree creepers are not particularly sociable, at any rate by day. By night, however, there is far greater contact between conspecifics. At least three species of *Certhia* roost communally, including the Short-toed Tree creeper.

This species spends the night in sheltered spots on buildings or inside holes and fissures in trees; the tree creepers sometimes excavate such tree holes themselves. During particularly cold weather, up to 20 birds may share a roost, piling up on top of each other to maximize heat conservation.

[*Certhia brachydactyla*.
Photo: ARCO Digital
Images/CD-Gallery]



and deciduous, forests are utilized. Certhiids will, at least occasionally, forage on the ground or on fence posts, and in extreme circumstances, as when migrants or vagrants are grounded in unsuitable habitat, they will forage on rocks and walls, but they otherwise stick very closely to the behaviour indicated in their English and many other vernacular names.

The habitats of three species of *Certhia*, namely the Eurasian, Short-toed and American Treecreepers, are well documented, but those of the remainder, and of *Salpornis*, remain relatively poorly

known. From the available evidence, it is clear that the limiting factors for treecreepers are the availability of trees with suitable foraging micro-habitats, and the availability of suitable nest-sites. These are, in turn, determined by the age and structure of the forest, with tree-species composition a secondary factor. Old-growth forests are more likely to provide large trees with rugged, fissured bark sheltering an abundance of invertebrates, and standing dead wood with peeling bark for nest-sites, and these are therefore favoured. Given the availability of suitable trees, however, treecreepers are adaptable and will utilize more open parkland with scattered trees, as well as parks and large gardens in some urban and suburban areas, especially in winter or when treecreeper breeding populations are high. The Short-toed Treecreeper in central and southern Europe seems to be particularly well adapted to these more open habitats, and in Spain and Portugal, for example, it can be abundant in the *dehesa* landscape dominated by evergreen oak (*Quercus*) woodlands. The Spotted Creeper is similarly tied to woodland with mature trees, and again the structure of the trees themselves and that of the forest are more important than are the particular species present. Spotted Creepers are found in mature, open *Isoberlinia* woodland in West Africa and in structurally similar mature miombo (*Brachystegia*) woodland in the southern tropics, but, rather anomalously, they occur also in juniper (*Juniperus*) woodland in the Ethiopian Highlands.

Within the aforementioned tolerance limits, treecreepers will occupy any available woodland, but the presence of another member of the genus can have a severely limiting effect on their habitat choices. Competitive exclusion clearly operates in Europe. Here, the Eurasian Treecreeper has a preference for deciduous woodland in Britain, where it is the only *Certhia* species present, but in Continental Europe, in the face of competition from the Short-toed Treecreeper, it is generally confined to coniferous woodland at higher altitudes, presumably a more marginal habitat, its congener occupying the more favourable deciduous woodlands. The Eurasian Treecreeper undergoes a similar "ecological release" in European Russia, again in the absence of the Short-toed Treecreeper, showing a strong preference for mature broadleaf and mixed forest, rather than conifers.

This process is presumably taken a stage further in the Himalayas and western China, where up to four species of *Certhia* may be present, each tending to occupy a distinct altitudinal band and particular forest formations. Thus, in Nepal, the Sikkim Treecreeper is found at the lowest elevations, in subtropical forest at 2000–2700 m, followed by the Rusty-flanked Treecreeper in moist mixed and deciduous forest at around 2550–3660 m, the

Foraging strategy is very similar in all treecreepers. With its body parallel to the tree, the bird ascends in little hops, its feet moving upwards in tandem and the stiffened tail supporting the bird at all times except during the hop itself. The narrow, decurved bill is used to probe under bark and into crevices, and, as shown by this **Eurasian Treecreeper**, the long, horny tongue is then deftly deployed to extract prey items concealed within. Treecreepers forage principally on the main trunk and larger branches, though occasionally they will feed on the outer branches. Eurasian Treecreepers even sometimes forsake their arboreal habitat to forage opportunistically on other substrates, including human constructions such as walls and buildings, and even on the forest floor among fallen pine needles.

[*Certhia familiaris britannica*, near Ringwood, Hampshire, England. Photo: Mike Read]



Treecreepers are almost exclusively carnivorous. As a rule, they mainly take small arboreal invertebrates, such as ants and other insects, and larvae, as illustrated by this **Rusty-flanked Treecreeper**. In winter, the birds may supplement this diet with seeds and other vegetable matter and, for bold American Treecreepers (*Certhia americana*) residing close to human habitation, suet and nuts taken from garden bird feeders.

[*Certhia nipalensis*, Chungthang, north Sikkim, India. Photos: Gaurav Bhatnagar]

Certhia treecreepers have an almost ritualized foraging strategy. They fly to the very bottom of a tree, often just a few centimetres above the ground, whence they spiral upwards around the trunk. This **American Treecreeper** is at the start of its perusal of a conifer. It will spend most of its time on the lower trunk, where branches are fewer and crevices that potentially conceal insects are more numerous. When the treecreeper feels that it has scoured the tree adequately, it flies to the base of another nearby tree and starts the process afresh. Spending time on large, old trees appears to be the key to efficient treecreeper foraging since their bark holds higher densities of invertebrates than that of young trees.

[*Certhia americana*, Kings Canyon, California, USA. Photo: Andy & Gill Swash]



Bar-tailed Treecreeper (*Certhia himalayana*) in open forests and orchards at about 2900–3660 m, and finally Hodgson's Treecreeper in coniferous forest at 2800–4200 m. It should be noted that most altitudinal data are based upon sight records, which are certainly open to error, and that there are few confirmed breeding records, so that the altitudinal bands occupied may, in fact, be more narrowly circumscribed than these figures suggest. Altitudinal separation is clearly not complete, and within a given altitudinal zone the overlapping species differ slightly in terms of the forest formations that they favour, but even this distinction is not total and up to three species have been found on territory in the same area, with apparently no difference in habitat preference. In these cases, differing bill lengths may effect ecological separation, allowing the syntopic species to exploit different food sources. Moreover, in the Bar-tailed Treecreeper the sexes do not overlap in bill measurement, further reducing competition, and there is hardly any overlap in bill length between the sexes of Hodgson's Treecreeper.

Further study of habitat preferences would clearly be worthwhile, and may be particularly relevant for the Sichuan Treecreeper. This restricted-range species is considered globally Vulnerable (see Status and Conservation) and is apparently confined to a very specific habitat. It has been recorded only in open, old-growth stands of Emei fir (*Abies fabri*), itself a globally threatened species, with a dense bamboo understorey.

General Habits

These small, diurnal, arboreal passerines are often tame and, indeed, indifferent to humans, although they do have what is, to the birdwatcher, the annoying habit of moving to the side of the tree trunk that is invisible to the observer. In general, they are altogether inconspicuous and unassuming, neither the plumage nor the voice demanding attention in the way in which those of most tits or nuthatches do.

Certhiids are normally observed as singles or in twos, both during and outside the breeding season, although they may, on

rare occasions, form small groups. For the Eurasian Treecreeper it has been noted that, apparently, the pair-bond sometimes persists outside the breeding season or, in some regions, pairs may be established in the autumn.

At times, treecreepers may be more sociable. After fledging, young Eurasian Treecreepers form family parties in which the individuals remain together for about 14 days, although this is dependent on the occurrence of second clutches, the young sometimes being divided between the parents. American



As befits a genus inextricably linked with trees, *Certhia* treecreepers are arboreal breeders. Typically, they site their nest between the trunk of a tree and its flaking bark, the narrow gap between the two being just the right size. Alternatively, certhiids such as this **Short-toed Treecreeper** nest in a crevice such as an old woodpecker hole; the key is that the entrance is large enough for the occupants to squeeze through, but too small for potential predators. Sometimes treecreepers nest within building or wall cavities, in the bottom of a raptor nest, or within a drey of squirrels (*Sciuridae*). They will also use nestboxes that have been carefully designed and suitably located.

[*Certhia brachydactyla*, Dombasle-sur-Meurthe, Meurthe-et-Moselle, France. Photo: Frédéric Fève/Bios]

Treecreepers likewise form family parties for about three weeks after the young fledge, and they and Eurasian Treecreepers are sometimes seen in small single-species flocks when on migration (see Movements).

Communal roosting has been recorded for at least three species of *Certhia*, and for such small-bodied birds it may be important for overnight survival. Eurasian Treecreepers roost in a variety of crevices or behind bark flaps, and, where such trees are available, they will excavate suitable cavities in decayed stumps or dig hemispherical hollows in the soft bark of ornamental redwoods (*Cupressaceae*), including giant redwoods (*Sequoiadendron giganteum*), the latter colloquially known as wellingtonias. They also roost under ivy (*Hedera*) and sometimes in buildings. Both solitary and communal roosting are recorded for this species, the individuals either using separate holes in the same tree, or sleeping in close physical contact, huddled together in a hollow or in the open on a trunk. Up to 13 or 14 Eurasian Treecreepers have been found huddled together at a roost. Such huddling is probably regular for fledglings, otherwise occurring only on cold nights. Once the nest is completed, the female roosts in it at night, and juveniles return to the nest to roost for the first few nights after fledging. Short-toed Treecreepers may also roost communally, with up to 20 individuals together in a dense huddle in cold weather, usually on buildings, where they cling to the wall under the eaves in a star formation, and some individuals may be totally hidden. Otherwise, this species roosts in trees, choosing very similar sites to those used by Eurasian Treecreepers. Once the bond has been

formed, the pair-members will roost close together, but the female roosts in the nest from the onset of laying.

After fledging, family parties of exclusively juvenile American Treecreepers roost together in the open, usually on a tree trunk sheltered by other trees. They form a tight circle, all heads facing inwards, as with Short-toed Treecreepers, and they use a different site each night. In addition, up to eleven individuals have been recorded as roosting in a cavity of a beam in a barn, in April. Otherwise, this species appears often to be a solitary rooster, but in Colorado, during the winters of consecutive years, groups of two or three individuals have been observed to roost every night in a crack or scar in the bark of the same tree. In winter, American Treecreepers may roost on or even inside buildings. In New York, for example, two individuals roosted every night in the angle formed between a chimney and a roof, their bills pushed into the wood of the roof.

In the presence of avian predators, treecreepers adopt a concealment posture, in which the body is pressed flat to the tree, hiding the pale underparts, the head is lowered, with the bill directed upwards, and the wings may be widely spread. They may freeze for several minutes in this position, presumably relying on their cryptic coloration for protection. Young Eurasian Treecreepers have also been noted to freeze in an upright posture, like that adopted by a bittern (*Botaurus*), as an anti-predator response.

American and Eurasian Treecreepers have been recorded as sunning, in which they adopt a spread-eagle posture, with the wings and the tail feathers spread. In addition, water-bathing has



The only certhiid not housed within the genus *Certhia* differs significantly in terms of nest location and structure. Rather than breeding in a secluded hole, the **Spotted Creeper** nests in an open tree fork, usually 3–12 m above the ground. The Spotted Creeper relies on impressive camouflage to safeguard its brood from predators. The nest is deep and cup-shaped, constructed from stalks, rootlets and bark chips, bound with spider webs and caterpillar secretions. It is lined with egg sacs and plant down, and is covered with lichen. It is the combination of this lichen layer and the Spotted Creeper's dark and light patterned plumage that makes the nest so hard to spot. Differences have been found in clutch size and egg coloration between the Spotted Creeper populations of Africa and India, which may lend credence to the argument that more than one species is involved.

[*Salpornis spilonotus*
xylodromus,
Harare, Zimbabwe.
Photo: Peter Steyn/Ardea]

In contrast to other *Certhia* treecreepers for which data are available, the male **Short-toed Treecreeper** usually takes full responsibility for nest construction. He builds two or three nest foundations, then shows them to his partner, whereupon she chooses one for completion; the process can take an entire month. To provide the nest foundation, the male collects twigs, grass, bark and plant fibres, and weaves them together into an untidy, sprawling mass that fills the chosen cavity. The nest is then lined with softer material such as feathers, hair, moss and lichen. While the majority of Short-toed Treecreepers breed as monogamous pairs, usually raising two broods per season, polygyny has occasionally been recorded. Indeed, in one case, two females were discovered breeding side-by-side in the same nestbox, incubating eggs and feeding chicks within a few centimetres of each other.

[*Certhia brachydactyla*
megarhynchos,
Spa, Liège, Belgium.

Photo: Franck Renard/Bios]

been observed for the American Treecreeper, but anting has not been recorded for any member of the family. Other types of maintenance behaviour include preening and scratching. The Eurasian Treecreeper scratches its head by using the indirect method, whereby it raises one leg over the wing on the same side.

Voice

The songs and calls of *Certhia* and *Salpornis* are mostly rather high-pitched and inconspicuous. The first vocalizations are the begging calls given by nestlings, from the age of 9 days at the latest. Other calls apparently stem from the begging calls, and the song is comprised of these calls arranged into a specific sequence. Adults deliver a variety of notes for contact and in social contexts, but all vocalizations are relatively short and simple in structure.

The songs of *Certhia* fall into two distinct categories. That of the Eurasian, Hodgson's, American and Short-toed Treecreepers is relatively complex, comprising a variety of note types. The remaining five members of the genus, namely the Bar-tailed, Sichuan, Rusty-flanked, Sikkim and Manipur Treecreepers, have a song that is much simpler, being a more or less rapid repetition of similar notes to produce a rattle or trill. Whether simple or complex, the songs are stereotyped, varying little from place to place or among individuals. This would suggest that the song is innate, rather than being learnt, but song-learning is well documented for both the Eurasian and the Short-toed Treecreepers, and in the case of the latter species it probably takes place at 50–100 days of age. Attempts to teach Eurasian Treecreepers by using recorded songs were unsuccessful, yet individuals were able to learn songs from interactions, either visual or acoustic, with live males. As the studies by G. Thielcke demonstrated, social interactions between males are apparently a requirement for song-learning for all *Certhia* species.

As a complication, there is an intricate relationship between the Eurasian and Short-toed Treecreepers in Europe. In places where the two species are found together, what have become known as "mixed" singers regularly occur. In these instances, the Eurasian Treecreeper imitates the song of the Short-toed Treecreeper and vice versa, or, more frequently, part of one song is "dubbed" or mixed into the other. It was once thought that all mixed singers were Eurasian Treecreepers, but Short-toed Treecreepers, too, may become mixed singers, especially on the edge of their range; in general, the mixed singers in any given area should be the less numerous of the two species. Each species has learnt the "wrong" song from its neighbours, be they of the other species or existing mixed singers. The imitations are perfect, but, although Eurasian Treecreepers are the better mimics, only a few are able to produce the multiple song types of Short-toed Treecreepers.

Salpornis has similarly simple, high-pitched songs and calls, lending support to a close relationship with *Certhia* (see Systematics). Notably, however, it exhibits some geographical variation, eastern and southern African populations having a distinctly higher-pitched song than that of individuals in India and West Africa. This certainly suggests that more than one species is involved, but it is hard to conceive how Indian and West African Spotted Creepers could be more closely related to each other than either one is to the intervening East African population, unless those in East Africa were relatively recent arrivals from southern Africa.

Food and Feeding

All members of the genus *Certhia* appear to employ the same foraging techniques. They shuffle, mouse-like, on the trunks and larger boughs of trees, occasionally among the outer foliage, employing the fine bill to extract prey from cracks and crevices. The mode of progression as the bird climbs upwards is a hop, the feet moving together, with the legs held one on each side of the body, and the head and upper body directed upwards and towards the tree trunk, so that the head bobs after each hop. The tail serves



as a prop at all times, except for a moment during each hop or when foraging on limbs. The long, curved claws, long toes, short legs and long tail make *Certhia* species highly adapted to climbing in a head-up direction. Typically, treecreepers fly to the bottom of a tree, work upwards in jerky hops, spiralling around the trunk, and then fly to the bottom of another tree and repeat the process. Much less frequently, they may indulge in flycatching or hover-gleaning.

The diet of treecreepers appears to be similar for all species, although there is little relevant information on the Asian ones. The bulk of their food items comprises various small invertebrates, such as ants (Formicidae) and other insects and larvae, spiders (Araneae) and their eggs, and pseudoscorpions (Pseudoscorpiones), supplemented to a limited extent, especially in winter, with some small seeds and other vegetable matter. In the winter months, American Treecreepers will visit bird-feeders and take suet and seeds. Nestlings appear to be fed exclusively with insects. Food items are swallowed whole and immediately. There are no records of a certhiid using its feet to hold down prey items.

Inventories of prey items have been published for the European and American species, but these are probably little more than lists of what suitably sized prey happen to occur in their habitats. Should clear interspecific differences in diet be revealed, they are likely to reflect the shape and length of the bill and, hence, the precise foraging niche. Treecreepers select larger trees, which tend to have trunks with more deeply furrowed bark, resulting in higher densities of invertebrates. It has been hypothesized that they may be able to increase energy intake by foraging on one large tree, rather than on numerous small trees; in studies in the United States, for example, it was found that, in Douglas-fir (*Pseudotsuga*) forests in Washington, an American Treecreeper, in order to obtain the same number of spiders as are available on a single old-growth tree, would have to fly to 13 young trees or 3.3 mature trees. Similarly, standing dead wood may be favoured as a rich source of prey. Treecreepers prefer to forage on the lower parts of the trunk, where the bark is more furrowed and there are fewer branches.



Eurasian Treecreepers start the nest-building process by constructing a rough foundation from twigs, bark, lichen and grass. Both sexes share this task, which may take up to nine days. Subsequently, however, the female assumes sole responsibility for collecting and positioning softer materials to serve as a comfortable, cosy lining. She seeks out feathers, moss, animal hair, spider webs or wool, carrying what she finds to the nest cavity (the fissure below the bark flap at the top of the image). If the birds start breeding early enough, they may raise two broods, as is the case with about one-fifth of pairs; this is most frequent in the south and west of the species' range. Prior to formalizing their relationship, pair members determine their mutual suitability through ritualized courtship display flights. These start with one individual spiralling around a tree trunk, showing off its gleaming white underparts in the dingy forest surroundings. There follows a chase, the male pursuing the female up and down the tree. The process culminates in courtship feeding: the female flutters her wings and opens her gape as wide as a hungry fledgling, and the male responds by presenting her with a choice morsel that illustrates the richness of his home range.

[*Certhia familiaris britannica*, Hampshire, England. Photo: Mike Read]

As if courtship, nest-building, egg-laying, incubation and feeding nestlings were not demanding enough for avian parents, they must carry out such tasks without attracting the attention of predators. It is imperative for adults to arrive at and leave nest-sites as rapidly and silently as possible. This is feasible when the nest is hidden amidst foliage. A hole in a bare tree trunk is a different matter, however, so this **Sichuan Treecreeper** is making a speedy departure from its brood.

[*Certhia tianquanensis*,
Wawushan,
Sichuan, China.
Photos: Li liwei]



Treecreepers rarely, if ever, store food. An American Treecreeper was reported as caching small bits of sunflower seeds (*Helianthus*) in the bark of pines (*Pinus*), although retrieval of seeds was never observed.

In contrast to the *Certhia* treecreepers, the Spotted Creeper does not use its tail as a prop when foraging. In other respects, however, it is very similar to them, both in its diet and in its mode of foraging. It consumes insects and spiders, which it picks from the trunks and larger branches of trees. As with the treecreepers, it starts near the base of the trunk and works its way upwards, before moving to the base of the next tree. While climbing, it holds the tail away from the bark, in the manner more of a nuthatch, and it will also cling upside-down to branches.

Although they generally forage singly or in twos, treecreepers also frequently join mixed-species foraging flocks, together with tits, long-tailed tits, nuthatches, kinglets and firecrests (*Regulus*), Old World warblers (*Sylviidae*) and others. It is not clear whether individuals or pairs attach themselves to the flock as it moves through their winter territory or home range, leaving again as the flock moves on, or whether some treecreepers move with the flock, covering a much larger area or even becoming semi-nomadic.

Spotted Creepers, likewise, may form small flocks in winter in India, and in Africa they often join mixed-species foraging parties. Up to ten Spotted Creepers have been recorded in such flocks in Zimbabwe.

Breeding

Whereas information on the breeding behaviour and biology of the three north-temperate species of treecreeper is relatively good or almost complete, comparable data for the southern Asian species is very poor or non-existent. In the nineteenth and early twentieth centuries, the finding of nests and eggs was a favourite pastime for naturalists, but they seem to have been largely defeated by *Certhia* in the Himalayas; of the little information that there is from there, much comes from unreliable sources or is clouded by doubts over the birds' identification. Similarly, in the Americas, the first nest of the American Treecreeper was not discovered until as late as 1879. The breeding habits of the Spotted Creeper in Africa and India are moderately well known.

In broad terms, the breeding season of the Certhiidae in the Northern Hemisphere extends from about April to June or July. It can begin a little earlier, in March, in the western Palearctic Region and in Mexico, and in southern parts of Asia nesting starts in January or February in some areas. The Spotted Creeper breeds

in February–May in India, while in Africa its season begins in January in Ghana but not until August or September in countries south of the equator. In the southern tropics in Africa, this species often has two seasons; in southern DR Congo, for instance, it breeds in August–October and again in February–March.

Certhia species are territorial during the breeding season. The breeding pair occupies a home range, and the area around the nest is apparently defended as a nesting territory by the male, usually with song. During territory establishment, males sing frequently, both while stationary and while climbing, with the bill held wide open; they may change songposts at brief intervals. Intraspecific competition during the breeding season usually involves threat calls, and song-duels at close quarters on or near the territory boundaries, as well as chases and aerial fights. Once

The **American Treecreeper** usually lays five to six eggs, although as many as nine. As in other congeners, the female takes sole responsibility for incubating the clutch, the male feeding her during the 13–17 days that this lasts. After hatching, the chicks are brooded by the female, but fed by both parents, for 13–20 days until they fledge. Thereafter, the fledglings remain dependent on their parents for as much as a further 17 days, or possibly more.

[*Certhia americana*
americana,
Ithaca, New York, USA.
Photo: Marie Read]



the territory has been established, the male sings more briefly, from lower on tree trunks, while foraging. The amount of time spent in singing is probably proportional to the number of conspecifics in the immediate area. The Eurasian Treecreeper is perhaps more territorial than is the Short-toed Treecreeper. Territories of the latter have poorly defined and poorly defended boundaries and may overlap, and in certain areas they may overlap also with those of Eurasian Treecreepers, with little or no conflict between the two species. In addition, Eurasian Treecreepers that are mixed singers (see Voice) will defend the territory against both conspecifics and Short-toed Treecreepers.

Courtship rituals, both of Eurasian Treecreepers and of American Treecreepers, involve special display-flights. In these, the treecreeper spirals rapidly around a tree trunk, first descending and then flying upwards, with the white underparts made conspicuous. Partners also indulge in excited chases, the male in close pursuit of the female, in spirals up and down the trunks. After chases, one or both individuals may raise the wings and flutter them rapidly, this being followed by further chasing or by courtship feeding. Courtship feeding, which starts during the nest-building stage and continues until the eggs hatch, usually takes place outside the nest; the female wing-flutters and gapes like a begging juvenile, whereupon the male lands above her, turns sideways, and places the food in the female's throat.

The typical site for a treecreeper nest is the space between the trunk of a tree and a flap of loose bark, usually dead or dying, the opening generally being just large enough for the treecreeper to enter. Nests may be close to ground level or high in a tree, up

to 18 m above ground, presumably depending on the location of available sites, but they tend to be recorded from the lower part of this height range. Where such sites are not available, treecreepers may be forced to be more adventurous in the placement of the nest, and they will then utilize other cavities, such as knotholes and abandoned woodpecker excavations. In addition, Eurasian Treecreeper nests have been found on or in buildings or stone walls, occasionally hidden among or behind vegetation, especially ivy, in masses of dead leaves accumulated in trees, and, very rarely, on the ground. Similar alternatives, as well as the base of a raptor's nest or a squirrel (Sciuridae) drey, have been noted for Short-toed Treecreepers, and the American Treecreeper can add woodpecker holes in fence posts, the spaces behind loose wooden tiles on buildings and the hollow beneath a piece of tin on an outhouse roof. Of the south Asian species, reasonable data are available only for the Bar-tailed Treecreeper; this uses similar sites to those described above, but it has been noted also as building in the angle between the trunk and a branch and in crevices among exposed roots. All three northern treecreeper species will make use of specially designed nestboxes or artificial nest-flaps.

For the nest itself, Eurasian and Short-toed Treecreepers first build a foundation of coarse material, such as twigs, conifer needles, bark fibres, grass, moss, lichen and wood chips, this often being a large and untidy basic structure, filling the cavity. They then line this with finer material, such as feathers, hair, wool, spider webs, eggs and cocoons, and soft moss and lichen. The American Treecreeper constructs a similar nest, although the foundation



With broods of five to seven nestlings to feed, on average, adult **Short-toed Treecreepers** have their work cut out during the breeding season. Both sexes must forage actively during daylight hours to bring back sufficient numbers of insects and spiders to satisfy their young. The male probably does the bulk of the provisioning, as the female also has brooding responsibilities. The nestling period lasts 15–18 days, after which the fledglings are thought to disperse relatively quickly. Their parents, however, are caught in a race against time. Trying to cram two broods into the summer, the male may leave the female to feed the first brood by herself while he builds the foundation of a new nest. When the chicks are 10–12 days old, the pair members swap roles, the male feeding the chicks while the female puts the finishing touches to the nest. In particularly efficient pairs, the female may even lay a second clutch before her first brood have fledged.

[*Certhia brachydactyla dorotheae*, Troodos Mts, Cyprus. Photo: Michael Gore]

of twigs, bark chips and the like is often crescent-shaped, with the ends higher than the hammock-like base, this supporting a cup of finer bark shreds, fibres, moss and plant down, sometimes supplemented with hair or feathers. The division of labour in the task of nest-building appears to vary among the species. In the case of the Eurasian Treecreeper, both sexes build the base but only the female adds the lining, and both sexes of the Bar-tailed Treecreeper build the nest. With the Short-toed Treecreeper, however, the male usually builds two or three foundations and the female selects one for completion, while it is the female of the American Treecreeper that builds, although the male may bring materials to the site.

All species of *Certhia* for which the relevant information is available lay eggs that are white, finely but variably marked with shades of reddish-brown, the markings frequently concentrated at the broader end, where they often form a ring or cap. With average dimensions of 15.5×12.1 mm, the eggs of the westernmost subspecies *britannica* of the Eurasian Treecreeper are typical in size. The American, Eurasian and Short-toed Treecreepers have a clutch size normally of five or six eggs; although clutches of up to nine eggs have been recorded for all three, one may speculate that these are the result of more than one female having laid in the same nest. The Bar-tailed Treecreeper, similarly, lays 4–6 eggs, but smaller clutches, containing an average of around 3–5 eggs, have been recorded for Eurasian Treecreepers in Japan and, as would be expected, a clutch size of 3–4 is recorded for the southernmost species, the Manipur Treecreeper.

For all species for which the data exist, only the female incubates; she is fed on the nest by the male. Incubation appears to

begin after the last egg is laid, and it lasts for around 15 days. Upon hatching, the nestlings are altricial, being mostly naked and helpless, with the eyes closed. Those of the American Treecreeper, for example, are entirely naked except for long, dark grey down on the head arranged in rows above both eyes and across the occipital region. Nestling treecreepers are fed by both sexes, although brooded only by the female. They leave the nest after 14–21 days and remain more or less dependent on the parents for 11–17 days afterwards.

Approximately 20% of Eurasian Treecreeper pairs are double-brooded, especially in the south and west of the range. Temporal overlap between broods is not unusual, the male building a new nest and the female even laying the second clutch while still feeding the first brood. Serial polygyny has occasionally been recorded for this species; in such cases, the male mates with a second female and feeds her young, rather than, or in addition to, provisioning the young of the primary female. Short-toed Treecreepers are usually double-brooded, and again there may be overlap in timing, the male starting a new nest while the female is still feeding the first-brood chicks. When the nestlings are 10–12 days old, the male takes over the duty of feeding them while the female completes the second nest; she sometimes lays the second clutch before the young from the first brood have fledged. Short-toed Treecreepers appear to be occasionally polygynous, and simultaneous bigamy has been recorded. In one case, two females of this species were found to be incubating eggs and feeding young at the same time in the same nestbox. In contrast, the American Treecreeper is single-brooded, but it will

This adult Short-toed Treecreeper appears to have reached the stage in the breeding cycle where its duties overlap, as it returns to the nest-site its bill crammed with both nesting material and insect larvae. Individuals may have to combine provisioning responsibilities towards a first brood with the establishment of a new nest-site in which to house a second brood. In more northerly latitudes, however, the norm is for pairs to raise just a single brood each year, probably because the breeding season is perforce more limited, with suitable conditions prevailing over a shorter period of time.

[*Certhia brachydactyla*
brachydactyla,
near Znojmo,
south Moravia,
Czech Republic.
Photo: Zdenek Tunka/
Ardea]





American Treecreepers, however, individuals breeding in more northerly areas move southwards in winter. With Eurasian Treecreepers, numbers involved and distances covered vary in an irregular pattern, although this species is possibly only a summer visitor in the northernmost parts of its range, implying regular movements there. Post-breeding dispersal takes place in the period from mid-September to mid-November, some being in a northward direction, with return movements between mid-March and early May. There is an old record of about 60 Eurasian Treecreepers being seen together on migration.

The American Treecreeper is perhaps a more regular migrant. Although some remain all year as far north as southern Alaska and southern Canada, there is a partial withdrawal from the north of the range and from higher altitudes; some northern breeders winter irregularly south throughout the eastern United States to Florida, the Gulf Coast, Texas and Arizona, and in northern Mexico. Migrants penetrate south of the breeding range from late August onwards, the main passage period extending from September to mid-November. Return passage northwards takes place between March and mid-May, most individuals having left southern areas by the early to middle part of April. The migration of the American Treecreeper is reported as being both nocturnal and diurnal, but the species is apparently very reluctant to undertake water crossings. On passage, this species sometimes occurs in small, loose monospecific flocks, rarely of up to 30 individuals.

The habits of certhiids in southern Asia are less well known, but all of the species are partial altitudinal migrants, moving downslope in the winter months. This post-breeding descent and pre-breeding ascent are perhaps made only in direct response to weather conditions, but the Bar-tailed Treecreeper is an exception, as it regularly disperses from its Himalayan and Central Asian breeding grounds to the plains of northern Pakistan and northern India.

Salpornis, the Spotted Creeper, is resident, although presumably undertaking some post-breeding dispersal. In Africa, however, this species is so poorly known that it is not clear whether records of supposed vagrants represent genuine wanderers or merely dispersal from undocumented local breeding populations.

lay replacement clutches after loss of the first one, and the general pattern may be that *Certhia* taxa breeding in more boreal habitats at higher latitudes or altitudes are single-brooded, as the period of time available for breeding is short, while those in more temperate environments are double-brooded. There is so little information on the southern Asian species that it is not clear how they fit into this pattern, but the Bar-tailed Treecreeper, which breeds in open coniferous forest and edge at medium and high elevations, is reported to be single-brooded.

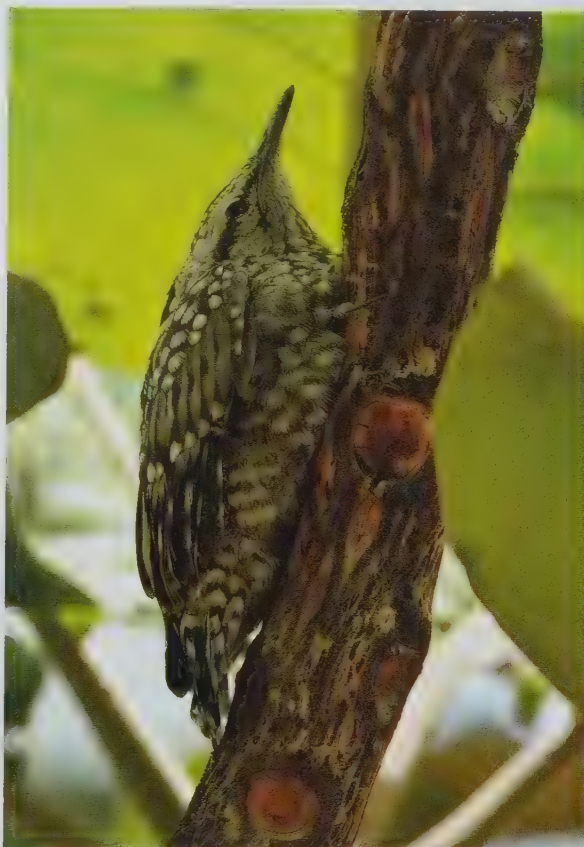
The Spotted Creeper differs little from the *Certhia* species in breeding biology, but with three important exceptions, those of nest-site, nest structure and egg colour. It places its nest in the open, in a tree fork, rather than in a concealed cavity site, although there is an echo of this in accounts for the Bar-tailed Treecreeper indicating that the latter occasionally uses more open nest-sites. The nest itself is a neat cup, superbly camouflaged and extremely hard to find. Rather than being white, the eggs of Spotted Creepers in India have a ground colour of pale grey or greenish-grey and those of African populations a pale turquoise-blue, bluish-green or pale green ground, in both cases with grey or lavender undermarkings and brownish speckles and spots. Measuring about 19×13 mm on average, they are a little larger than the eggs of *Certhia*. The clutch size of the Spotted Creeper is comparatively small, at 1–3 eggs.

Movements

Where climate allows, treecreepers are rather strictly resident. Thus, for most Eurasian Treecreepers ringed in Britain, recoveries involve movements of less than 20 km and, for the Short-toed Treecreeper, a species the entire range of which lies within the temperate zone, there are few ringing recoveries beyond 10 km from the original site. In the case of both the Eurasian and the

The early days of the life of a juvenile Eurasian Treecreeper follow a pattern similar to that of its congeners. Nestlings are fed by both of their parents for their first 15–17 days on average before fledging, although this period may stretch to 23 days if they are being fed solely by the female because the male is busily constructing a new nest in preparation for a second breeding attempt. Once fledged, the young treecreepers continue to be fed by one or more parents for the first week, at which point they begin to test out their own foraging skills. After a further week, the juveniles are independent and join mixed-species feeding flocks moving through and beyond their parents' home range. Adult Eurasian Treecreepers are predominantly monogamous, although there is evidence of serial polygyny, some males mating with two females and seeking to raise two broods.

[*Certhia familiaris macrodactyla*, Lombardy, Italy. Photo: Pierandrea Brichetti]



The buff tips to the greater coverts, the scaled effect on the throat and upper breast, the short tail and short bill with a pale gape line age this Spotted Creeper as a young juvenile. Despite this species being widespread and better known than some of the Asian treecreepers, no data exist on the duration of incubation, nesting or fledging periods. What is known, however, is that only females incubate the eggs, but that both parents brood and feed the chicks. When this juvenile Spotted Creeper is fully independent, it may join congeners for the non-breeding season, or even team up with wide-ranging mixed-species foraging flocks.

[*Salpornis spilonotus emini*, Ngaoundaba, Cameroon. Photo: Ketil Knudsen]

As they are dependent on forest and woodland, and forage most effectively in old-growth forests, all certhiids are potentially at risk from anthropogenic deforestation. To date, however, no species is globally threatened with extinction. The **Sichuan Treecreeper** is Near-threatened, with fewer than 1000 birds estimated to remain within a range of under 20,000 km² in south-central China, where there has already been extensive deforestation. Even within this relatively small area, the species appears to be restricted to old-growth Emei fir forest in a narrow altitudinal band of 2500–2800 m. The only significant subpopulation occurs on the table mountain of Wawu Shan, a site now under pressure from tourism. This combination of restricted range, low population and new threats suggests that the species might perhaps require reclassification as threatened.

[*Certhia tianquanensis*,
Longxi-Hongkou National
Nature Reserve,
Dujiangyan, Sichuan,
China.

Photo: Dong Lei]



Relationship with Man

No relevant information.

Status and Conservation

Of the ten members of the family, none is considered to be globally threatened. The least secure is the Sichuan Treecreeper, which is listed as Near-threatened; indeed, until recently it was classed as Vulnerable. It has a very small theoretical population based upon a hypothetical range of 19,690 km², within which considerable deforestation has taken place. The Sichuan Treecreeper appears to be a relict species, and so far as is known it breeds only in open stands of old-growth Emei fir at elevations of about 2500–2800 m. Even at these high levels, intensive logging of primary conifer forests in the twentieth century considerably reduced the amount of suitable habitat available to this species. The only significant population known is on Wawu Shan, where forest covers the plateau at the top of a table mountain, the steep slopes of which, combined with an absence of roads, have to date made access by loggers impractical. Worryingly, however, the area has recently been opened up for tourism and development by the construction of a cable-car railway. The global population of the Sichuan Treecreeper is estimated at fewer than 1000 individuals.

All certhiid species are dependent on forest, with optimal conditions for all species likely to be old-growth forest with abundant large trees and standing dead wood. Throughout the ranges of all of the family's species, such forests have declined sharply in extent in historical times, and certhiid populations must be significantly smaller than the habitat's carrying capacity was before the arrival of modern man. In addition, there have been substantial reductions in forest cover in the Americas over the last

200 years, and in the Himalayas and western China even more recently. Both *Certhia* and *Salpornis* are hard to locate and observe, and in Asia and Africa are very poorly known, so that any marked downward trends in their populations would probably go undetected.

More insidiously, habitat fragmentation and degradation have diminished the suitability of the remaining forests for certhiids and many other species. Such forestry practices as thinning, selective felling and the removal of standing dead wood all have the effect of reducing the suitability of the habitat. In western North America, as an example, immature and mature second-growth forests, even 100-year-old stands, often do not provide the appropriate structural characteristics for American Treecreepers and are less suitable habitats for this species than are old-growth forests.

Certhia species are vulnerable to the effects of adverse weather. In Britain, for instance, the Eurasian Treecreeper suffers significant winter mortality when wet snow or rain is followed by hard frosts, resulting in trees becoming glazed with ice, which the birds cannot penetrate. Such conditions are much more likely where the trees are scattered than when they are part of a dense, closed-canopy forest, again suggesting that the former is a suboptimal habitat.

General Bibliography

Ali & Ripley (1983), Alström *et al.* (2006), Berndt (1984c), Bock (1994), Carrascal *et al.* (2001), Cramp & Perrins (1993), Dickinson (2003), Dickinson *et al.* (2006b), Ferguson-Lees (1985), Fry *et al.* (2000), Greenway (1967b), Haffer (1993c), Harrap & Quinn (1996), Hejl *et al.* (2002), Jönsson & Fjeldså (2006a), Manegold (2008), Martens & Tietze (2006), Rasmussen & Anderton (2005b), Sheldon & Gill (1996), Sibley (1996), Sibley & Ahlquist (1990), Sibley & Monroe (1990, 1993), Stuart Baker (1922), Suhonen & Kuitunen (1991), Thielke (1973), Tietze (2007), Tietze & Martens (2008), Tietze *et al.* (2006), Vaurie (1957c, 1959).



(from mid-Aug in "irruption" years), with return movements mid-Mar to early May; local resident populations tend to mask presence of such migrants, but wanderers of N nominate race have reached e.g. Britain, Netherlands, Denmark, W Germany, SE Russia (including Saratov), Caspian Sea and Sea of Azov. Apparently reluctant to undertake water crossings, however, and little evidence of immigration in Britain apart from few records of vagrant nominate race; vagrants recorded Balearic Is (Mallorca), Channel Is and Faeroe Is. Also some post-breeding dispersal in N direction, and has reached Russian Lapland and White Sea. In E of range, recorded in winter in outliers of Greater Khingan Range in Mongolia, and an uncommon passage migrant and winter visitor in Korea; in NE China away from breeding areas, a few occur at Beidaihe (coastal Hebei) in late autumn and recorded Feb–Mar in Qingdao (Shandong). In addition, upland populations may undertake some altitudinal movements, e.g. in Japan, Tien Shan, W Ukraine, Caucasus and Hungary. **Status and Conservation.** Not globally threatened. Fairly common in general, but unobtrusive; uncommon to rare in many areas towards N & S extremes. Densities much lower in N of range than in S, e.g. 0.04–0.5 pairs/10 ha in Finland compared with 0.25–3.43 pairs/10 ha in Germany and 1.6–8 pairs/10 ha in Corsica. European populations either stable or exhibiting declines as a result of habitat fragmentation and loss of older-growth woodland. Susceptible to effects of hard winters, especially extended periods of glazed frost or freezing rain; N & E populations tend to fluctuate in irregular pattern, possibly tied to variations in crop of spruce seeds. **Bibliography.** Adamian & Klem (1999), Aho (1997), Aho *et al.* (1997), Brazil (1991), Cheng Tsohsin (1987), Cramp & Perrins (1993), Dementiev *et al.* (1954a, 1970), Enemar (1997), Enemar & Nilsson (2008), Etchécopar & Hùe (1983), du Feu (2002), Gorman (1996), Hafler (1993d), Hagemeijer & Blair (1997), Handrinos & Akriotis (1997), Harrap & Quinn (1996), Hirschfeld (1984), Jouard (1930b), Kren (2000), Martens & Geduldig (1988), Martens & Tietze (2006), Matsuoika (2007), McCarthy (2006), Mead (1975), Morioka (1994), Müller (2001), Norberg (1979), Osiejuk (1998), Osiejuk & Kuczyński (2000), Patrikeev (2004), Portenko & Stübs (1977), Raja *et al.* (1999), Rogacheva (1992), Roselaar (1995), Schickendanz (1978), Schönfeld (2003, 2006b), Sora (1997), Stepanyan (2003), Stresmann (1919a), Suhonen & Kuitunen (1991), Sultana & Khan (2000), Suorsa & Hakkarainen (2007), Suorsa, Helle, Huhta *et al.* (2003), Suorsa, Helle, Koivunen *et al.* (2004), Thibault & Bonaccorsi (1999), Thielcke (1961, 1962, 1986), Tietze (2007), Tietze *et al.* (2006), Tomek (2002), Vaurie (1957, 1959).

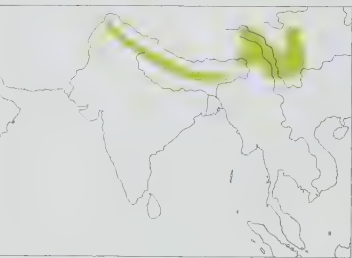
2. Hodgson’s Treecreeper
Certhia hodgsoni

French: Grimpereau de Hodgson German: Kaschmirbaumläufer Spanish: Agateador de Hodgson

Taxonomy. *Certhia familiaris hodgsoni* W. E. Brooks, 1871, Kashmir. Formerly treated as conspecific with *C. familiaris*, but differs genetically and vocally. Geographical variation marked: nominate race and *mandellii*, as well as differing morphologically, exhibit significant genetic differences (based on studies of cytochrome *b*), and their ranges abut in Himalayas of N India with no evidence of intergradation; they may each merit species status. Races *mandellii* and *khamensis* are much more similar to each other morphologically, but show significant, albeit smaller, difference in cytochrome *b*. Birds from the Kwanhsien region of Sichuan (China) having dull grey underparts described as race *kwanhsienensis*, which possibly worthy of recognition. Three subspecies currently recognized.

Subspecies and Distribution.

C. h. hodgsoni W. E. Brooks, 1871 – W Himalayas in Pakistan (Hazara, Indus Kohistan and Gilgit), Kashmir and NW India (E to Lahul, in Himachal Pradesh).
C. h. mandellii W. E. Brooks, 1874 – C Himalayas of N India from Himachal Pradesh (E from Kulu) E, including Nepal and Bhutan, to extreme W Arunachal Pradesh (Tawang).
C. h. khamensis Bianchi, 1903 – S China from S Gansu (S flanks of Qin Ling) S to S & SE Xizang, W Sichuan and Yunnan (Lijiang range and Nu Shan), and presumably NE India (in Pachakshiri region of Arunachal Pradesh); one Jun record from NE Myanmar (Adung valley).



Descriptive notes. 11–12 cm; 7.6–12 g. Nominate race in fresh plumage has crown and nape dull brown, feathers fringed black with narrow whitish shaft streaks, lores blackish, long white supercilium from base of upper mandible to nape (may be indistinct over lores); cheek and ear-coverts mottled black, white and rufous-brown; mantle and scapulars as crown but with large whitish feather centres (imparting spotted appearance), back, rump and uppertail-coverts cinnamon-orange with vague paler shaft streaks; upperwing-coverts dark brown, lessers with broad rufous-buff centres and darker tips, medians tipped whitish and broadly fringed rufous-buff, greater broadly tipped off-white on outer web and fringed rufous-buff at base (may have fine white shaft streaks); alula dark brown, broadly tipped off-white, primary coverts dark brown, tipped buff on outer web; inner webs of tertials pale grey-brown, outer webs brown, becoming black towards tip, fringed and broadly tipped pale buff; primaries and secondaries medium brown, all of these except outer three primaries with broad buff band across feather (only on outer web on P4, primaries numbered ascendently), bordered on each side by black-brown band, fringed pale buff distally of these bands and broadly tipped off-white (fringes and tips less distinct on outer primaries); tail feathers pale brown, darker adjacent to shaft, shafts pale buff; side of neck to throat and underparts off-white, washed dull buff on rear flanks, belly and vent, undertail-coverts pale buff, tipped white; in worn plumage (from about spring onwards) dark feather fringes above abraded, pale streaks on crown and nape better defined, and upperparts slightly colder; iris brown; upper mandible horn-brown, lower mandible pinkish-flesh; legs horn-brown. Distinguished from *C. familiaris* mainly by duller, less rufous upperside, from *C. himalayana* by plain unbarred tail, and from *C. discolor* by white throat and breast; from more similar *C. nipalensis* mainly by rather uniformly pale underparts lacking extensive and contrasting cinnamon on flanks and vent. Sexes similar. Juvenile is as adult but shorter-billed, duller overall, with underparts indistinctly and finely spotted darker. Race *mandellii* is darker and more rufous than nominate, upperpart feathers sooty black with smaller, darker and more richly coloured cinnamon-buff centres (thus appearing less spotted), supercilium tinged buff, rump rather darker and richer cinnamon-orange, and lower underparts darker buff; *khamensis* is poorly marked, similar to previous but on average slightly paler above, with paler and less rufous feather centres (especially on lower mantle and scapulars), rear flanks, vent and undertail-coverts slightly colder and greyer. VOICE. Calls include "tsree" note, sometimes doubled, and "tsree-seee tsree-seee". Song 2–3 high-pitched, sibilant "tsree" notes followed by several rapidly falling notes and then a terminal flourish that is usually lower-pitched, similar in basic structure to song of *C. familiaris* although a little shorter; little geographical variation, although song of nominate race perhaps on average shorter and less complex.

Habitat. Breeds in high-altitude coniferous woodland, often with mixture of rhododendrons (*Rhododendron*), birch (*Betula*) or occasionally oak (*Quercus*), sometimes in pure birch forest. In winter may descend into mixed oak–rhododendron woodland. In Pakistan found in summer above 3000 m; in Kashmir and NW India, from 3000 m to at least 3660 m, descending in autumn and winter to 2135 m, and in Uttarakhand Pradesh (N India) recorded at 2590–3960 m; in Nepal 2800–4200 m and recorded in winter at 2000–3800 m; in Sikkim and Darjeeling generally at 2440–3660 m, sometimes to 4115 m, and in winter down to c. 1675 m; in Bhutan 1800–4000 m (sometimes 1600–4200 m) in summer and mostly below 3200 m in winter; in Myanmar recorded at 3960 m in Jun. In China, found in SE Xizang at 2925–4115 m in summer, down to 2285 m in winter, in Sichuan breeds c. 2900–3960 m, moving down to 1600 m in winter (although at 2440–3050 m throughout winter at Wolong), and in Yunnan recorded from 2745 m to at least 3660 m and in winter still found above 3050 m.

Food and Feeding. Food small arthropods. Forages on trees in typical treecreeper manner, work upwards in jerky hops, spiralling around trunk, then flies to bottom of another tree and repeats process; recorded as foraging also on moss-covered rocks. Will join mixed-species flocks.

Breeding. Poorly known; few nests found, and older data in the literature unreliable owing to nomenclatural confusion and possibility of misidentification. One nest found on 4th May, in Nepal, had bottom lined with rhododendron bark, above this pieces of rotten wood, feathers and hair, was 50 cm above ground in hole in rhododendron; clutch 4 eggs.

Movement. Resident, but some altitudinal movements.

Status and Conservation. Not globally threatened. In Himalayas, rare and erratic in Pakistan and apparently very rare in Kashmir, but not uncommon from Uttarakhand E to Bhutan. The commonest treecreeper in SE Xizang, but rather uncommon in adjacent parts of China. In Pakistan, report of breeding in Murree Hills considered dubious.

Bibliography. Ali & Ripley (1983), Cheng Tsohsin (1987), Cheng Tsohsin *et al.* (1983), Etchécopar & Hùe (1983), Harrap & Quinn (1996), Martens & Eck (1995), Martens & Tietze (2006), Rasmussen & Anderton (2005b), Roberts (1992), Robson (2000b), Spierenburg (2005), Tietze (2007), Vaurie (1957, 1959).

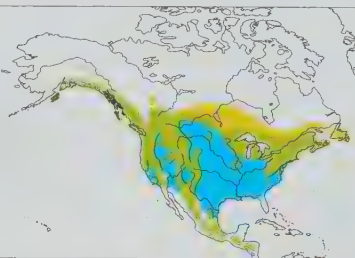
3. American Treecreeper
Certhia americana

French: Grimpereau brun German: Andenbaumläufer Spanish: Agateador Americano
Other common names: American Creeper, Brown Creeper

Taxonomy. *Certhia americana* Bonaparte, 1838, eastern and northern parts of North America. Formerly treated as conspecific with *C. familiaris*, but differs genetically and vocally; recent genetic evidence (cytochrome *b*) indicates that its closest relative is *C. brachydactyla*. Geographical variation slight and largely clinal, races intergrading where they meet, e.g. those breeding NE USA E from about SE Minnesota and S to N Virginia and Maryland are intermediate between nominate race and *nigrescens* (for convenience, included within former); on other hand, marked difference between N birds and Mexican ones. "Brown morph" of nominate race in Newfoundland described as a separate race (*anticostiensis*). In S Mexico, proposed races *jalisensis* (described from S Jalisco), *guerrerensis* (from Guerrero) and *molinensis* (from Oaxaca) all synonymized with *alticola*. Thirteen subspecies recognized.

Subspecies and Distribution.

C. a. alascensis Webster, 1886 – SC Alaska (S at least from Mt McKinley and E from Kodiak I); non-breeding also WC USA (Idaho S to SE Arizona and SW New Mexico, E to NW Arkansas).
C. a. occidentalis Ridgway, 1882 – Pacific coast from SE Alaska S in W USA to NC California, E to coastal slopes of Coast Range in Alaska and British Columbia and W slope of Cascades in Washington and Oregon; non-breeding also occasionally E to CS British Columbia and in WC California.
C. a. stewarti Webster, 1886 – Queen Charlotte Is (possibly also N Vancouver I), off British Columbia.
C. a. zelotes Osgood, 1901 – E slope of Cascades from S Oregon S through Sierra Nevada to mountains of N, E & S California and E to Nevada; non-breeding also Arizona and New Mexico.
C. a. phillipsi Unitt & Rea, 1997 – outer Coast Ranges of C California (from San Francisco S to San Luis Obispo County).
C. a. montana Ridgway, 1882 – breeds interior SW Canada (E from E flanks of Coast Range in British Columbia, N Alberta) and in WC USA from Cascades of Washington and C Oregon E to CN Idaho, NW Montana and W South Dakota and S to S Arizona and extreme W Texas (Guadalupe Mts); non-breeding also W to Pacific coast, E to Wisconsin and Louisiana, and S to N Mexico (N Coahuila).
C. a. leucosticta van Rossem, 1931 – mountains of S Nevada and WC Utah.
C. a. americana Bonaparte, 1838 – breeds S Canada from C Saskatchewan and C & S Manitoba E to S Quebec (including Anticosti I and Brion I), New Brunswick, Nova Scotia, Newfoundland and Prince Edward I, also NE USA S to Wisconsin, NE Ohio, E West Virginia and N Virginia; non-breeding mainly USA (E from Colorado, S to Texas and Florida) and NE Mexico (S to SE Coahuila).
C. a. nigrescens Burleigh, 1935 – Great Smoky Mts (E Tennessee and North Carolina), in E USA.
C. a. albescens Berlepsch, 1888 – mountains of SW USA (SE Arizona and SW New Mexico) and NW Mexico (S in Sierra Madre Occidental to NE Nayarit, NW Jalisco and W Zacatecas).
C. a. alticola G. S. Miller, 1895 – Mexico in Sierra Madre Oriental (S from Coahuila, W Nuevo Leon and Tamaulipas) and Sierra Madre del Sur (Jalisco E to Oaxaca).
C. a. pernix Griscom, 1935 – S Mexico (C Chiapas) E to Guatemala (to Volcán de Fuego).
C. a. extima W. deW. Miller & Griscom, 1925 – E Guatemala (Sierra de las Minas), Honduras and NC Nicaragua (S at least to San Rafael del Norte).



Descriptive notes. 12–13.5 cm; 8–9.9 g, autumn migrants in E USA (New Jersey) 6.5–9.8 g. Many races occur in two morphs, one basically brown (commonest in Maritime Provinces, and dominant in Newfoundland) and the other greyer. Nominat race in fresh plumage (autumn) has crown and nape medium brown, feathers with whitish shaft streaks and darker brown fringes, lores and upper ear-coverts dark brown, cheek and lower ear-coverts mottled pale grey and dark brown, supercilium off-white (buffy in brown morph); mantle and scapulars similar to crown but centres light grey and much larger, with darker fringes relatively small (brown morph has feathers of mantle and scapulars warmer, more gingerly brown, with reduced dark brown fringes); back, rump and uppertail-coverts cinnamon-orange, faint whiter shaft streaks and whiter feather bases; lesser upperwing-coverts brown-buff with large white centres and

darker fringes, median and greater coverts dark brown, medians with pale buff shaft and tip, greater with outer web tipped and fringed off-white (fringes broader and whiter on inner feathers); alula dark brown, tipped whitish, primary coverts dark brown with fine pale buff-white tip on outer webs; tertials light grey-brown, outer webs becoming dark brown towards tip, broadly tipped and fringed off-white on distal half; primaries and secondaries medium to dark brown (primaries slightly paler at extreme base), all of these except outer four primaries with broad buff-white band across feather near base, broad buff-white slot subterminally on outer web and small white tip on outer web; tail medium grey-brown, feathers darker along shaft, shafts buffy; side of neck off-white, throat and underparts white, breast washed pale grey, flanks, belly, vent and thighs washed pale drab buff, undertail-coverts washed buff and tipped white; in worn plumage (Apr–Aug) darker fringes and, especially, tips of upperpart feathers abraded and pale centres reach tips, producing more streaked (less spotted) effect, underparts slightly duller; iris brown; bill black to dark grey, basal part of lower mandible dull pale yellow or pale flesh; legs dark brown to flesh. Sexes similar. Juvenile is as adult but relatively buffer, with larger buff spots on upperparts (especially noticeable on crown), faint dark spotting on throat and scaling on breast, sometimes buffy fringes on upperwing-coverts. Races vary rather little, nominate bill relatively short and wing relatively long, upperparts moderately brown to greyish-brown (virtually dimorphic in upperpart coloration): *nigrescens* has upperparts rustier than nominate, pale streaks more brown-tinged than in other races (except Middle American and Pacific coast ones); *montana* is essentially dimorphic, grey morph has whitish supercilium, white streaks on crown sparse and narrow, brown morph slightly darker than dark-morph nominate, with reduced reddish-brown tones, pale streaks better defined and greyer, rump duller, reduced buff on flanks, rarely slight buff wash on breast, undertail-coverts dull pale buff to buffy grey (rarely, more orange-buff, this colour extending to flanks), bill long; *alascensis* is paler and greyer above than previous, with white streaks broader and more numerous, especially on crown, bill shorter; *occidentalis* has upperparts rather buffer and browner than *montana*, especially the pale streaks (although slightly darker than brown-morph nominate), also much browner than previous, and bill longer, breast washed buff, undertail-coverts orange-buff and this usually extending to flanks; *stewarti* resembles last, but upperparts brighter orange (most orange of all races); *zelotes* has upperparts browner than *montana* and darker, duller and more reddish-brown (less orange-brown) than *occidentalis*, streaks pale smoke-grey, rump duller dark reddish-tawny, may be slightly washed buff on breast, orange-buff on undertail-coverts and often extending to flanks; *leucosticta* is whitest below of all races; *phillipsi* has chin white, underparts greyish-brown, crown narrowly streaked deep buff, back streaked whitish (shafts and at tips of feathers) and smoke-grey, rump golden-cinnamon; *albescens* is very dark above with well-defined narrow whitish streaks (blackest dorsally of all races, with streaks whitest), very contrasting rump (darker and more chestnut than in N races), breast and belly light grey with slight drab wash, undertail-coverts light drab buff; *alticola* is as previous, but upperparts browner (less black), pale streaks washed drab olive, rump paler, more orange and less rufous, underparts less grey, more drab or buffy, especially undertail-coverts; *pernigra* differs from previous in having upperparts darker brown with narrower and more cinnamon-brown pale streaks; *extima* is as last, but crown and upperparts slightly less brownish, more black, with slightly broader and whiter streaks, rump darker (more rufous, less orange), underparts paler and purer grey, bill longer. VOICE. Calls include soft but penetrating, high-pitched, drawn-out, sibilant “seee” or “trsee”, a pure, tinkling or bell-like “ti” or “tyt” and an incisive “tsit”, sometimes repeated; flight call a brief “chip” or “sit”; fledged juvenile gives high, sibilant “tssssi” or “ts-tssi” location call, and when begging “chee”. Song, by male only, from prominent songpost in early spring, more sporadically once territories established, ceasing once young fledged, a short, weak warble (audible to 120 m) comprising 4–8 thin, high-pitched and sometimes sibilant whistled notes, often introduced by “tsree”, e.g. “tsce-tuti-sedu-wee” or “tsce-trrrr-sit-tu-tee” (or in California “tsce, sisi’suisi”), phrase 1–2 seconds in average duration, and repeated several times; each male gives stereotyped song, although some variation, with odd notes (especially terminal note) dropped or units slurred, and some birds string together standard phrase two or three times to make very long song. Also some geographical variation, with distinct regional dialects, in California “N song” is introduced with buzzing note while “S songs” terminate in a buzz (and isolated population on Angel I, in San Francisco Bay, gives song of simpler structure but greater individual variability).

Habitat. Primarily late successional stages of coniferous or mixed woodland, preferring extensive areas of mature old-growth, especially dense, well-shaded stands with abundance of large dead or dying trees for nesting and large live trees for foraging. In boreal zone of Canada and Rocky Mts typically in coniferous forest with mixture of aspen (*Populus*) and birch (*Betula*); farther S and at lower altitudes in NE USA and on W coast will use deciduous forest, favouring riparian woodland and wet areas such as forested floodplains, swamps and bogs, often with large dead trees, while in SW USA often in ponderosa pine (*Pinus ponderosa*). In Mexico and Central America breeds in moister stands of pine-oak (*Pinus-Quercus*) and pine-oak-fir (*Pinus-Quercus-Abies*) forests, but in Oaxaca (at least) absent from drier pine-oak stands. In autumn and winter found in wider variety of wooded habitats, more regularly including deciduous woodland, also riparian cottonwoods (*Populus*), scrub, well-wooded suburban areas, woodlots, parks and cemeteries. Altitudinal ranges generally follow conifer forest zones. In N and on Pacific coast breeds from sea-level to tree-line, e.g. to 2070 m in Washington, to 2440 m (sometimes 3050 m) in California, at least 2745 m in Idaho, to 3500 m in Colorado; in S mainly at higher altitudes, e.g. in North Carolina at 1370 m, in E Tennessee generally above 1200 m, in SW Texas 2440–2590 m, in Arizona 1980 m, in New Mexico 2135–3355 m (dispersing upwards to 3660 m); in Mexico occurs at 1525–3050 m in Chihuahua, above 1525 m in Sinaloa, to 3960 m in Jalisco, 1900–3000 m or higher in Oaxaca, and from at least 2225 m to 3900 m in Chiapas; 1550–3350 m in Guatemala.

Food and Feeding. Variety of small (less than 3 mm) insects and larvae, spiders (Araneae) and their eggs, and pseudoscorpions (Pseudoscorpiones); in winter may take small amount of seeds and other vegetable matter, and will visit bird-feeders for chopped peanuts, seeds and suet. Nestling diet appears to be solely insects. Forages mouse-like almost exclusively on trunks and larger branches of trees and stubs, delicately picking items from cracks and crevices in bark with its fine bill. Usual method of progression is to work upwards in jerky hops, spiralling around trunk, and then fly to bottom of another tree and repeat the process. Rarely feeds on the ground or on fallen logs, and exceptionally will even forage on walls; occasionally flycatches. May join mixed-species foraging flocks.

Breeding. Season in most of range May–Jul, although may begin in Apr, especially in S & W USA; from Mar in S Mexico; single-brooded. Nest built by female, male may bring materials, construction work taking 6–30 days, foundation of twigs and wood and bark chips, sometimes bound with spider webs and egg cases, supporting cup of finer bark shreds, wood fibres, moss, plant down and sometimes hair or feathers (base often crescent-shaped, with ends higher than cup), 0.6–22.5 m above ground and usually well concealed between trunk and a loose flap of bark on large tree or stump, usually dead or dying (both deciduous and coniferous trees utilized); rarely, placed in natural cavity such as knothole or abandoned woodpecker (Picidae) excavation, even in fence post, and exceptionally behind loose shingles on building, or under piece of tin on outhouse roof; specially designed artificial nest-sites also accepted. Clutch 1–9 eggs, usually 5–6, white, variably but usually sparsely spotted reddish-brown, larger markings sometimes concen-

trated at larger end, average size 15.4 × 11.7 mm (nominate race), replacement laid if first clutch lost; incubation by female, fed at nest by male, period 13–17 days; female also broods chicks, which are fed by both parents, nestling period 13–20 days; fledglings remain with, and dependent on, adults for up to at least 17 days.

Movement. Resident and migratory. Present all year as far N as coast of S Alaska, S Canada (regular E British Columbia, C Alberta, SC Saskatchewan and Manitoba) and coasts of Maritime Provinces, but partial post-breeding withdrawal from N of range, and most E & N populations appear to be strongly migratory. Centre of gravity of population shifts S in winter, thus uncommon in winter in SE Canada (Ontario, Quebec) and NE USA (the Dakotas E to Maine, New Hampshire and Rhode Island), and rare in winter in Saskatchewan, Manitoba and Newfoundland. Common on passage in Ontario, Minnesota, Iowa, Missouri, Wisconsin, Michigan, Illinois, Indiana and E to Massachusetts and New Jersey, and fairly common Rhode Island. Immature ringed in Port Huron (Michigan) on 4th Oct recaptured 10 days later 442 km to W in Wisconsin; other long-distance movements include Ontario to North Carolina (877 km), Quebec to New Jersey (695 km), Massachusetts to New Jersey (423 km), Wisconsin to Arkansas (1262 km), Ohio to Virginia (522 km). Some N birds winter irregularly S throughout E USA to C Florida (and rarely to S Florida), Gulf Coast, Texas, and NE Mexico (Coahuila and C Nuevo Leon, casually to C Tamaulipas). Farther S, some populations migrate latitudinally or altitudinally, and S races appear to be sedentary or local migrants. In W, uncommon winter visitor to riverine woodland in S Arizona (especially around Camp Verde and Tucson, rarely W to lower R Colorado); also occasional records from NW Sonora and casually to C Sonora. In S California a rare autumn and winter visitor to coastal lowlands and Channel Is, also rare in desert (primarily in autumn). Migrants penetrate S of breeding range from late Aug onwards, main passage period Sept to mid-Nov; does not usually occur in moderate numbers until mid-Sept in NE and Oct–Nov in Florida, Gulf States, Texas and Arizona. Return passage N Mar to mid-May, most birds having left S areas by mid-Apr and NE by May. In Mexico extreme dates for N migrants are 9th Nov and 18th Apr. Vagrants recorded N to S Yukon (summer records at L Dezadeash and L Tagish), and in W Atlantic on Bermuda (3–4 in Nov 1870, at least 7 in Oct 1970, 1 in Nov 1987).

Status and Conservation. Not globally threatened. Fairly common in summer in most of breeding range; uncommon in Alaska, Alberta, Saskatchewan, Newfoundland, New Brunswick, Prince Edward I, Montana, South Dakota, Wisconsin, Michigan, E USA seaboard from Massachusetts S to Maryland, also S Appalachians and Texas. In NE parts of US range breeding sporadic or very local, thus rare in summer in North Dakota, Nebraska, Iowa, Missouri, Illinois, Indiana and Ohio. Generally fairly common to common in Mexico, although uncommon in Oaxaca; common in Guatemala. Current data on population trends indicate that the species is stable in most areas in North America. Some recent expansion in NE USA, spreading into SW & SE Pennsylvania, with extension S down E coast since 1960s; also, increase in New England, probably owing to regrowth of forests, and widespread mortality of elms (*Ulmus*) due to Dutch elm disease may have temporarily helped the species; in addition, S of main range breeding has apparently become more regular in Mississippi Basin, this perhaps due to maturation of relict swamp-forests (or better observer coverage), and breeding range has evidently expanded in mid-Atlantic states and California. On other hand, local extinctions caused by habitat loss in New York, Michigan and lower Colorado Valley, and numbers have declined since pre-settlement times in W North America as a result of loss of mature and old-growth trees; highly likely that numbers have continued to decline owing to logging and other forestry practices.

Bibliography. Anon. (1998b), Baptista & Johnson (1982), Baptista & Krebs (2000), Bent (1948), Campbell *et al.* (1997), Davis (1979), DeSante & Pyle (1986), Franzreb (1985), Gorney (2000), Harrap & Quinn (1996), Hejl *et al.* (2002), Hellmayr (1934), Macoun & Macoun (1909), Shaffer & Alvo (1996), Thielcke (1962), Tietze (2007), Tietze *et al.* (2006), Webster (1986a, 1986b).

4. Short-toed Treecreeper

Certhia brachydactyla

French: Grimpereau des jardins **German:** Gartenbaumläufer **Spanish:** Agateador Europeo

Taxonomy. *Certhia brachydactyla* C. L. Brehm, 1820, Roda Valley, Thuringia, Germany.

Recent genetic evidence (cytochrome *b*) indicates that this species is closest to *C. americana*. Geographical variation slight and largely clinal, but N African race *mauritanica* exhibits moderately well-marked genetic and also vocal differences from European races and may merit separate species status; further study required. Nominative race and *megarhynchos* intergrade in C Pyrenees, W & S Spain and S Portugal. Racial affiliation of birds in Caucasus uncertain, currently included in *stresmanni*; similarly, those on larger Ionian Is (Greece) placed with *dorotheae*, but further study needed. Proposed race *rossocaucasica* (described from Sochi-Khosta region of NW Caucasus) possibly worthy of recognition; *harterti* (described from NW Turkey) is considered a synonym of nominate. Five subspecies currently recognized.

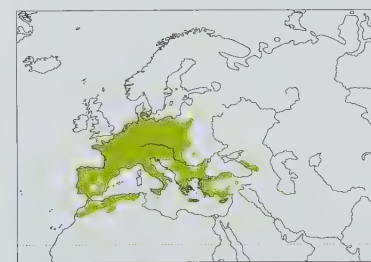
Subspecies and Distribution.

C. b. megarhynchos C. L. Brehm, 1831 – Channel Is, W & N France, Belgium, Netherlands and W Germany S to NW Spain and Portugal.

C. b. brachydactyla C. L. Brehm, 1820 – S Denmark, Poland and extreme S Lithuania S to E & SE France, Spain (except NW), C Germany, Italy, Sicily, Greece (except S), Hungary, W Ukraine, very locally Romania, and W Turkey.

C. b. mauritanica Witherby, 1905 – Morocco (S to Moyen and Haut Atlas), Algeria (S to Atlas Saharien and Aurès range) and NW Tunisia.

C. b. dorotheae E. J. O. Hartert, 1904 – S Greece (and most of larger Ionian Is), Crete and Cyprus. *C. b. stresmanni* Kummerlöwe & Niethammer, 1934 – C Turkey; also foot of W Caucasus on Black Sea coast (E at least to NC Georgia).



Descriptive notes. 12.5 cm; 7.5–11 g. Nominative race in fresh plumage (autumn and winter) has feathers of crown and nape rather dark brown, fringed blackish, with narrow off-white shaft streaks, lores blackish, supercilium greyish-white to brownish-white (usually indistinct or absent in front of eye), ear-coverts mottled white, black and brown; mantle and scapulars as crown but only tips of feathers blackish, and off-white centres broader (streaking well defined); rump and upperpart-coverts cinnamon-rufous, feather centres whitish (may reach tip of shaft), concealed base blackish; lesser upperwing-coverts brown, tipped orange-buff, median and greater coverts black-brown, medians tipped orange-buff and centred whitish, greater fringed and broadly tipped pale buff to rufous-brown (sometimes with pale shaft streak); alula and

primary coverts black-brown, tipped pale buff. largest feather of alula often with complete pale fringe on outer web; inner webs of tertials medium brown to light brown, outer webs dark brown, black from centre towards tip, with narrow buff-white fringe and broad white tip; primaries and secondaries medium brown, all of these except outer three or four primaries having pale buff band across feather (restricted to outer web on P4/P5, primaries numbered ascendingly), bordered on each side by blackish-brown band, feathers fringed orange-buff distally of bands (especially on secondaries) and tipped off-white; tail feathers pale brown, slightly darker around shaft, which is pale rufous-brown; throat and underparts greyish-white to pale grey, breast and belly usually variably washed rufous-brown or brown, flanks washed rufous-brown, undertail-coverts pale rufous-brown with whitish tips, thighs pale grey; iris brown; upper mandible dark brown, cutting edges paler, lower mandible pale brown with dark brown tip; legs pale brown. Distinguished from extremely similar *C. familiaris*, often with great difficulty (separation of the two sometimes impossible), by duller supercilium which is also shorter, narrower and less prominent (often inconspicuous in front of eye, and supercilia never meet above bill base), duller underparts more often sullied dirty buff on breast and flanks (some have only throat pure white), but mainly by voice; separation very difficult also in the hand, requiring detailed biometrics and careful examination of exact pattern of wing feathers. Sexes similar. Juvenile is as adult but upperparts more spotted (less streaked), and has some small brownish or grey spots on underparts. Races vary minimally, mainly in size and coloration: *megarhynchos* is on average slightly paler and warmer brown than nominate and with whitish streaking on upperparts somewhat less well defined; *mauritanica* is poorly differentiated, resembles nominate but with slightly darker and colder upperparts, pale streaks on crown generally narrower and less conspicuous, underparts less whitish, with breast and flanks more extensively washed dull buff; *dorotheae* is also poorly marked, as nominate but slightly duller greyish earth-brown above, bill longer; *stresemanni* is like last, but bill not so long. Voice. Calls similar to those of *C. familiaris* but louder, more emphatic and more varied, include diagnostic, clear, explosive "tyt" or "tut", likened in quality to call of Dunnock (*Prunella modularis*) or Coal Tit (*Periparus ater*), given singly, in slow series at well-spaced intervals, in fast series (almost trills), or in characteristic short phrase with "dripping" rhythm which accelerates and falls slightly in pitch ("tyt...tyt, tyt tyt-tyt"); occasionally a loud, penetrating "tsree" (similar to that of *C. familiaris*, although fractionally lower-pitched), both singly and in series at varying speeds, as a contact call and in intraspecific disputes, this sometimes combined with "tyt" call (helpful for identification purposes); high calls include quiet, thin, high "si", "sit" or "isup" (only subtly different from analogous calls of *C. familiaris*). Full song, by male, throughout year (especially Mar–Jul), a stereotyped phrase rising in pitch towards end, comprising 6 (4–9) loud, clear, sweet whistled notes, evenly spaced but with slightly "jolting" rhythm, rapidly and energetically delivered, begins with "tyt" calls and terminates with "tsree" notes, "tyt, tyt, siri-toi-see", c. 1.1–1.5 seconds in duration (shorter, lower-pitched, louder and more emphatic than song of *C. familiaris*); some songs abbreviated to 3–4 notes (notably in Denmark); each male has 1–3 song types, and there are also regional dialects within Europe, but these variations generally distinguishable only in sonagrams. N African race (*mauritanica*) has different, lower-pitched song, often starting with "tyt" note but then longer and more jumbled (and elicits no response from European races), and song on Cyprus (*dorotheae*) is very short and simple, of 3–6 units (again, producing little response from European races). This species sometimes imitates song of *C. familiaris*, but latter is the more frequent mimic.

Habitat. Mixed and broadleaf deciduous woodland, particularly oak (*Quercus*), favouring edge habitats, as well as pine (*Pinus*) forest (especially in S), riverine willows (*Salix*) and poplars (*Populus*), copses, orchards and parks, usually with dense understorey, well-wooded farmland and suburban areas, and sometimes plantations of rough-barked exotic conifers; generally avoids pure stands of fir (*Abies*), spruce (*Picea*) and beech (*Fagus sylvatica*). In S Spain, prefers open forest of cork oak (*Quercus suber*) or stone pine (*Pinus pinea*) with some shrubby undergrowth, and groves of olives (*Olea*), and in N Africa found in pine, cedar (*Cedrus*) and oak woodland. Overall, essential requirement is for stands of mature rough-barked trees. In N portion of range usually found below 1000 m, but in S occurs at higher altitudes, e.g. in SE France to 1800 m, in S Switzerland to c. 1400 m, in Greece to tree-line at c. 1800 m, and to 2000 m in Algeria and Turkey; in Morocco occurs locally near sea-level but otherwise montane, at 800–2200 m, occasionally to 2500 m in juniper (*Juniperus*) woodland.

Food and Feeding. Food mainly insect larvae and pupae, and spiders (Araneae), also some seeds. Forages on trunks and larger boughs of trees, sometimes among outer foliage, using fine bill to extract prey from cracks and crevices. Works upwards in jerky hops, spiralling around trunk, and then flies to bottom of another tree and repeats process. Foraging behaviour very much like that of *C. familiaris* but a little slower and less agile, making more spirals and hops and moving more quickly onto side branches. Occasionally forages on walls and buildings, fences and the like. Often joins mixed-species foraging flocks, sometimes with *C. familiaris*.

Breeding. Season Apr to mid-Jun, occasionally from late Mar; usually double-brooded. Apparently occasionally polygynous, also simultaneous bigamy (two females incubating eggs and feeding young at same time in same nestbox) recorded. Usually male builds two or three nest foundations and female selects one for completion, the process taking up to 32 days; foundation made from twigs, conifer needles, grass, bark, plant fibres, cloth, paper etc. (often large and untidy, filling nesting cavity), lined with feathers, hair, down, rootlets, moss and lichen, most nests sited 0.5–4 m above ground, only a few above 10 m, placed behind bark flap or in crack or crevice in tree trunk, including abandoned woodpecker (Picidae) hole, or in cavity in building (wooden or stone) or woodpile, sometimes behind ivy (*Hedera*), in base of raptor nest or squirrel (Sciuridae) drey, exceptionally in tangle of twigs close to tree trunk; will use specially designed nestboxes; in Morocco in hole or narrow crack or fork of trunk, rarely behind bark flap. Clutch 4–9 eggs, usually 5–7, white, with reddish-purple and reddish-brown (sometimes very faint) spots and blotches concentrated at broader end, average size 15.6 × 12.2 mm (race *megarhynchos*); incubation by female, period 13–15 days; chicks brooded by female, fed by both sexes, nestling period 15–18 days; young probably disperse quickly; male may start new nest while female still feeding first brood, and when chicks 10–12 days old male takes over the feeding of them while female completes second nest, sometimes laying second clutch before first-brood young have fledged.

Movements. Resident, with some altitudinal movement; otherwise rather strictly sedentary, with very limited post-breeding dispersal and few ringing recoveries at distances of more than 10 km, but few may move slightly longer distances Sept–Oct and Mar–Jun. Vagrant NW Belarus, NW Russia, Sweden and England; rare straggler in Ukraine.

Status and Conservation. Not globally threatened. Generally fairly common, but scarcer towards N & E of range; rare in Caucasus. Breeding densities ranging from 0.5 pairs/10 ha to 5–6 pairs/10 ha. European populations probably stable, although loss of prime habitat has almost certainly led to reduction in numbers in many areas. Expanded into E Poland in 20th century and has similarly colonized Denmark, where first bred in 1946 and c. 300 pairs by 1980s. Status in Corsica uncertain; recorded Jan 1908, and tape recordings of three singing individuals made in Apr 1969 were identified as being of this species (song of N African race *mauritanica*); there have been no subsequent records.

Bibliography. Bergmann (1983), Carrascal & Tellería (1989), Carrascal *et al.* (2001), Cleere (2005), Cramp & Perrins (1993), Cuisin (1987, 1993), Daumicht (1991), Demetiev *et al.* (1954a, 1970), Étchécopar & Hùe (1964), Flint & Stewart (1992), Fry *et al.* (2000), Gil (1997), Gorman (1996), Hafler (1993c), Ilagemeijer & Blair (1997),

Handrinos & Akriotis (1997), Harrap (1992), Harrap & Quinn (1996), Hirschfeld (1984, 1985), Jouard (1930a), Kren (2000), Mauersberger (1960), McCarthy (2006), Mead (1975), Mead & Wallace (1976), Osiejuk (1998), Osiejuk & Kuczyński (2000), Roselaar (1995), Scherneckau (1977), Schönfeld (2003, 2006a), Stepanyan (2000, 2003), Stresemann (1919a), Sudhaus (1991), Svensson (1992), Thévenot *et al.* (2003), Thibault & Bonaccorsi (1999), Thielcke (1961, 1962, 1973, 1986, 1987, 1992), Tietze (2007), Vaurie (1959).

5. Bar-tailed Treecreeper

Certhia himalayana

French: Grimpereau de l'Himalaya

Spanish: Agateador del Himalaya

German: Himalajabaumläufer

Other common names: Himalayan Treecreeper

Taxonomy. *Certhia himalayana* Vigors, 1832, Himalayas (Garhwal and Kumaon).

Closest relatives uncertain, although song rather similar to those of *C. discolor* and *C. manipurensis*. Despite this species' occurrence in two disjunct populations, geographical variation is clinal across whole range, W birds being palest with longer bill and E birds darker and shorter-billed (cline is apparently reversed at extreme E parts of range). Pronounced local individual variation tends to mask geographical variation. Four subspecies recognized.

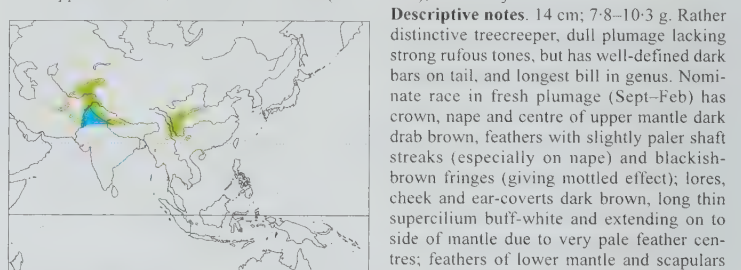
Subspecies and Distribution.

C. h. taeniura Severtsov, 1873 – mountains of C Asia in E Uzbekistan, W Kyrgyzstan, extreme SE Turkmenistan, W Tajikistan and N Afghanistan.

C. h. himalayana Vigors, 1832 – breeds E Afghanistan (S of Hindu Kush, from Nuristan S to Kandahar), N Pakistan (S at least to C Baluchistan, also in Murree Hills) and E in Himalayas (also N of main range, in upper Indus and associated valleys) to W Nepal.

C. h. yunnanensis Sharpe, 1902 – S China (from SW Gansu and S Shaanxi S to SE Xizang, NW & W Yunnan and W Sichuan, also SW Guizhou) and N Myanmar.

C. h. ripponi Kinnear, 1929 – S Chin Hills (Mt Victoria), in SW Myanmar.



Descriptive notes. 14 cm; 7.8–10.3 g. Rather distinctive treecreeper, dull plumage lacking strong rufous tones, but has well-defined dark bars on tail, and longest bill in genus. Nominative race in fresh plumage (Sept–Feb) has crown, nape and centre of upper mantle dark drab brown, feathers with slightly paler shaft streaks (especially on nape) and blackish-brown fringes (giving mottled effect); lores, cheek and ear-coverts dark brown, long thin supercilium buff-white and extending on to side of mantle due to very pale feather centres; feathers of lower mantle and scapulars with whitish centres, fine warm brown sub-terminal markings and fine blackish-brown fringes (giving mealy, dark-scalloped appearance on paler ground), feathers of back and rump dull cinnamon-orange subterminally with light olive-brown tips, uppertail-coverts light olive-brown, faintly barred darker; upperwing-coverts dark brown, lessers and medians tipped buff-white, inner greater with pale buff shafts and dull buff-white tips; alula and primary coverts dark brown, feathers of alula tipped dirty white on outer web; tertials medium-brown, barred dark brown, outer webs with subterminal dark brown spot and whitish tip, secondaries drab brown, slightly warmer on outer feathers, with dark subterminal band and off-white tip, dark brown central portion and base separated by pale orange-buff band; primaries medium brown, drab brown on distal part of outer webs, P3–P4 (primaries numbered ascendingly) barred dark brown inwards of emarginations, P5–P10 dark brown at base and in centre with intervening pale orange-buff band (as on secondaries); tail medium drab brown with narrow dark brown bars, pale rufous-brown shafts; chin, throat and centre of upper breast creamy white, sides of neck and breast washed pale buff, lower breast, upper flanks and belly very pale drab-buff, rear flanks and thighs to undertail-coverts pale drab brown (when plumage very fresh may show fine dark fringes on breast and belly, giving faint scalloped effect); in worn plumage (Mar–Aug) crown and nape look more distinctly streaked and warm tones on mantle and scapulars lost, underparts paler and whiter (dingy pale grey when heavily worn); iris dark brown; upper mandible dark horn-brown to blackish, lower mandible pale fleshy with brown tip; legs brown to fleshy-coloured. Distinguished from all congeners by thin blackish bars on tail. Sexes similar, male on average slightly longer-billed than female. Juvenile is as adult but feather centres of forehead to nape larger, browner and less distinct, giving more mottled appearance, upperparts slightly warmer and browner, more blotched (less scalloped), throat and breast whiter (but blotchy, grey feather bases showing), contrasting more sharply with drab-buff lower underparts, with fine dark feather fringes forming scattered faint dark spots or scallops. Race *taeniura* is paler and greyer than nominate, with pale feather centres of upperparts greyer and darker fringes narrower and pale brown (rather than black-brown), rump and tail paler grey (rump with reduced warmth but same relative contrast with upperparts), paler and greyer below with little or no buff wash, even when fresh (except on lower belly and vent), and less contrast between throat and breast, bill longer; *yunnanensis* is darker than nominate, upperparts blackish-brown and breast and belly darker, more smoky buff (but slightly paler in NE Sichuan); *riponi* resembles last, but upperparts slightly warmer and paler brown (still darker than nominate), with more obvious rufous tinge on lower back and rump. Voice. Song of usually 7–12 (extremes 3–13) full, slightly disyllabic, whistled notes given in slow, deliberate rattle, c. 6 notes per second (up to 12 in fastest songs), often slightly decelerating, and introduced by higher, sweeter note, each song typically c. 2 seconds in duration, e.g. "tswee-chi-chi-chi-chi-chi-chi", similar to that of *C. discolor* but tends to be slower and more halting. Also a more conversational, tinkling, descending (almost laughing) "ti, ti-tu-du-du-du". Call a short, thin, high-pitched, piercing "tsee", singly or in slow series, "tsui, tsui, tsui...", also much thinner and higher "see" and "psit" notes.

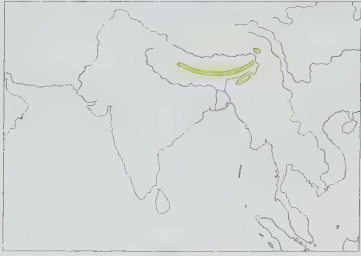
Habitat. Breeds in open coniferous forest and forest edge. In C Asia, N Afghanistan and W Pakistan (Baluchistan) favours mature juniper (*Juniperus*) forest; in E Afghanistan, N Pakistan, W Himalayas and S China occurs in forests of pine (*Pinus*), spruce (*Picea*), cedar (*Cedrus*) and fir (*Abies*), as well as peach (*Prunus persica*) and apricot (*Prunus armeniaca*) orchards, and rhododendron (*Rhododendron*), juniper and birch (*Betula*) at high altitudes, also in more arid treeless regions of trans-Himalaya; on Mt Victoria (SW Myanmar) exclusively in mature pine forest. In winter on plains of Pakistan and NW India, may be found in acacia (*Acacia*) groves, riverine woodland, orchards, village trees, gardens and roadside avenues, even when these isolated in otherwise treeless semi-desert. W populations breed at 1800–3660 m (towards lower end of range in W, at higher end in Nepal), and in winter from 2100 m down to plains level although some remain as high as 2400 m; E populations occur to 4000 m in summer and down to 650 m in winter, but limits of breeding distribution unclear.

French: Grimpereau discolore **German:** Sikkimbaumläufer **Spanish:** Agateador Gorjipardo
Other common names: Brown-throated Treecreeper (when treated as conspecific with *C. manipurensis*)

Taxonomy. *C[erthia] discolor* Blyth, 1845, Darjeeling, India.

Formerly treated as conspecific with *C. manipurensis*, but now separated on basis of vocal and genetic evidence. Birds from NE India (Nagaland, W Manipur) sometimes placed with *C. manipurensis*, but plumage details indicate clear affiliation with present species. Monotypic.

Distribution. E Himalayas in C & E Nepal (E from Dhaulagiri massif) E to NE India (E to E Arunachal Pradesh, also S of R Brahmaputra in Nagaland and W Manipur); also S Xizang (Chumbi and Tsangpo valleys), in SW China.



Descriptive notes. 14 cm; 8–12.5 g. In fresh plumage (from Sept onwards), feathers from forehead to mantle are cinnamon-brown with paler buff shafts and dark brown fringes (neat pattern of pale buff spots on crown and upper mantle, more scaled appearance on lower mantle and scapulars); lores dark brown, supercilium flecked pale buff with odd whitish feathers, not well demarcated from crown, although broader and whiter behind eye; cheek and ear-coverts dark brown, ear-coverts tipped buff; lower back, rump and uppertail-coverts orange-rufous; lesser upperwing-coverts as mantle, median coverts blackish-brown, tipped cinnamon-buff, greater coverts dark brown, inners with buff tip, shaft streak and fringe on outer web, outers tipped buff; alula and primary coverts dark brown, alula tipped pale buff, largest feather also fringed pale buff; tertials dull buff, inner webs washed brown, outer webs with dark brown subterminal band adjacent to shaft on distal half, separated from dark brown basal half by buff band; secondaries dark brown, tipped pale buff, with pale band across base buffy white on outer web (buff notch on distal quarter); pale brown on outer webs, P5–P10 with pale notch on distal quarter of outer web and crossed by pale band at base (continuous with band on secondaries), also P6–P10 tipped pale grey; tail dull cinnamon, shafts pale rufous; throat and breast light drab-buff, becoming paler on rear flanks, belly and vent (when plumage very fresh, faint darker tips sometimes visible on chin, throat and side of neck), undertail-coverts warm buff, axillaries and underwing-coverts white; in worn plumage (spring–summer) underparts on average slightly duller, dingier and less buffy, belly slightly darker and duller, sometimes (when very worn) pale streaks on crown and nape narrower and better defined; iris reddish-brown to dark brown, almost black on culmen, lower mandible pale horn to whitish with darker tip; legs pale flesh-brown to dark brown. Distinguished from *C. himalayana* by plain unbarred tail, and from *C. hodgsoni* and *C. nipalensis* also by dull underparts with pale brown wash on throat and breast, and lack of contrastingly cinnamon flanks. Sexes similar. Juvenile is as adult but shorter-billed, with fine dark scallops on throat and breast, which are tinged cinnamon-buff. Voice. Song a monotonous, fast rattle lasting 1–2 seconds, of simple, full “chi” notes at c. 12 per second, slightly accelerating and, more obviously, gaining in power and volume towards end, “chi’chi’chi’chi...”. Call an explosive, deliberate, disyllabic “chi-tip”.

Habitat. Mature broadleaf forest, both deciduous and evergreen, especially mossy oak (*Quercus*) forest, less frequently rhododendrons (*Rhododendron*). In Himalayas summers at 1600–2750 m, with most records above 2000 m, exceptionally as high as 3300 m, and in winter regularly down to 1000 m, exceptionally to 300 m, but also as high as 3050 m; in Nagaland and Manipur (NE India) found at c. 800–2300 m. Occupies lowest altitudinal belt of the four species of treecreeper found in Himalayas and associated ranges, normally overlapping in breeding season only with *C. nipalensis*; in non-breeding season, however, this separation obscured by altitudinal movements.

Food and Feeding. Food insects and spiders (Araneae). Foraging behaviour typical of the genus, creeping jerkily on moss-laden and lichen-covered trunks and boughs of trees and picking prey items from crevices and cracks. Found singly and in pairs; in non-breeding season also in groups of up to five individuals in mixed-species foraging flocks.

Breeding. Season probably Mar–May in Himalayas. No other information.

Movements. Resident, but some altitudinal movements and perhaps also some dispersal in winter. Records from N India (E Uttaranchal) in Jun and extreme W Nepal (near Dhangarhi) in Mar presumably involve stragglers.

Status and Conservation. Not globally threatened. Fairly common in Himalayas, becoming more abundant in E. In NE India, old unconfirmed records from Meghalaya (Khasi Hills) and S Assam (Cachar Hills). Poorly known species, e.g. no documented breeding records from Nepal or Bhutan.

Bibliography. Ali & Ripley (1983), Cheng Tsohsin (1987), Cheng Tsohsin *et al.* (1983), Harrap & Quinn (1996), Inskipp & Inskipp (1991), Li Dehao & Wang Zuxiang (1979), Martens (1981), Martens & Eck (1995), Martens & Tietze (2006), Rasmussen & Anderton (2005b), Spierenburg (2005), Stuart Baker (1922), Thet Zaw Naing (2003), Tietze (2007), Tietze *et al.* (2006), Vaurie (1950b).

9. Manipur Treecreeper

Certhia manipurensis

French: Grimpereau du Manipur **German:** Manipurbaumläufer **Spanish:** Agateador de Manipur
Other common names: Brown-throated Treecreeper (when treated as conspecific with *C. discolor*)

Taxonomy. *Certhia manipurensis* Hume, 1881, Manipur, India.

Formerly treated as conspecific with *C. discolor*, but now separated on basis of vocal and genetic evidence. Birds from NE India (Nagaland, W Manipur) sometimes placed with present species, but plumage details indicate clear affiliation with *C. discolor*. Birds from SW Myanmar (Arakan Yomas) tentatively included in nominate race, but racial identity requires examination. Four subspecies recognized.

Subspecies and Distribution.

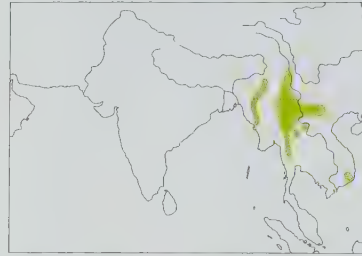
C. m. manipurensis Hume, 1881 – NE India (S Manipur, E Mizoram) and W Myanmar (Chin Hills, Arakan Yomas).

C. m. shanensis Stuart Baker, 1930 – NE & E Myanmar (S to the Karenni), S China (Yunnan from Gaoligong Shan S to Tengchong), NW Thailand and NW Vietnam (Fansipan massif, in W Tonkin).

C. m. laotiana Delacour, 1951 – Tranninh Plateau (around Xieng Khouang), in NC Laos.

C. m. meridionalis Robinson & Kloss, 1919 – Da Lat Plateau, in S Vietnam.

Descriptive notes. 14 cm; 9–11 g. Nominative race in fresh plumage has feathers of forehead to mantle orange-buff with paler buff shafts and dark brown fringes (forming spots on crown and upper mantle, scaled pattern on lower mantle and scapulars); lores dark brown, supercilium flecked pale buff with odd whitish feathers, not well demarcated from crown, although broader behind eye; cheek and ear-coverts dark brown, ear-coverts tipped buff; lower back, rump and uppertail-coverts orange-rufous; lesser upperwing-coverts as mantle, median coverts blackish-brown, tipped cinnamon-buff, greater coverts dark brown, inners with buff tip, shaft streak and fringe on outer webs, outers tipped buff; alula and primary coverts dark brown, alula tipped pale buff, largest feather also



breast rich cinnamon or cinnamon-orange, belly and vent duller and paler (pale drab-cinnamon or drab-buff), undertail-coverts rich cinnamon, thighs light drab-buff; in worn plumage underparts slightly duller; iris reddish-brown to dark brown; upper mandible horn-brown to dark brown, almost black on culmen, lower mandible pale horn to whitish with darker tip; legs pale flesh-brown to dark brown. Differs from *C. discolor* in rather warmer and more richly coloured general appearance, with rich cinnamon underside. Sexes alike. Juvenile is as adult, but with fine dark scales on throat and breast. Races differ only moderately: *shanensis* has colder and greyer feathers centres above (especially on crown and nape) than nominate, below rather darker, dingier and less buff, throat and breast drab-grey, belly dull grey, undertail-coverts buff or cinnamon-buff; *meridionalis* resembles previous, but crown and nape slightly paler and buffier, upperparts much warmer, feathers rufous with finer dark fringes (especially on mantle, back and scapulars) and only slightly paler shaft streaks, back and rump slightly richer and more rufous, underparts perhaps darker and purer grey on average; *laotiana* is as last, but upperparts less rufous and much more strongly marked black and bright tawny, undertail-coverts slightly brighter rufous. Voice. Song a monotonous rattling repetition of paired notes, 5–7 pairs per second, e.g. “tchi-chi, tchi-chi, tchi-chi...” or “chid-de chid-de-chid-de...”; speed of rattle approaches that of *C. discolor* song, but disyllabic units impart halting or “trotting” rhythm. Calls include high, soft, thin “tsit”, rather lower-pitched, explosive, deliberate, disyllabic “chid-ip” (very like that of *C. discolor*), full explosive “tchiu!” and hard “chip”; calls sometimes extended into short, rattling “chi’r’r’r’it”.

Habitat. Moist hill evergreen forest; locally also pine (*Pinus*) forest, especially when in association with stands of broadleaf trees. In India (Manipur) found at c. 800–2300 m (but records not distinguished from those of *C. discolor*); in Myanmar, breeding proven at 1830 m in N Chin Hills and recorded at 1400–3000 m farther S (on Mt Victoria), and noted at 2135–2195 m in NE and 1465–2285 m in SE; in S China (Yunnan) recorded at 2000–3050 m, in Thailand from 1370 m to at least 2440 m, and in Vietnam above 2000 m in NW and 1000–2500 m in S.

Food and Feeding. Food and behaviour typical of the genus, but no specific information.

Breeding. Poorly known. Season Apr–May in India (Manipur) and W Myanmar (N Chin Hills), and fledged young seen end Mar in SW Myanmar (Mt Victoria); pair at nest in early Feb and juvenile recorded in early May in NW Thailand; season about Jan–Jul in S Vietnam. Nest a pad of fibre, moss and a few roots, lined with few feathers, placed 2.4–3.7 m above ground in shallow hole in small tree. Clutch 3–4 eggs, white, densely blotched and freckled with pale reddish or reddish-brown, marks sometimes concentrated towards broader end, average size c. 15.9 × 12.3 mm (nominate race). No other information.

Movements. Resident.

Status and Conservation. Not globally threatened. Not uncommon in Myanmar, and common there in SE; uncommon in Thailand, and very rare in NW Vietnam. Now absent or, at best, very rare at Doi Suthep-Pui National Park (Thailand), where it was formerly not uncommon.

Bibliography. Ali & Ripley (1983), Harrap & Quinn (1996), Hopwood & Mackenzie (1917), Martens & Tietze (2006), Rasmussen & Anderton (2005b), Robson (2000b, 2002c), Smythies (1986), Stresemann & Heinrich (1940), Stuart Baker (1922, 1932), Tietze (2007), Tietze *et al.* (2006).

Subfamily SALPORNITHINAE

Genus *SALPORNIS* G. R. Gray, 1847

10. Spotted Creeper

Salpornis spilonotus

French: Grimpereau tacheté **German:** Stammsteiger **Spanish:** Agateador Moteado
Other common names: Spotted Treecreeper, Spotted Grey Creeper

Taxonomy. *Certhia spilonota* Franklin, 1831, between Calcutta and Benares, India.

Has been placed in Sittidae or treated as a monospecific family, Salpornithidae, mainly due to lack of stiffened tail feathers. Data derived from DNA–DNA hybridization indicate present genus is closest relative of *Certhia*. Recent research using biometrics, song structure and cytochrome *b* sequences supports treatment as a separate family with closest but still loose relationship to Tichodromidae; also calls for specific separation of African birds as *S. salvadori*. In contrast, other studies suggest distinct vocal differences exist between, on the one hand, Indian and W African birds and, on the other, S African populations, and these two groups might represent two separate species; further study required, e.g. of Ethiopian birds. Six subspecies currently recognized.

Subspecies and Distribution.

S. s. emini Hartlaub, 1884 – Gambia S to W Guinea, NW Sierra Leone and N Ivory Coast E discontinuously to N Ghana, Burkina Faso, Nigeria, N Cameroon, S Chad (S from Azoum/Chari confluence) and N Central African Republic; also S Sudan, adjacent NE DR Congo (NE Uele) and extreme NW Uganda.

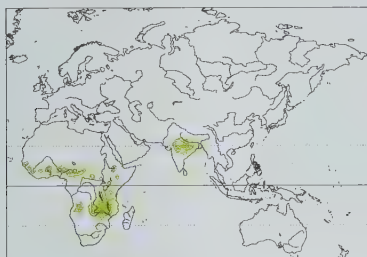
S. s. erlangeri Neumann, 1907 – W & SE Ethiopian Highlands.

S. s. salvadori (Bocage, 1878) – extreme E Uganda and adjacent highlands of W Kenya; also C Angola, S & SE DR Congo, most of Zambia, NE, W & S Tanzania (S from near SE of L Victoria in W and from Songea and Liwale in SE), Malawi and N Mozambique (S to R Zambezi).

S. s. xylodromus Clancey, 1975 – N & C Zimbabwe (Zambezi Escarpment and Mashonaland Plateau) and adjacent Mozambique (Manica platform S to R Save).

S. s. rajputanae R. Meinertzhagen, 1926 – C & SE Rajasthan (E from Sambhar, Ajmer, Aravalli Hills and Mt Abu), in WC India.

S. s. spilonotus (Franklin, 1831) – C India from E Gujarat (E from Rajpipla and Disa) and S Haryana (Gurgaon) E to N Uttar Pradesh (Gonda, near Nepalese border) and N Bihar, S to E Maharashtra, N Andhra Pradesh and SE Madhya Pradesh (Bastar District).



Descriptive notes. 15 cm; 14 g, 13.5–16 g (Africa). Very distinctive if seen well, with spotted and barred plumage, long, slender, decurved bill and bark-gleaning habits; tail slightly rounded and, unlike *Certhia*, not used for support while climbing; flight undulating. Nominate race in fresh plumage (from about Oct onwards) has forehead drab brown, crown and nape very dark brown with buff-white shaft streaks, long, broad off-white supercilium, dark brown lores and upper ear-coverts, off-white cheek and side of neck, some dark brown fringes on side of neck; upperparts very dark brown, feathers tipped white, extreme tips narrowly margined brown (white bases fully concealed); lesser upperwing-coverts pale drab-grey with dark brown subterminal bar, median and greater coverts dark brown with white spots at tip and at base of shaft; alula drab brown, slightly paler at tip, primary coverts drab brown with off-white fringes at tip and a white notch centrally on outer web; flight-feathers dark brown, tertials with off-white notches along fringe of outer web and white tips, secondaries and primaries (except outer two) similar but white tips much reduced on primaries and P3–P5 (primaries numbered ascendingly) unmarked distally of emarginations (flight-feathers with concealed white bars on inner webs); tail dark brown, boldly barred white, central pair of rectrices with extensive pale drab-grey areas along shaft and at tip; chin and throat white, poorly demarcated from underparts, feathers of which white with bold brown bars and narrow cinnamon-brown margins (appearing variably spotted and barred brown and white), variable cinnamon fringes may produce cinnamon wash over entire underparts; in worn plumage (from about May onwards) white spotting on upperparts and wings reduced; iris dark brown; bill blackish-horn or brownish-horn, lower mandible and cutting edge of upper mandible flesh-coloured or pale horn; legs greyish or purplish-grey to blue-black. Sexes similar. Juvenile is as adult, but notches and spots on wings tinged buff, primaries and secondaries broadly fringed off-white at tip, throat and upper breast finely scaled or streaked darker (appearing mottled or scaled more than spotted). Races vary relatively little, mainly in colour and intensity of markings above and below: *rajputanae* has ground colour above slightly paler and browner than nominate, with white spotting slightly less profuse, scapulars slightly plainer and greyer, and underparts (not throat) washed cinnamon and dark markings reduced to narrow black bars; *emini* resembles nominate but slightly paler and browner above, pale spots on average larger and not so pure white, underparts slightly whiter with reduced cinnamon wash (adult has pale fringes at tips of flight-feathers and dark fringes on throat, i.e. as juvenile of nominate); *erlangeri* resembles previous, but spots above variably washed rufous-buff, especially on crown, mantle and back (and ground colour darker), underparts washed cinnamon-rufous and with bolder and blacker bars and more white spotting, bill shorter; *salvadori* has underparts as previous but ground colour paler, more buffy white, feathers with rather narrower dark bars and tips, a reduced cinnamon-buff wash and more extensive white areas, upperparts as *emini* but white spots generally larger and a variable slight buff wash, primaries more boldly fringed white at tips, bill shorter; *xylodromus* is as last but starkly black and white, with upperparts sooty black (not dark brown), pale subterminal barring whiter (buff wash reduced), terminal spots purer white, tail more sharply black and white, throat whiter, underparts paler buff. **VOICE.** Calls in India include a series of full, strident, rising notes, “tui-tui-tui”, while in W Africa recorded as giving single, high-pitched “tsee”; in S Africa calls include high-pitched, very thin “tse-cet” and 5–6 high, even croaking notes, “kek-kek-kek-kek”, said to be reminiscent of a coot (*Fulica*). Song in India and W Africa a short, simple series of clear, slightly plaintive whistled notes, e.g. “tsit-tsee tuu tuui-tuwec” with slight variations (when excited, e.g. after playback, gives longer and faster but more rambling song); E & S African birds have much higher-pitched, almost lisping phrase, “tsit’tsit-tsui, tsit’tsit-tsui, tsui-tsui-tsui, tsit’tsit-tsui, tsit’tsit-tsui, tsui-tsui...”, lasting 3–4 seconds, and repeated several times in succession (often transcribed as “sweepy-swee-seepy” or “sweepy-svip-svip-svip”).

Habitat. In India found in fairly open deciduous forest of acacia (*Acacia*), teak (*Tectona*) etc., also in well-wooded country and mango groves; favours mature trees with deep-fissured bark. In plains

and hills. In W Africa principally in mature, open *Isobertia* woodland and in S tropics in rather similar mature miombo (*Brachystegia*) woodland, favouring well-developed stands of rough-barked species (e.g. *Brachystegia spiciformis*) with canopy of 10–15 m, but in Ethiopia occurs in evergreen juniper (*Juniperus*) forest although recorded also in acacias; apart from these broad preferences, recorded also in orchard-bush savanna in Nigeria, *Terminalia macroptera*–*Pseudocedrela kotschy* savanna woodland in Central African Republic, open wooded areas (especially with acacia) in Kenya, *Cryptosepalum* forest (mavunda) in Zambia, gallery woodland in Angola, and open stands of *Terminalia sericea* in Malawi, where occurs also in the *Brachystegia*/riparian-forest ecotone, exceptionally in evergreen forest up to 5 km from nearest *Brachystegia*. Recorded to at least 760 m in Sierra Leone, to at least 1350 m in Nigeria, at 1000–2300 m in Kenya, above 1500 m in Ethiopia, at 1250–1380 m in SE DR Congo, and at 915–1525 m (occasionally 305–1675 m) in Malawi.

Food and Feeding. Food insects, including moths and caterpillars (Lepidoptera), beetles (Coleoptera) and bugs (Hemiptera), also spiders (Araneae). Forages on trunks and larger branches of trees, starting near base and working upwards, then moving to base of next tree; may also search horizontal branches. Holds tail away from bark as it moves, thus resembling a nuthatch (*Sitta*), and may cling to branches upside-down. Sometimes forms small flocks in non-breeding season in India; in Africa often joins mixed-species foraging parties, and up to ten individuals recorded in such flocks in Zimbabwe.

Breeding. Season Feb–May in India; Jan in Ghana, Apr (and possibly Mar) in Ethiopia, May and Dec in Kenya/Uganda, Nov in Tanzania; Aug–Sept in Angola, Oct–Dec in NE DR Congo and Aug–Oct and Feb–Mar in S; Sept in Zambia, Sept–Oct in Malawi, and Aug–Oct (peak Sept) in Zimbabwe. Nest a neat, deep cup constructed from flower and leaf stalks, rootlets and bark chips, cemented on outside with spider webs, insect cocoons, caterpillar excreta and vegetable down, covered with lichen, and lined with spider webs and egg sacs, cocoons and plant down, external diameter c. 60–70 mm, internal diameter c. 45 mm, depth of cup c. 45 mm, wall c. 12 mm thick; placed 3–12 m above ground in tree fork, often where horizontal branch joins main trunk and where a knot or other protuberance breaks up outline; superbly camouflaged and extremely hard to find. Clutch 1–3 eggs (usually 2 in India, 3 in S Africa), in India pale grey or greenish-grey with dark brown specks and paler secondary blotches, especially at larger end, c. 19 × 13 mm, in Africa pale turquoise-blue, bluish-green or pale green with grey or lavender undermarkings and irregular black and brown spots, often concentrated at broader end, average 18.3 × 13.3 mm; incubation by female, fed on nest by male, she often sits with bill pointing upwards and gives high-pitched twittering call to maintain contact with male (usually feeding nearby); chicks brooded and fed by both parents; no information on duration of incubation and nestling periods.

Movements. Essentially resident, but some seasonal movements thought to take place in Africa. A scatter of records away from core breeding areas may represent vagrants and wanderers but, in less well-watched areas, could possibly indicate local breeding populations (the species is notoriously elusive). Thus, reported SE Senegal (one record, Niokolo-Koba National Park), Gambia (three records), Guinea-Bissau (three or more records), NW Guinea (one old record), Togo (one record), Botswana (one record, Kasane) and NE South Africa (one old record, Kruger National Park).

Status and Conservation. Not globally threatened. Rather scarce and local in India. In W Africa generally rather scarce and local, although may be frequent in NW Sierra Leone and N Ivory Coast; uncommon to locally frequent in Ethiopia, but scarce or rare and local in S Sudan, NE DR Congo, Uganda and Kenya; rather commoner in S tropics, where common in Angola in N Huila (although rare in Congo Basin), quite common in Zambia (scarcer in drier woodland), not uncommon in Malawi W of Rift Valley (scarcer elsewhere) and locally common in Tanzania; sparse and local in Zimbabwe. Often shy and elusive; easily overlooked and may be commoner in areas of suitable habitat than records suggest. Throughout range, this species’ requirement for large trees means that habitat loss and degradation have undoubtedly caused some decline in recent decades; in Kenya extirpated from most areas as a result of these factors and now confined to Kapenguria region, and no recent records from Uganda. Occurs in several protected areas: in India, for example, probably breeds in Kawal Wildlife Sanctuary, in Andhra Pradesh, and rare in Keoladeo Ghana (Bharatpur) National Park, in Rajasthan; in Africa, present in e.g. Comoé National Park, in Ivory Coast, Bénoué National Park, in Cameroon, and Dzalanyama Reserve, in Malawi.

Bibliography. Ali & Ripley (1983), Bannerman (1948), Borrow & Demei (2001), Carswell *et al.* (2005), Dean (2000), Fry *et al.* (2000), Ginn *et al.* (1989), Harrap & Quinn (1996), Harrison *et al.* (1997), Hockey *et al.* (2005), Howland (1988), Lewis & Pomeroy (1989), Masterson (1970), Mitsch (1974), Nilsen (2007), Randall (1994), Rasmussen & Anderton (2005b), Sibley & Ahlquist (1990), Skead (1967), Srinivasulu (2004), Stevenson & Fanshawe (2002), Stuart Baker (1922), Tietze & Martens (2008), Zimmerman *et al.* (1996).

Class AVES

Order PASSERIFORMES

Suborder OSCINES

Family RHABDORNITHIDAE (RHABDORNIS)



- Medium-small passerines with moderately long, strong bill; mostly brown above, pale below with distinctive streaking, and dark face mask.
- 15–19 cm.



- Philippines.
- Forest edge, and secondary and primary forests.
- 1 genus, 3 species, 7 taxa.
- No species threatened; none extinct since 1600.

Systematics

The family Rhabdornithidae is one of several poorly known, enigmatic avian groups found exclusively within the Philippine Archipelago. It contains a single genus, *Rhabdornis*. Its members receive this same name, “rhabdornis”, as their normal English vernacular name, which is treated as invariable in singular and plural. Rhabdornis have several superficial similarities to the treecreepers (Certhiidae) and the Australasian treecreepers (Climacteridae), and the genus was placed in the family Certhiidae by R. B. Sharpe in volume four of his *Handlist of the Genera and Species of Birds*, published in 1903 by the British Museum (Natural History). This treatment was followed by R. C. McGregor, the foremost ornithologist in the Philippines during the first half of the twentieth century, in the passerine volume of his 1909 tome *A Manual of Philippine Birds*, published by the Bureau of Science, in Manila. It was continued by J. Delacour in his section of the book *Birds of the Philippines*, co-authored with E. Mayr in 1946. Being the eminent systematist that he was, however, Delacour did comment that rhabdornis are “very aberrant and recall only vaguely the familiar North American and European birds [genus *Certhia*], being more closely like the Australian creepers (genus *Climacteris*)”.

In 1967, J. C. Greenway, in volume 12 of J. L. Peters’s *Checklist of Birds of the World*, elevated the taxonomic status of rhabdornis to that of a family, the Rhabdornithidae. He remarked that “The relationships of this taxon [Rhabdornithidae] are obscure.” A colleague of both Delacour’s and Mayr’s, Greenway probably had many conversations about this “obscure” taxon that led him to place the family between Certhiidae and Climacteridae, all of which followed the nuthatches (Sittidae) in sequence. Four years later, in his landmark book *Philippine Birds*, J. E. duPont pulled together all that was known with regard to the systematics of Philippine birds and, for the first time, had them illustrated in full colour. He apparently saw the similarities of rhabdornis with the *Ptilocichla* ground-babblers and placed the family between Sittidae and Timaliidae. The divergence away from the creepers was supported by R. Orenstein in his PhD thesis for the University of Michigan, entitled “Morphological adaptations for bark-foraging in the Australian Treecreepers (Aves: Climacteridae)”; Orenstein found that rhabdornis differs from both Certhiidae and Climacteridae in leg musculature and in the lack of such adaptations for climbing and creeping as stiffened tail feathers, elongated toes and reduced toe pads. In 1985, he and R. S. Kennedy,

in the section on “Philippine creepers” in *A Dictionary of Birds*, edited by B. Campbell and E. Lack, point out that rhabdornis have “plumage and anatomical similarities to the babblers *Ptilocichla* and *Kenopia*...”.

The duPont sequence was followed by K. C. Parkes in 1973, by E. Dickinson, Kennedy and Parkes in 1991, and by Kennedy and colleagues in 2000. On the other hand, C. G. Sibley and B. L. Monroe, in their monumental 1990 work *Distribution and Taxonomy of Birds of the World*, tentatively placed rhabdornis in a greatly enlarged family Sylviidae, where they were incorporated after the parrotbills (*Paradoxornis*) at the end of a babbler tribe “Timaliini”. This arrangement was followed by T. Inskipp, N. Lindsey and W. Duckworth in 1996.

These attempts to determine the true relationships of *Rhabdornis* were made in the absence of tissue or blood samples, which, had they been available, would have enabled molecular investigations to be conducted. The obtaining of tissue, however, has not been an easy task. During the period from the late 1940s through to the early 1970s, hundreds of specimens were obtained by D. Rabor and collectors from the Philippine National Museum, and there is, therefore, excellent comparative material which can be utilized as a means of examining rhabdornis by traditional morphological methods. Recent specimen-collectors from the Field Museum of Natural History, in Chicago, the Cincinnati Museum of Natural History, in Ohio, and the US National Museum, in Washington, as well as local ones from the Philippine National Museum, have in most cases used mist-nets or single-shot pellet guns as their collecting tools. Rhabdornis tend, however, to inhabit the upper and middle levels of the canopy (see Habitat), and the traditional mist-net set from the ground to 2.5 m above ground has been virtually useless in catching these birds. Special efforts to raise nets higher in the canopy in front of fruiting and flowering trees have yielded mixed results, and then, of course, the teams need liquid nitrogen, certain buffers or alcohol to obtain suitable tissue for DNA analysis.

Despite the problems, *Rhabdornis* tissue has finally been obtained, it has been possible to examine the molecular genetics of this family, and some of the initial results of analyses appear, at least on the surface, quite startling. The big surprise is the suggestion, based on nuclear RAG-1 gene research undertaken by A. Cibois and J. Cracraft, and published in *Molecular Phylogenetics and Evolution* in 2004, that rhabdornis may belong in the superfamily Muscicapoidae, positioned after the mockingbirds (Mimidae) and before, or even within, the starling family

Rhabdornithidae comprises three rather similar species in a single genus (*Rhabdornis*) endemic to the Philippines. Smallish to medium-sized, rather front-loaded passerines, they have relatively long, pointed wings and a short, square-tipped tail. The bill is rather long and slender, with a slightly decurved culmen.

The **Stripe-headed *Rhabdornis*** gets its English name from the white streaks on its otherwise dark brown crown, a feature that quickly distinguishes it from its congeners.

[*Rhabdornis mystacalis*
mystacalis,
Subic rainforest, Zambales,
Luzon, Philippines.
Photo: Romeo M. Ocon]



(Sturnidae). The suggested relationship between the rhabdornis and the starlings did not, however, have strong statistical support. On the other hand, a more recent study, carried out by D. Zuccon and colleagues, using both nuclear and mitochondrial genes, suggested that not only is *Rhabdornis* closely related to Sturnidae, but it is also belonged within the starling group. These later findings, published in the same journal in 2006, indicated also that the oxpeckers (*Buphagus*), long considered closely related to starlings, are basal to the whole starling assemblage. Although the relationship of rhabdornis, starlings and *Buphagus* was unexpected, all of these species share the habit of nesting in holes in trees.

The rhabdornis' brush-tipped tongue, on which J. Whitehead commented in 1899 (see Morphological Aspects), is a character that would not normally place these birds among the starlings. This feature, however, must represent a derived character, perhaps an adaptation for exploiting the nectar of flowers, or for other unknown purposes. In 2000, Kennedy and colleagues, in putting to rest the long overused vernacular name of "creeper", stated that the rhabdornis rarely creep but that, rather, they hop along and between branches, gleaning insects from beneath the bark and leaves. This type of foraging behaviour is not unlike that employed by glossy starlings of the genus *Aplonis*. Thus, the rhabdornis may well represent an early lineage among starlings, one with morphologically unique adaptations that were unrecognized by earlier investigators.

With regard to the origin of rhabdornis, the best inference can be obtained by looking at the origin of starlings. Cibois and Cracraft support an Old World origin for the sturnids. Divergence-dating calculated on the basis of a "molecular clock" suggested that the rhabdornis separated from the other major lineages of starlings, namely an Oriental-Australasian clade (including the genera *Sarcops* and *Aplonis*), and an Afrotropical-Palearctic clade (including *Sturnus* and *Acridotheres*), at a point some 18–20 million years ago. The only large island present at that time in what is now known as the Philippines would have been the northern part of Luzon, which originated over 25 million years ago. Mindoro arose *de novo* as an oceanic island around 8–10 million years ago, but *Rhabdornis* has not been found there, and it probably never successfully colonized the island.

Alignment of RAG-1 gene sequences from GenBank, a massive open-access database containing all publicly available nucleotide sequences, indicated that the Stripe-headed Rhabdornis (*Rhabdornis mystacalis*) and the Stripe-breasted Rhabdornis (*Rhabdornis inornatus*) differ by 1.0%, a considerably large divergence for putatively closely related species. Using the rate cali-

bration for passerines of 0.13% divergence per million years for RAG-1 gene sequence, as estimated by J. G. Groth and G. F. Barrowclough, it can be calculated that these two rhabdornis species diverged 7.7 million years ago. This estimated timing predates the emergence and geological upliftment of other large islands of the central and southern Philippines during the last 2–5 million years, the Pliocene and Pleistocene periods. This divergence among the founder population may have taken place on the island of Luzon, the oldest land formation in the archipelago, with later colonization of other islands towards the south soon after their emergence from the ocean floor. This estimate, however, remains tentative, and may well change as more refined models of molecular clocks are devised. One unique feature revealed by the sequence alignment of *R. mystacalis* with other muscicapoids is the deletion of one amino acid, glutamine. Insertion or deletion of amino acid in nuclear protein-coding genes such as RAG-1 is a rare event, even for non-sibling species, and can be considered a useful marker to delineate higher-level groupings.

Although Rhabdornithidae appears not to be so highly speciose as other families within the Muscicapidae, the early split of the lineage from Sturnidae, and its many novel features, would seem sufficient to warrant retention of the group as a separate family until more data on its evolution and biology have been gathered, and until a clearer resolution of the whole oscine phylogeny has been found. In this connection, it is interesting to note that in the most recent edition of *The Howard and Moore Complete Checklist of the Birds of the World*, published in 2003, the editor has retained the family Rhabdornithidae and placed it between the Mimidae and the Sturnidae. Whether this phylogenetic position will hold for this endemic Philippine family of birds, which various authors have described as being "aberrant", "very aberrant" and "obscure", is dependent on future developments in the field of molecular systematics.

Turning to the genus itself, the number of species of rhabdornis that have been accepted by ornithologists has varied over the years. In the nineteenth century, it was typical of taxonomists of the time to accord full species status to each new bird population discovered that was in any way different from another. In 1909, McGregor reported three species, *R. mystacalis*, *R. minor* and *R. inornatus*. In 1911, he offered the name *R. longirostris* for a potential fourth species, this based on one specimen from Negros which had a longer bill and larger feet than individuals of *R. mystacalis* from Luzon. With the rise of the subspecies concept in the middle of the twentieth century, the various taxa were "lumped" into two distinctive species, *R.*



The **Stripe-breasted Rhabdornis** is very similar in plumage to the **Grand Rhabdornis** (*Rhabdornis grandis*); while current taxonomy lists them as separate species on the basis of different body, bill and tail lengths, the validity of this treatment is under review. Although rhabdornis have been considered closely related to the treecreepers (*Certhiidae*), to the extent of being grouped within that family, they lack morphological adaptations, such as stiffened rectrices or long claws, that would enable them to ascend tree trunks and thereby favour such a taxonomic relationship.

[*Rhabdornis inornatus alaris*,
Mt Kitanglad, Mindanao,
Philippines.
Photo: Simon Harrap]

mystacalis and *R. inornatus*, and most subsequently discovered taxa were described as subspecies of one or the other of these two. The result was that *R. mystacalis* included subspecies *minor* and *longirostris*, as well as the nominate race, and *R. inornatus* incorporated the nominate race and the new subspecies *leytensis*, *alaris*, *zamboanga* and *abori*. In 1952, however, F. Salomonsen described a new species, similar to *R. inornatus* but decidedly larger in all body measurements, most prominently in the bill. He named it *R. longirostris*, unaware that the name was preoccupied by McGregor's "species", and in 1953 he renamed it as *R. grandis*. Fourteen years later, Greenway, in Peters's *Check-list of Birds of the World*, concluded that *grandis* should be a subspecies of *R. inornatus*, a treatment followed by duPont in 1971 in his *Philippine Birds*. Salomonsen, however, was not happy about this, and in his 1973 review of duPont's book, in *The Auk*, he stated "I do not agree that *Rhabdornis grandis* is a geographical race of *R. inornatus* as it differs so remarkably in size, the long tail, the long curved bill, etc."

So, are there two, three or more species of rhabdornis? Dickinson and colleagues, in their 1991 checklist of Philippine birds, followed Salomonsen in recognizing the Grand Rhabdornis (*Rhabdornis grandis*) as a full species, a decision based on examination by Kennedy of the two specimens available at that time. This treatment was followed by many subsequent authors, in particular by Inskipp and colleagues in 1996 and by Kennedy and co-authors in 2000. This, however, is certainly not the end of the story. Dickinson examined the type specimen of *R. grandis*, and concluded that it was merely a larger subspecies of *R. inornatus*; this explains the note regarding an expected taxonomic review of the genus *Rhabdornis* in Kennedy and colleagues' *A Guide to the Birds of the Philippines*, of which Dickinson was one of the five authors. It is not surprising, therefore, that Dickinson, in his role as editor of the third edition of *The Howard and Moore Complete Checklist*, preferred to treat *grandis* as a subspecies of the Stripe-breasted Rhabdornis.

For the time being, it seems better to continue to recognize three species of rhabdornis, partially for reasons of conservatism but, more importantly, because a major review is currently underway. It is hoped that this study, which is being undertaken by Kennedy, H. Miranda and A. Jones, will clarify the taxonomy of *Rhabdornis* in respect of the number of valid species that it contains, whether it be two or three or, perhaps, even as many as

five. The Stripe-breasted and Grand Rhabdornis can be considered to form a superspecies, and it seems most unlikely that the Stripe-headed Rhabdornis consists of anything more than a single superspecies, if that.

Morphological Aspects

Rhabdornis are medium-sized to rather small passerines. The smallest is the subspecies *minor* of the Stripe-headed Rhabdornis, with an overall length of about 15 cm, whereas the largest, the Grand Rhabdornis, has an average length of about 17 cm. They are generally brown or greyish-brown above and white below, and all three species have a dark blackish-brown to greyish-brown facial mask bordered to a greater or lesser extent by white. In 1909, McGregor aptly described the salient morphological aspects of *Rhabdornis*, and the following is a paraphrasing of his words. All three of the species have wings of moderate length and somewhat pointed. The first, outermost, primary is narrow and short, being less than one-third the length of the second, which is almost as long as the third; the fourth and fifth primaries are the longest and are almost equal in length. The tail is square-ended and short, its length little more than half the width of the wing. The moderately long bill is gently curved, slender, and distinctly compressed laterally beyond the nostril. It has a hint of a notch in the cutting edge near the tip, and a distinct ridge along the culmen; the nostril is linear, exposed, and with an overhanging operculum. There are only a few rictal bristles, and these are very short. Frontal bristles are lacking, but several long backward-pointing hairs are present among the feathers of the forehead. The tarsus is equal to or shorter than the length of the middle toe with claw, and longer than the distance from the nostril to the bill tip; it is holothecal, the divisions between the scutes being obsolete.

The Stripe-headed Rhabdornis is easily distinguished from the other two species by the presence of white shaft streaks bordered by black on the otherwise brown crown and nape, and by the pure white breast and belly, with bold clear black and white streaks on the sides or flanks. The Stripe-breasted and Grand Rhabdornis lack white streaking on the head, and have greyish-white underparts with less bold streaks on both the breast and the flanks. A. Rand and Rabor, in 1960, and Parkes, eleven years

later, commented on the uniformity of the colour characteristics within and between subspecies of the Stripe-headed Rhabdornis. Examination of representatives of each population from northern Luzon south to Basilan corroborates these authors' statements.

Among the taxa included in the Stripe-breasted and Grand Rhabdornis, there are only slight differences in plumage colour. All geographical populations have varying amounts of white streaking on the hindneck, forming a collar; in the Stripe-breasted Rhabdornis, the nominate race and *leytensis* have the most white and the southern subspecies *alaris* has the least. With the exception of the last-named taxon, all populations of these two species have white spots on the lesser and median upperwing-coverts. The white spots on the hindneck, the side of neck and the wing-coverts of *inornatus* and *leytensis* make these two subspecies the most decorated of all taxa within the *R. inornatus* superspecies.

Bill length or culmen length in this genus is very interesting, and is one of the key attributes that helps to separate species and subspecies. Salomonsen, when first describing *R. grandis*, pointed out that the two "superspecies" (see Systematics) that co-exist in the eastern Philippine Islands, from Luzon south to Mindanao, exhibit a parallel development in bill length. On Luzon, the bill of the nominate race of the Stripe-headed Rhabdornis and that of the Grand Rhabdornis average almost the same size, 26 mm and 25 mm, respectively, while on Mindanao the race *minor* of the Stripe-headed Rhabdornis and subspecies *alaris* of the Stripe-breasted Rhabdornis have smaller but similar-sized bills measuring 21 mm and 20 mm, respectively. This pattern does not hold, however, in the west-central Philippines: on Panay and Negros, the nominate race of the Stripe-headed Rhabdornis has a bill length of 26 mm or more, whereas race *rabori* of the Stripe-breasted Rhabdornis has a bill about 20 mm long.

In 1899, Whitehead described the tongue of the Stripe-headed Rhabdornis as being "brush-tipped", and added that it was similar to that of other insectivorous birds that feed among flowers. Recent examination of the tongue of two specimens of this rhabdornis in the Delaware Museum of Natural History, in the USA, revealed that there are two ribbon-like projections extending from the tip of the tongue. Each of these projections is about 2.5 mm long, is 0.5 mm wide at the base, and tapers from the base to a point at the tip.

For the most part, rhabdornis show very little difference between the sexes. In general, females are slightly smaller than males, and are browner on the crown and face mask than males.

Recently fledged rhabdornis are very similar to adults but tend to be lighter brown, with less distinct striping.

As mentioned previously, rhabdornis do not possess any of the specialized morphological features, such as stiffened tail feathers or long claws, that would support their description as "creeping" birds. Their wings have no significant modifications for specialized flight. On the other hand, they do have fairly large, strong legs and feet that are well suited for hopping among branches of trees, and also for hanging from outer branches when securing small fruits and insects (see Food and Feeding).

Habitat

Rhabdornis live in both primary forest and secondary forest, and forest edge, from the lowlands to the montane zone, ascending to about 1750 m. They do not hesitate to fly across clearings or valleys, and they will forage in individual isolated trees when in clearings. They prefer the canopy and middle storey of the forest, and rarely come down to within a metre or so of the ground.

Generally, the Stripe-breasted and Grand Rhabdornis are altitudinally segregated from the Stripe-headed Rhabdornis. This is particularly true of populations of each group on Luzon, Mindanao and Negros, where the subspecies of the first two rarely occur below 800 m and those of the Stripe-headed Rhabdornis rarely exceed 1000 m. On Samar, Leyte, Biliran and Panay the Stripe-breasted Rhabdornis ranges down to lower elevations, presumably because there is very little higher-elevation forest remaining for the species on these islands. The lowest elevation recorded for the subspecies *leytensis* is at 230 m in the foothills of Mount Lobi, in central Leyte, where two specimens were obtained in May and June of 1964. The Stripe-breasted and Stripe-headed Rhabdornis thus overlap altitudinally on these islands. The Stripe-breasted Rhabdornis superspecies has not been found on Catanduanes, Masbate, Bohol, Calicoan, Dinagat and Basilan, which are relatively flat islands and do not therefore offer the altitudinal structure required to support more than one species; the Stripe-headed Rhabdornis is the only member of the family living on these islands.

General Habits

As with all other areas of their life, the habits of the rhabdornis are very poorly known. They are very active birds, usually travelling in single-species flocks or joining mixed flocks containing such species as the Elegant Tit (*Periparus elegans*), the Sulphur-billed Nuthatch (*Sitta oenochlamys*), fantails (*Rhipidura*) and leaf-warblers (*Phylloscopus*). The Stripe-headed Rhabdornis tends to travel in larger groups of up to 20 or so individuals, while the other two species normally move in smaller groups of ten or fewer. They hop and jump among main tree branches as they proceed towards the smaller outer branches. They do not creep, despite the earlier English name of "Philippine creepers", which indicates that such behaviour was widely suspected, but they do walk along branches. D. Amadon and S. G. Jewett, in their 1946 paper, were the first to mention that rhabdornis do not creep; these authors wrote that, rather, the bird "hopped briefly into view" and that they "saw no signs of creeping in the manner of *Certhia*".

When perched, rhabdornis tend to sit upright and perpendicular to branches. They usually sit in this manner on smaller branches, even on the tops of branches in dead trees. Periods of sitting are normally short, lasting for a few seconds, but longer sessions of 15–20 seconds are not uncommon, and there is at least one record of an individual sitting motionless for over one minute.

Rhabdornis have an undulating flight, with shallow wingbeats at the bottom of the undulation. They will often cover distances of 200 m or more in flight, before alighting again.

In the evening, at twilight, as many as several hundred rhabdornis have been seen to fly in to roost trees in clearings in the forest. This has been observed on several occasions, particularly in the forests of eastern Mindanao. One such event was recorded in detail in Kennedy's field notes of 3rd October 1982.

While the rhabdornis constitute a poorly known family, the paucity of information regarding the three species' vocalizations appears to be as much due to their taciturn nature as to inadequate research. The genus is not known to sing, and the main calls, given while foraging or perched, are relatively unremarkable, quiet, short and high-pitched notes, often given in succession. Sometimes breaking with this pattern, the **Stripe-headed Rhabdornis** also gives an explosive note amidst a more expansive, but otherwise barely audible, four-note series.

[*Rhabdornis mystacalis*
mystacalis,
Mt Maliking, Luzon,
Philippines.
Photo: Ketil Knudsen]



At 17:00 hours, near a quarry at an elevation of about 760 m, a flock of 30–50 rhabdornis, believed all to be Stripe-breasted Rhabdornis, flew into the top of a 30-m tree isolated in a clearing; some began to sally out on the outer branches, appearing very nervous. Between 17:15 and 17:20 hours a further eight individuals flew in to the tree, followed by three more in the ensuing eight minutes; no rhabdornis left the tree. The birds arrived singly or in groups of two or three, from all directions, from the surrounding forest. By 17:30 there was little movement, and it was almost dark; all activity had ceased by 17:37 hours. All of the rhabdornis roosted within 60 cm of the outermost branches, and many within the top 30 cm. Observations ceased at 17:41, ten minutes before total darkness prevailed. This roosting behaviour is similar to that of the Short-tailed Starling (*Aplonis minor*) on Mindanao, but the latter usually ends up sleeping in nesting cavities at its breeding colonies.

Voice

There is little to be said about the vocalizations of the rhabdornis. They are essentially unmusical, high-pitched utterances, and consist of a rapid series of several similar-sounding notes, "tsee", "tzit" or "zeet", strung together. Series can contain four or more notes. Generally, the vocalizations of these birds are hardly audible, but some notes have been described as having an explosive quality.

Food and Feeding

Rhabdornis are opportunistic omnivores. They feed on insects, including caterpillars and the contents of cocoons, which they glean from beneath and on bark and among leaves and in flowers, and they consume seeds and fruits, which they obtain in the outer branches of trees. When travelling in flocks through the forest, they tend to feed more on insects.

When foraging in fruiting or flowering trees, they usually visit the trees singly or in small groups, and not in a flock. Here, they will approach from all directions. Having arrived in the tree, they then pluck fruits, usually pea-sized or smaller ones, while perched; alternatively, they sally out to the last limbs and pluck the fruit, and then either fly to a perch to consume the food or fly back in the direction from which they came. Whitehead was the first to describe the foraging behaviour of rhabdornis. In his 1899 "Field-Notes" published in *The Ibis*, he recorded that a feeding Stripe-headed Rhabdornis, which he watched in Isabella, on Luzon, reached forward among flowers, much in the same way as spiderhunters (*Arachnothera*). Rhabdornis also indulge in aerial flycatching, and they will chase insects that fly out while they are foraging. In addition, Kennedy and colleagues, in 2000, reported that on one occasion more than 100 Stripe-breasted Rhabdornis gathered at a site in eastern Mindanao in order to exploit "termites [Isoptera] or some other similar flying insect", which they caught by flycatching. They are known also to eat small vertebrates. For example, a Stripe-breasted Rhabdornis on Mindanao was once seen to consume a tree-frog.

In duPont and Rabor's 1973 paper on the birds of the island of Dinagat, Rabor describes the foraging habits of the race *minor* of the Stripe-headed Rhabdornis in some detail. He recorded that the bird went about its daily feeding activities usually singly or in pairs, "creeping on the trunks and branches of trees of moderate heights", and also that a pair was occasionally seen to feed at the ends of small branches. In this latter method of feeding, the pair alighted on small twigs nearest the leaves containing the food items in which the birds were interested; he remarked that, when they foraged in this manner, there was no creeping action at all but "the birds behaved like ordinary perching bird species". Rabor commented that, when the rhabdornis feeds on the flowers and fruits at the ends of twigs in the manner of other birds, it is possible that it does not need to creep, whereas, "when it is after insect food, it creeps and examines the branches and trunks for possible tidbits".

Rabor's observation describes fairly accurately the foraging behaviour of rhabdornis, with the exception of the "creeping" behaviour. As contended elsewhere (see Morphological Aspects, General Habits), rhabdornis, when actively foraging for insects, rarely creep. Rather, they jump, hop, run, walk and fly between branches while gleaning or probing, or they sally for insects at the end of branches among leaves, or they capture invertebrates by means of aerial flycatching.

Breeding

Very little is known about the breeding behaviour and biology of *Rhabdornis*. Whitehead, in his 1899 field notes, reported that one of his hunters had told him that he had shot a Stripe-headed Rhabdornis while it was building a nest in a hole in a tree.

More than 80 years later, in 1981, Kennedy observed a pair of Stripe-breasted Rhabdornis of the subspecies *leytensis* which was building a nest in the hole of tree on Biliran Island, north of Leyte. He watched the pair from 09:40 to 14:50 hours on 8th April and from 08:30 to 13:39 on 9th. A reforestation guard at the site, which was at an elevation of 600 m, identified the partially dead tree as being a binoloan (*Acmena acuminatissima*), a member of the family Myrtaceae. The tree was about 1 m in diameter at the base and about 20 m tall. It was located at the forest edge, 30 m below the crest of a ridge covered with cogon grass (*Imperata cylindrica*). The presumed nest-cavity was about 15 m from the ground, inside a knothole of 10–13 cm diameter located at an old junction of two large branches, with the main branch before the junction about 20–25 cm in diameter. The two birds collected four or five short sticks 5–8 cm in length, about the size of a toothpick, from the upper outer branches of the nest tree or from other forest trees up to 200 m away; in addition, they brought in two yellow-green red-stemmed leaves, each about 7 cm long, and a piece of shredded bark. All items were carried in the bill. On returning, the rhabdornis would usually land in the nesting tree before entering the nest-hole, but on two occasions they flew directly into the hole from adjacent areas. The time spent inside the nest-cavity by an individual varied from 10 seconds to as much as 6 minutes, and there were two occasions when both partners were in the nest-hole together for up to 2 minutes. Once, one of the rhabdornis emerged with a fluffy white object, possibly a down feather or spider webs, and proceeded to attach this to the upper rim of the nest-hole opening.

In their 1990 report on the birds of Mount Isarog National Park, in south-east Luzon, S. Goodman and P. Gonzales recorded that, on 29th February 1988, they had seen a Stripe-headed Rhabdornis as it entered an excavated hole in a tree, carrying food in its bill; the hole was about 5 m above the ground. Also, two nest cavities of the Grand Rhabdornis were recently found, in dead trees 10–15 m above the ground.

Except for the already mentioned dates for presumed active nesting, information on the timing of breeding of rhabdornis comes from data on the tags of scientific skins, or from specimens of what are obviously recently fledged individuals. If information exists on specimen labels, it usually includes details of gonad size, direct or estimated measurements indicating enlarged testes or an enlarged ovary, or the presence of an egg in the oviduct.

Timing of breeding appears to be similar for all rhabdornis. Most breeding activity begins in late March and continues through May to early June. "Egg about to be laid", or some similar statement, was written on labels of Rabor's specimens of Stripe-headed Rhabdornis; these were of the nominate race, from Mount Bulusan, in south-east Luzon, on 30th April, and of the subspecies *minor*, from Samar on 16th April and from Leyte on 30th May. Records of recently fledged young include, for the Stripe-breasted Rhabdornis, two in February, one in April and three in May, all of the subspecies *alaris*, with one of the nominate race in June and one of the subspecies *rabori* in April. For the Stripe-headed Rhabdornis, there are single records of recently fledged young of the nominate race in May and June, and singles of the subspecies *minor* in May and August. The August fledgling came from Mindanao, and was obtained by Governor C. Forbes in 1922. An-



For a family whose members are not particularly rare and occur on several major Philippine islands, it is curious that so little is known about rhabdornis breeding biology. There have been a few observations of birds, such as this **Stripe-headed Rhabdornis**, apparently nesting in cavities in tree trunks or branches. But what goes on inside the presumed nest-hole remains a mystery. There is no information at all for the family on nest structure or clutch size, the division of parental responsibilities or nestlings.

[*Rhabdornis mystacalis*
mystacalis,
Mt Maliking, Luzon,
Philippines.
Photo: Ketil Knudsen]

other "anomalous" date involved a male Stripe-breasted Rhabdornis of the race *leytensis*, which had enlarged testes in July.

It is not surprising that for so poorly known a family, there is no detailed information available on the nests themselves, nor, of course, on the eggs, the clutch size and the nestlings. The breeding biology of *Rhabdornis* remains unknown.

Movements

Rhabdornis are non-migratory, and there is no evidence to suggest that any of the species undertakes seasonal altitudinal movements. They do move through the forest in flocks, and they may make reasonably long flights to fruiting or flowering trees in search of food, but they are, within these constraints, essentially resident.

Relationship with Man

The members of this family eat seeds and fruits, and are likely, therefore, to be important in dispersing seeds throughout the forest. They consume insects in the forest and forest edge, but they have not been recorded entering agricultural fields or orchards. Any possible beneficial effects of rhabdornis as consumers of insects considered by humans to be injurious remain to be determined.

As this is a small family of three poorly known species, all confined to the Philippine Islands, it is a target avian group for both resident and visiting birdwatchers seeking to observe it in the field. Consequently, the rhabdornis have a moderate economic importance to the Philippines.

Status and Conservation

The three species of rhabdornis are considered to vary from uncommon to common, and none is listed in the Red Data Books. It is widely known, however, that the Philippines are undergoing an "ecological meltdown", as frequently noted by Miranda, and that the forests are retreating up the sides of mountains, leaving lowlands and foothills with mixed agriculture and cogon grasslands.

The loss of lowland forests poses a particular threat to the Stripe-headed Rhabdornis, since it is basically a lowland spe-

cies, rarely reaching above 1000 m. Although almost all of the islands of the Philippines are being denuded, Negros is probably in the worst condition of any of the larger islands where rhabdornis occur. Most of the forest below 1000 m is virtually gone on Negros. Moreover, in 1911, McGregor pointed out that a specimen of the Stripe-headed Rhabdornis from Negros had a much longer bill and larger feet than those of its counterparts on Luzon, and he remarked that, if this trait held in a series of specimens, the Negros population "may be known as *Rhabdornis longirostris*" (see Systematics). Some 50 years later, Rand and Rabor, with additional specimens to hand, agreed with McGregor and elevated the taxonomic status of the Negros population to that of a subspecies. This decision was reviewed in 1971 by Parkes, who did not concur with Rand and Rabor's conclusion, and "*longirostris*" has since been considered to be no more than a long-billed population of the nominate race of the Stripe-headed Rhabdornis, like the long-billed population in northern Luzon.

Be that as it may, rhabdornis do not fly long distances, and it is likely that the Negros birds, and probably the Panay ones, too, have been genetically isolated for at least the last 10,000 years since the Pleistocene. The point here is that at the species level, or even at the subspecies level as we now know them, no rhabdornis taxon is rare or threatened. Nevertheless, the final word on the systematics of this group is still to be written, and we should therefore consider each disjunct population as a discrete conservation unit. This applies whether populations are separated by water, as are those of the Stripe-headed Rhabdornis, or by lowlands and/or water, as are the populations of the two other species currently recognized.

General Bibliography

Amadon & Jewett (1946), Anon. (2007k), Bock (1994), Butchart & Stattersfield (2004), Cibois & Cracraft (2004), Delacour & Mayr (1946), Dickinson (2003), Dickinson *et al.* (1991), Goodman & Gonzales (1990), Greenway (1967c), Groth & Barrowclough (1999), Hail (1996, 2002), Inskipp *et al.* (1996), Jönsson & Fjeldså (2006b), Kennedy *et al.* (2000), Mayr (1957), McGregor (1909, 1911), Meyer de Schauensee & duPont (1962), Morony *et al.* (1975), Ogilvie-Grant (1896b), Orenstein (1977), Orenstein & Kennedy (1985), Parkes (1971, 1973), duPont (1971b), duPont & Rabor (1973b), Poulsen (1995), Rand (1948, 1950a, 1970), Rand & Rabor (1957, 1960), Ripley & Rabor (1961, 1968), Salomonsen (1952, 1953a, 1973), Sharpe (1903), Sibley (1996), Sibley & Ahlquist (1990), Sibley & Monroe (1990, 1993), Steinbacher (1984a), Whitehead (1899), Worcester (1898), Worcester & Bourns (1898), Zuccon *et al.* (2006).



PLATE 7

Family RHABDORNITHIDAE (RHABDORNIS) SPECIES ACCOUNTS

PLATE 7

Genus *RHABDORNIS* Reichenbach, 1853

1. Stripe-headed Rhabdornis

Rhabdornis mystacalis

French: Rhabdornis à tête striée

Spanish: Rhabdornis Común

German: Streifenkopf-Trugbaumläufer

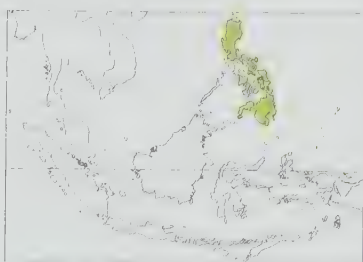
Other common names: Stripe-headed Creeper, Stripe-sided Rhabdornis

Taxonomy. *Meliphaga mystacalis* Temminck, 1825, neighbourhood of Manila, Luzon, Philippines. Proposed race *longirostris* (from vicinity of Cadiz, in N Negros) described on basis of long bill, but bill length evidently no different from that of birds of nominate race from N Luzon. Two subspecies currently recognized.

Subspecies and Distribution.

R. m. mystacalis (Temminck, 1825) – N & WC Philippines (islands of Luzon, Catanduanes, Masbate, Panay and Negros).

R. m. minor Ogilvie-Grant, 1896 – Samar, Biliran, Leyte, Bohol, Calicoan, Dinagat, Mindanao and Basilan, in EC & S Philippines.



Descriptive notes. 15.1–17.5 cm; 22.4–31.5 g. Male nominate race has crown and nape dark brownish-black, feather centres white (forming bold white streaks); upperparts dark brown, becoming redder towards rump, mantle feathers with conspicuous white shaft streaks continuing from streaks on hindneck and becoming inconspicuous towards lower back; upperwing and tail dark brown; broad facial mask from lores and extending to nape dark brown to black, bordered by narrow white eyebrow; throat and centre of breast and belly pure white, feathers of side of breast, flanks and undertail-coverts with bold white centres bordered by dark brown and black (forming broad stripes); iris dark brown; bill black or dark horn; legs dark horn. Female differs from male in having lighter brown crown and facial mask. Immature is similar to adult but browner above, including mask, with less conspicuous streaks on head and mantle, has buff-white underparts with streaks on flanks less contrasting. Race *minor* is similar to nominate in plumage but distinctly smaller, with shorter bill (20 mm, compared with 25 mm of nominate). Voice. Calls during foraging and when perched a series of “zeet” notes. Also recorded is an unmusical high-pitched “tsee tsee wick-tsee”, first notes hardly audible, followed by explosive “wick” syllable of last phrase.

Habitat. From virgin forest to forest edge and clearings, from sea-level to 1000 m, rarely higher.

Food and Feeding. Varied diet, including insects (e.g. caterpillars), and fruits and seeds. Forages in flocks of up to 20 or more individuals, moving rapidly through canopy and middle storey and gleaning insects from beneath bark and under leaves. Also joins mixed-species feeding flocks, especially those with Elegant Tit (*Periparus elegans*); one such flock joined by present species on Luzon consisted also of Philippine Woodpecker (*Dendrocopos maculatus*), several Philippine Orioles (*Oriolus steerii*), a number of Blackish Cuckoo-shrikes (*Coracina coerulescens*) and several small leaf-warblers (*Phylloscopus*). Will travel several hundred metres to a flowering or fruiting tree, arriving singly or in small groups; plucks seeds and fruits from outer branches by sallying out and hovering momentarily under those branches.

Breeding. On basis mainly of data on gonad condition of specimens, most breeding activity from Mar, or perhaps Feb, to Jun or early Jul; oviduct eggs in mid-Apr on Samar and end May on Leyte; recently fledged young 28th Apr to 9th Aug. Apparently nests in tree cavity. No other information.

Movements. Resident. Only local foraging movements documented.

Status and Conservation. Not globally threatened. Fairly common throughout range. Presence on Biliran known only from sight record. Forests below 1000 m are rapidly disappearing throughout Philippines, putting this lowland and middle-elevation species at possible risk; Negros population likely to be the first in danger, as almost all lower-elevation forests on that island have already been destroyed. Present but relatively rare in Rajah Sikatuna National Park, on Bohol.

Bibliography. Amadon & Jewett (1946), Brooks *et al.* (1996), Delacour & Mayr (1946), Dickinson *et al.* (1991), Gilliard (1950a), Goodman & Gonzales (1990), Kennedy *et al.* (2000), McGregor (1909, 1911), Meyer de Schauensee & duPont (1962), Ogilvie-Grant (1896b, 1897a, 1897b), Orenstein & Kennedy (1985), Parkes (1971, 1973), duPont (1971b), duPont & Rabor (1973b), Rand (1970), Rand & Rabor (1960), Salomonsen (1952), Whitehead (1899), Worcester & Bourns (1898), Zuccon *et al.* (2006).

2. Grand Rhabdornis

Rhabdornis grandis

French: Rhabdornis à long bec

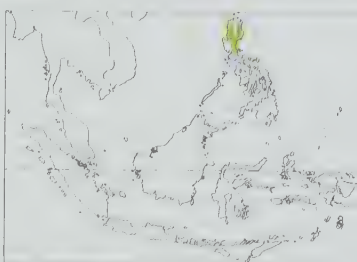
Spanish: Rhabdornis Grande

German: Langschnabel-Trugbaumläufer

Other common names: Long-billed Rhabdornis/Creeper

Taxonomy. *Rhabdornis grandis* Salomonsen, 1953, Kainay, Abra Province, Luzon, Philippines. Originally described under the name *longirostris*, but that name invalid, as preoccupied. Forms a superspecies with *R. inornatus* and often considered conspecific, but differs somewhat in size and proportions; taxonomic review currently in progress. Monotypic.

Distribution. Cordillera Mts and Sierra Madre of N & NC Luzon, in N Philippines.



Descriptive notes. 16.3–18 cm; 45–46 g. Male has crown dark grey, feathers with darker grey to black tips; hindneck grey, leading to brown on back (with very faint shaft streaks), rump reddish-brown; lesser upperwing-coverts with conspicuous white shaft streaks and/or spots bordered by dark brown, primaries dark brown, secondaries reddish-brown; tail dark brown; blackish-brown mask from lores to nape, bordered above by white supraocular stripe and below by indistinct white malar stripe; black spots on side of neck behind mask; throat light grey; upper breast mottled grey and white, some black spots continuing from side of neck;

side and flank feathers greyish-white, reddish-brown margins forming streaks that fade into side of breast; belly dirty white, undertail-coverts as flanks; iris brown; bill black or dark horn; legs brownish-grey. Female is similar to male in plumage, but slightly smaller. Immature plumage undescribed; thought to be similar to adult. Voice. Calls described as quiet high-pitched “zip zip zeet zip”; some notes have short trill-like quality, “zrrrrt”.

Habitat. Middle-elevation and higher-elevation primary and secondary dipterocarp and hardwood forests, including logged forest. Not known from high-elevation pine (*Pinus*) forest, but likely to occur in mixed pine and hardwood forests.

Food and Feeding. Varied diet, including insects, seeds and fruits; green seeds and fleshy fruits found in stomachs. Found singly and in small groups, also in mixed-species flocks. Group of six individuals observed while foraging in crown of isolated tree along logging road at 700 m in Sierra Madre (in Cagayan Province); arrived at fruiting tree one or two at a time, flying across a valley from adjacent forests; same tree attracted several Philippine Hanging-parrots (*Loriculus philippensis*), Buzzing Flowerpecker (*Dicaeum hypoleucum*) and also *R. mystacalis*.

Breeding. Both male and female specimens had brood patches and enlarged gonads in early May. Two nest-holes were 10–15 m up in dead trees; bark strips seen being brought as nest material. No other information.

Movements. No movements known.

Status and Conservation. Not globally threatened. Restricted-range species: present in Luzon EBA. Generally uncommon and local; locally rather common in Sierra Madre, which is probably the species' only real stronghold. Main threat is large-scale deforestation, occurring throughout its range. Apparent ability to survive in secondary forest, however, suggests that it is moderately secure.

Bibliography. Dickinson *et al.* (1991), Kennedy *et al.* (2000), Mayr (1957), duPont (1971b), Poulsen (1995), Rand (1970), Rand & Rabor (1960), Salomonsen (1952, 1953a, 1973).

3. Stripe-breasted Rhabdornis

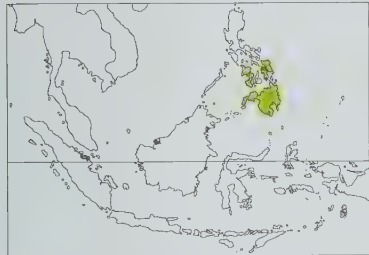
Rhabdornis inornatus

French: Rhabdornis à tête brune **Spanish:** Rabdornis Cabecipardo
German: Braunkopf-Trugbaumläufer
Other common names: Plain-headed/Stripe-breasted Creeper

Taxonomy. *Rhabdornis inornatus* Ogilvie-Grant, 1896, Samar, Philippines. Forms a superspecies with *R. grandis* and often considered conspecific, but differs somewhat in size and proportions; taxonomic review currently in progress. Proposed race *zamboanga*, described from Masawan, on Mt Malindang (E Zamboanga Peninsula), in W Mindanao, treated as synonym of *alaris*. Four subspecies currently recognized.

Subspecies and Distribution.

R. i. rabori Rand, 1950 – Panay and Negros, in WC Philippines.
R. i. leytenensis Parkes, 1973 – Biliran and Leyte, in EC Philippines.
R. i. inornatus Ogilvie-Grant, 1896 – Samar, in EC Philippines.
R. i. alaris Rand, 1948 – Mindanao, in S Philippines.



centres (contributing to necklace); throat mottled dirty white and grey; flank feathers white bor-

Descriptive notes. 15.2–18.8 cm; 35–40 g (excluding *rabori*). Male nominate race has crown brownish-grey with slightly darker feather edges, hindneck brown with prominent white shaft streaks (forming decorative necklace); back brown with faint shaft streaks, rump redder with very faint streaks; lesser upperwing-coverts with conspicuous white shaft streaks or spots, primaries dark brown, secondaries brown; tail dark brown; dark brown mask from lores to hindneck, bordered above by supra-ocular line of white feathers with dark brown margins and below by whitish malar, neck behind mask with dark brown feathers with white

dered by reddish-brown (giving striped appearance), pattern fading into breast, centre of breast and belly dirty white, undertail-coverts similar to flanks but with striping less clearly defined; iris dark brown; bill black; legs dark horn. Female is similar to male but lighter brown, including on mask. Immature is browner above than adult, underparts heavily streaked and washed with buff. Races differ mainly in presence or absence of decorative collar and white spots on lesser wing-coverts: *leytenensis* is very similar to nominate, but crown greyer; *alaris* lacks collar and lacks white shaft streaks/spots on lesser coverts; *rabori* is larger than others, with greyer crown, face mask and throat, and inconspicuous shaft streaks on hindneck. **Voice.** Calls described as a high-pitched "tzit", repeated often, sometimes in rapid series as "tzit tzit tzit tzit".

Habitat. Usually in submontane and montane forests above 800 m, up to 1750 m; on Samar, Leyte, Biliran and E Mindanao ranges lower, down to 500 m or below, lowest records two specimens at 230 m in foothills of Mt Lobi (Leyte). Apparently prefers canopy of tall dipterocarp trees and the transition zone between dipterocarp and mid-mountain forest types on Mt Malindang, in W Mindanao. Uses forest edge and second growth, and crosses clearings to reach isolated fruiting trees.

Food and Feeding. Opportunistic, eating a wide range of items including insects, and seeds and fruits, and once a small tree-frog; seen to eat small pea-sized (c. 5 mm) red berries on Mindanao. One individual attempted to eat contents of a cocoon, but without success. Tends to stay in upper and middle canopy of forest, and rarely seen near ground, but does not hesitate to perch openly on dead branches. Forages in small groups of up to ten individuals, and will join mixed-species flocks; will gather in large numbers at times when food concentrated and abundant, and aggregation of over 100 individuals reported at insect emergences. While foraging for insects, jumps and hops among branches and leaves, gleaning. Individual on Mindanao hopped among outer branches, reaching under, stretching up or sallying out to pluck berries; at one point it perched perpendicularly on a branch next to a cluster of berries, and picked off and ate six berries in 33 seconds; after feeding, it flew to exposed dead branch. Captures emerging termites (Isoptera) or similar flying insects by aerial flycatching.

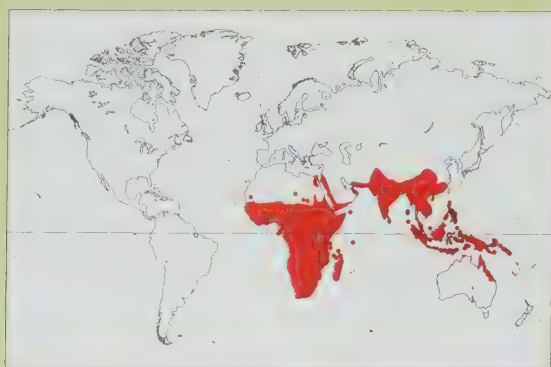
Breeding. Nest construction observed in early Apr on Biliran; birds with enlarged gonads in Apr and May and immatures in Feb and Apr–Jun. Nest in tree cavity; Biliran nest was being built c. 15 m above ground in hole of partially dead tree, provisionally identified as a binoloan (*Acmena acuminatissima*), two adults brought in small sticks 5–8 cm long, leaves c. 7 cm long and a piece of shredded bark, and time spent by birds inside nest-hole varied from 10 seconds to 6 minutes. No other information.

Movements. Resident.

Status and Conservation. Not globally threatened. Relatively uncommon and local. Status on Panay not evaluated; only one sight record, of two individuals. Widespread habitat destruction is taking place throughout this species' range. On Negros, now confined to the few remaining forests: on Mt Kanla-on, around L Balinsasayao and on Cuernos de Negros.

Bibliography. Brooks & Dutton (1997), Delacour & Mayr (1946), Dickinson *et al.* (1991), Kennedy *et al.* (2000), Mayr (1957), McGregor (1909), Meyer de Schauensee & duPont (1962), Ogilvie-Grant (1896b, 1897a, 1897b), Orenstein & Kennedy (1985), Parkes (1973), duPont (1971b), Rand (1948, 1950a, 1970), Rand & Rabor (1957, 1960), Ripley & Rabor (1956, 1961, 1968), Salomonsen (1952, 1973), Whitehead (1899), Worcester & Bourns (1898), Zuccon *et al.* (2006).

Class AVES
Order PASSERIFORMES
Suborder OSCINES
Family NECTARINIIDAE (SUNBIRDS)



- Small, slender passerines with long, usually decurved bill, some with long tail; many brightly coloured, most with some iridescence, particularly in male.
- 8–23 cm.



- Old World.
- All vegetated habitats.
- 16 genera, 132 species, 396 taxa.
- 7 species threatened; none extinct since 1600.

Systematics

The sunbirds and spiderhunters comprise a well-characterized and fairly uniform family of 132 species, distributed over Africa and much of the southern part of Asia eastwards to the Australo-Papuan region. Species richness of the African nectariniids is highest in montane areas and upland savannas, centres of radiation in the recent past, although what are phylogenetically the oldest species in Africa are probably those inhabiting the Guineo-Congolese rainforest. For the family as a whole, R. C. K. Bowie's studies of nuclear and mitochondrial DNA have pointed to an Asian origin of the sunbirds, which is supported by recent analyses of vocalizations.

The syrinx is tracheobronchial, which is typical of oscine passerines, and is acromyoidian, meaning that the muscles are attached to the extremities.

Over the years, relationships between Nectariniidae and other avian groups, and the generic boundaries within the family, have been subject to varied and changing opinion. C. J. Sundevall, in his 1872 classification, placed the sunbirds in a "cohort Cinnyri-morphae", referred to also as the "Tubilingues", in which he also included four other families, consisting of some of the Neotropical honeycreepers (Thraupidae), the Hawaiian honeycreepers (Drepanididae), the Australian pardalotes (Pardalotidae) and the two sugarbirds (Promeropidae) of southern Africa, on the basis of tongue structure and a diet in which nectar figures prominently. He grouped the flowerpeckers (Dicaeidae) with the *Zosterops* white-eyes, some other Neotropical honeycreepers, the New World warblers (Parulidae) and the Australian pardalotes (*Pardalotus*) in another cohort, "Cichlomorphae", on the basis chiefly of their having nine, rather than ten, long primaries. Some ten years after Sundevall's publication, H. Gadow included the Malagasy false-sunbirds (*Neodrepanis*) in his family Nectariniidae.

Sixty years later, J. Delacour, considered the sunbirds to be close to the Dicaeidae, a view supported by E. Mayr and D. Amadon. Further, Amadon removed *Neodrepanis* from the Nectariniidae, placing it in the asity family Philepittidae, and he recognized *Hypogramma* as a separate genus. W. J. Beecher grouped the sunbirds with the flowerpeckers and white-eyes in the "sylvioid nectar feeders", which he considered to be derived from the bulbuls (Pycnonotidae), all of which he treated within an expanded family Sylviidae. In J. L. Peters's *Check-list of Birds of the World*, A. L. Rand presented the Nectariniidae as five genera, namely *Anthreptes*, *Hypogramma*, *Nectarinia*, *Aethopyga* and

Arachnothera. About a decade thereafter, W. S. Peckover and L. W. C. Filewood included in the Nectariniidae the two *Toxorhamphus* longbills, a genus traditionally classified as meliphagid but more recently found to be linked with the berrypeckers in the family Melanocharitidae. H. E. Wolters introduced a further three genera: *Deleornis*, for one of the *Anthreptes* species; *Paradeleornis*, for another of the *Anthreptes* and for one of the *Nectarinia* sunbirds; and *Haplocinnyris*, in which he placed one other of the *Nectarinia* species.

Towards the later part of the twentieth century, C. G. Sibley and J. E. Ahlquist, on the basis chiefly of evidence obtained from their studies involving DNA-DNA hybridization, presented a slightly different arrangement. Their classification included an enlarged Nectariniidae, which they split into two subfamilies. These were the Promeropinae, containing the two *Promerops* sugarbirds, and the Nectariniinae; the latter was further divided into two tribes, namely the Nectariniini, including the same genera as in Rand's Nectariniidae, and the Dicaeini, which housed the two flowerpecker genera *Prionochilus* and *Dicaeum*. M. P. S. Irwin then expanded the number of sunbird genera by splitting *Anthreptes* and *Nectarinia*; he added *Deleornis* and *Hedydipna*, formerly merged with *Anthreptes*, and *Anabathmis*, *Dreptes*, *Anthobaphes*, *Cyanomitra*, *Chalcomitra*, *Leptocoma* and *Cinnyris*, all of which had previously been subsumed in *Nectarinia*.

R. A. Cheke and C. F. Mann, in their 2001 monograph, added the genus *Chalcoparia*, which had previously been merged with *Anthreptes*, and *Drepanorhynchus*, hitherto treated within *Nectarinia*. Both of these resurrected genera are monotypic. It seems sensible, for the sake of convenience, to follow this latest arrangement for the time being, although it is worth noting that the genus *Hedydipna* has been replaced by *Anthodiaeta*, which has been shown to have precedence over the former name. Furthermore, it is very likely that future research will lead to additional changes in the coming years.

In the sequence presently followed, the first genus in the family is *Chalcoparia*. This contains a single species, the Ruby-checked Sunbird (*Chalcoparia singalensis*), found in South-east Asia and the Greater Sundas. This species has the bill shorter than the head, with a very slightly curved culmen, a straight lower mandible and, in contrast to other sunbirds, no serrations. The non-tubular tongue is similarly unique among the nectariniids, coming closer to that of some flowerpeckers, particularly the *Prionochilus* flowerpeckers. In terms of its habits, the Ruby-checked Sunbird

is reminiscent more of the white-eyes and of small babblers (Timaliidae). The argument that it is somewhat distant from other sunbirds is supported by Bowie and colleagues' study of nuclear and mitochondrial DNA of this avian group. This genus may merit separation in a monotypic family or subfamily.

The two species in *Deleornis*, the Scarlet-tufted (*Deleornis fraseri*) and Grey-headed Sunbirds (*Deleornis axillaris*), are of West and Central African distribution. In the past they were considered conspecific, but they are probably better treated as two members of a superspecies. The bill is short, stouter than that of *Anthreptes* and almost straight, with a completely straight lower mandible. The tapered tongue is slightly convex in cross-section, and the distal quarter forms two incomplete, much-fimbriated tubes. The tail is nearly square, with the outermost rectrices much shorter than the rest. *Deleornis* exhibits no iridescence in the plumage, and the only outward difference between the sexes is that the males possess brightly coloured pectoral tufts. These sunbirds are rather similar to the Old World warblers (Sylviidae) in appearance and behaviour.

Fourteen species, occurring in Africa, South-east Asia, the Greater Sundas, the Philippines and western Wallacea, make up the genus *Anthreptes*. Their habits are, again, reminiscent of those of Old World warblers. All are small, and have a rather short, slightly curved bill with the basal third straight. The tongue is long and narrow, forming a tube for four-fifths of its length, with the distal fifth bifurcate and creating two incomplete tubes, each with three points on the inner edge. The square-ended tail is of short or medium length, and never elongated. Some members of the genus display marked sexual dichromatism, and most, at least in the male, have some iridescence. Analyses of mitochondrial DNA have suggested the possibility that the genus as currently constituted is not monophyletic, as the African members represent a separate lineage and should, therefore, be placed in a separate genus. This is supported by the results of preliminary studies of the alimentary canal. The Plain-backed (*Anthreptes reichenowi*), Anchieta's (*Anthreptes anchietae*), Plain (*Anthreptes simplex*), Mouse-brown (*Anthreptes gabonicus*) and Little Green Sunbirds (*Anthreptes seimundi*) appear to be isolated, none hav-

ing any close relative. In contrast, the Brown-throated (*Anthreptes malacensis*) and Grey-throated Sunbirds (*Anthreptes griseigularis*) were for many years treated as conspecific, but they are now considered to be separate species forming a superspecies. They are distinct not only in plumage, but also in details of measurements, and they show no evidence of hybridization or introgression. Although the range of the Red-throated Sunbird (*Anthreptes rhodolaemus*) is contained entirely within that of the Brown-throated Sunbird, these Oriental species appear to be close relatives of each other and the Red-throated may be part of the same superspecies. J. C. Brown concluded that the Grey-throated Sunbird once inhabited much of the present area of distribution of the Brown-throated Sunbird in Indonesia and the Philippines, but that, during the last glaciation, it was replaced in the former region, and in much of the latter archipelago, by *malacensis*. The Grey-throated Sunbird is now found only in eastern parts of the Philippines, and the only island inhabited by both of these species is Mindanao, where the Grey-throated Sunbird is present only to the east of the Diuata range, whereas its relative is found only to the west of this range. There may have been two invasions of the Philippines by the Brown-throated Sunbird, first by representatives of the "chlogaster group" and latterly by the "nominate group".

The Western Violet-backed (*Anthreptes longuemarei*), Kenya Violet-backed (*Anthreptes orientalis*), Uluguru Violet-backed (*Anthreptes neglectus*) and Violet-tailed Sunbirds (*Anthreptes aurantius*) form a superspecies, their ranges exhibiting barely any geographical overlap. The first three are particularly closely related, as was indicated by the results of the molecular-genetic study undertaken by Bowie and co-workers. The Straight-billed Green Sunbird (*Anthreptes rectirostris*) and the geographically isolated Banded Sunbird (*Anthreptes rubritorques*), once considered to be conspecific, constitute a further superspecies.

Four species confined to Africa and Arabia are united in the genus *Anthodiaeta*. These are small sunbirds having a short, broad-based bill with only a slight curvature, which begins at the base. The proximal three-quarters of the long tongue are narrow and flat, with the edges rolled inwards to form two tubes, and the

The sunbirds are generally small, fairly slim birds, and males of many species, such as the **Ruby-cheeked Sunbird**, are brightly coloured. The English name of this species refers to the male's copper ear-coverts, which are framed by an iridescent blue-green crown and chestnut throat and upper breast. The Ruby-cheeked Sunbird occupies a monotypic genus and is unusual amongst the Nectariniidae in its bill and tongue structure. In all family members, the bill is narrow and pointed, but only the Ruby-cheeked lacks fine serrations near the tip. Unlike most sunbirds, its bill is shorter than its head, its lower mandible is straight rather than decurved, and the tongue is flattened rather than tubular. It has been suggested that it may merit treatment in a separate monospecific family.



[*Chalcoparia singalensis*
assamensis,
Mengyang National Nature
Reserve, Yunnan, China.
Photo: Dong Lei]



Not surprisingly, in a sizeable family of 132 species shared among 16 genera, there is a considerable array of plumage patterns and coloration types. As well as differences between genera, there is also considerable variation within individual genera. At first glance, one could be forgiven for thinking that the birds in this pair of photographs were not closely related, but they are: both the **Brown-throated Sunbird** and the **Plain Sunbird** belong to the genus *Anthreptes*. Both these individuals are males, vividly representing opposite extremes in terms of plumage coloration. The Brown-throated shows strong sexual dichromatism, males being significantly brighter than females in all 16 races. These differ mainly in the male's plumage tone and the colour of the iridescence. The races fall into two plumage groups. This individual, a bird of the nominate race, is in the group of males that have iridescent violet upperparts and vivid yellow underparts, as opposed to the iridescent dark green upperparts and olive-green underparts of the other group. In contrast to this spectacular species, the aptly named Plain Sunbird is dull olive-green above and greyish-olive below in both sexes. There is, however, partial sexual dichromatism, as the female lacks the male's metallic blue or green forehead.

[Above: *Anthreptes malacensis malacensis*, Chinese Garden, Singapore. Photo: Jimmy Chew.



Below: *Anthreptes simplex*, Panti Forest, Peninsular Malaysia. Photo: Ong Kiem Sian]

distal quarter is bifurcated and forms two complete tubes, with the inner edges fimbriated. They are sexually dimorphic, and the males of two of the species, the Pygmy Sunbird (*Anthodiaeta platura*) and the Nile Valley Sunbird (*Anthodiaeta metallica*), have the central rectrices greatly elongated. Plumage iridescence is present only in the males of these two, but in both sexes of the two short-tailed species. Once considered to be conspecific, the Pygmy and Nile Valley Sunbirds constitute a well-defined superspecies, and a third species, the Collared Sunbird (*Anthodiaeta collaris*), is probably close to these two. The fourth member of this genus, the Amani Sunbird (*Anthodiaeta pallidigaster*), is somewhat different from the others, and it has been suggested that it may be close to the Oriental genus *Leptocoma*, although it has a much shorter bill than the latter and exhibits few similarities in plumage.

Hypogramma contains a single, medium-sized species, the Purple-naped Sunbird (*Hypogramma hypogrammicum*), found in South-east Asia, Sumatra and Borneo. It has a longish bill with a curved culmen and straight lower mandible. The tongue, unlike that of any other sunbird, is rolled at the edges to form two half-tubes for much of its length; the distal fifth is split centrally, the inner edges deeply fimbriated, and each half is split again for half of its length, thereby forming a four-pronged brush-like tip. The tail is rounded. The male differs from the female in having a metallic purplish nuchal patch and tufts of elongated metallic feathers at the base of the lower back, characters found in no other sunbird. The Purple-naped Sunbird is somewhat babbler-like in its behaviour. It possibly merits separation in its own subfamily.

The genus *Anabathmis* houses three small to medium-sized West African nectariniids. All have a strong bill, decurved from the base, and a graduated tail. The Principe (*Anabathmis hartlaubii*) and Newton's Sunbirds (*Anabathmis newtonii*) may form a superspecies, although the former is much the larger of the two, but the third member of the genus, Reichenbach's Sunbird (*Anabathmis reichenbachii*), is rather different in appearance. The first two species are superficially more similar to *Dreptes* than they are to Reichenbach's Sunbird. Bowie's work on the molecular genetics of sunbirds places *hartlaubii* and *reichenbachii* at some distance from each other, and each closer to some members of *Cinnyris* than those members are to other sunbirds currently placed in *Cinnyris*. However, Iddi's analyses of vocalizations place *hartlaubi*, *newtonii* and the Sao Tome Sunbird (*Dreptes thomensis*) closer to *reichenbachii* than to any other species, suggesting that *reichenbachii* invaded from the continent and radiated on the islands.

Placed in the monotypic *Dreptes*, the Sao Tome Sunbird is, like Newton's Sunbird, confined to the island of São Tomé, in the Gulf of Guinea, West Africa. The largest of all sunbirds, it has a long decurved bill, a long graduated tail, and only slight iridescence in the plumage. The sexes are similar. The genus is probably close to *Anabathmis*, showing certain resemblances to two of the three species. This view is supported by analyses of vocalizations, the results of which are as yet unpublished.

Another monotypic genus contains a South African species, the Orange-breasted Sunbird (*Anthobaphes violacea*). This has a medium-long, thin and curved bill. The edges of the long, narrow tongue are curled inwards to form two tubes; the distal quarter is bifurcate, forming two non-fimbriated tubes with helical walls. The tail is graduated, and that of the male has the central rectrices noticeably elongated. A recent DNA study suggests that the Orange-breasted Sunbird is closer to some *Cinnyris* species than some members of the latter genus are to each other.

The genus *Cyanomitra* contains eight species confined to Africa. These are medium-sized, with a long, heavy bill that is slightly but distinctly curved. The long, narrow tongue has rolled edges, forming a single complete tube, over three-quarters of its length; the distal quarter broadens, and is split to create two almost complete tubes, the inner edges of which are jagged. The males are larger than the females, and sexual dichromatism is apparent in five species. The Green-headed (*Cyanomitra verticalis*), Bannerman's (*Cyanomitra bannermani*), the Cameroon (*Cyanomitra oritis*) and the Blue-headed Sunbirds (*Cyanomitra alinae*) possibly form a group, and could perhaps be considered as a superspecies, the first two being particularly

There is substantial variation in tail length among nectariniids, and this characteristic also plays its part in sexual dimorphism. Males of 21 species of sunbird in six genera have elongated central tail feathers, a feature absent in their females. These protruding rectrices form roughly half the overall length of the **Pygmy Sunbird**. This species is one of four species that make up the genus *Anthodiaeta*, which occurs in Africa and Arabia. These small sunbirds have a short, slightly decurved bill with a broad base.

[*Anthodiaeta platura*, Lake Chad, Bornu, NE Nigeria.
Photo: A. P. Leventis]



closely related to each other. The relationship of *alinae*, *oritis* and *verticalis* is supported by Bowie's DNA results, which indicate that the Blue-throated Brown Sunbird (*Cyanomitra cyanolaema*) is a sister-taxon to this group. The Eastern Olive Sunbird (*Cyanomitra olivacea*) and the Western Olive Sunbird (*Cyanomitra obscura*) lack iridescence, and were for long considered to be conspecific. P. A. Clancey separated them, a taxonomic decision accepted both by Irwin, in volume VI of *The Birds of Africa*, and by Cheke and Mann, in their 2001 monograph, although Irwin, after reconsideration, expressed the view that the two should be recombined as a single species. Intriguingly, a molecular-genetic study, using mitochondrial DNA, appears to



The only member of its genus, the **Purple-naped Sunbird** differs sufficiently from other sunbirds in its tongue morphology and babbler-like behaviour to prompt suggestions that it merits its own subfamily. This large, stocky sunbird has a fairly long bill, the upper mandible of which is decurved and the lower straight. Both sexes are olive-green above, and broadly olive-yellow below. The male differs from the female in having an iridescent nuchal half-collar, lower back, rump and uppertail-coverts, the colour of which varies from blue to purple in the five races. The elongated feathers of the lower back are not found in any other sunbird.

[*Hypogramma hypogrammicum*, *hypogrammicum*, Tabin Reserve, Sabah, Borneo.
Photo: Jimmy Chew]



demonstrate that neither the Eastern Olive Sunbird nor the Western Olive Sunbird, as presently understood, is monophyletic. The Mouse-coloured Sunbird (*Cyanomitra veroxii*) and the Blue-throated Brown Sunbird are rather different from their congeners, and also from each other. The latter's female plumage resembles that of other *Cyanomitra* species, whereas the male's plumage is suggestive of *Chalcomitra*.

Seven African species are placed in the genus *Chalcomitra*, which seems to be close to *Cyanomitra*. These are medium-sized

to large, rather stocky sunbirds with a heavy, markedly decurved bill. The tongue structure is similar to that of *Cyanomitra*, but the tongue broadens at the tip and is less deeply bifurcated. The tail is square-ended. The males are generally larger than the females, and most of the seven species are also sexually dichromatic, some markedly so but others only slightly. Two have pectoral tufts, and the rest do not. The plumage is primarily brown, males having some iridescent brighter feathering on the head, at least. There is an exception to this general rule, the geographically isolated Socotra Sunbird (*Chalcomitra balfouri*) differing from all others in the genus in that it lacks iridescence, the male having female-like plumage. The Socotra Sunbird appears to have no close relative. The Carmelite (*Chalcomitra fuliginosa*), Amethyst (*Chalcomitra amethystina*) and Green-throated Sunbirds (*Chalcomitra rubescens*) constitute a well-marked group, perhaps forming a superspecies, although the Green-throated Sunbird has been linked to the Buff-throated Sunbird (*Chalcomitra adelberti*). The Scarlet-chested (*Chalcomitra senegalensis*) and Hunter's Sunbirds (*Chalcomitra hunteri*) have mostly discrete ranges and form a superspecies. The studies of nuclear and mitochondrial DNA by Bowie and others found that *amethystina*, *rubescens* and *adelberti* were linked, with *senegalensis* also close. Mitochondrial DNA studies undertaken by B. H. Warren and colleagues, however, associated the Buff-throated and Scarlet-chested Sunbirds with three species in other genera, namely the Long-billed Green (*Cinnyris notatus*) and Red-chested Sunbirds (*Cinnyris erythrocercus*) and the Bronze Sunbird (*Nectarinia kilimensis*).

In tropical Asia, five small species of sunbird, all possessing a curved, rather weak bill, make up the genus *Leptocoma*. The genus is characterized by having the nasal operculum feathered. The tongue has rolled edges forming a single tube proximally, this becoming a double tube with a common inner wall, and finally two separate tubes over the distal tenth of its length. The tail varies from being short and square to being rounded or graduated, and to being fairly long. There is much velvety feathering, but iridescence in the plumage is restricted. The Crimson-backed (*Leptocoma minima*) and Purple-throated Sunbirds (*Leptocoma sperata*) could be considered to form a superspecies, and the Black (*Leptocoma sericea*) and Copper-throated Sunbirds (*Leptocoma calcostetha*) could be regarded as forming another; it has been suggested also that, instead, the Purple-throated and Black

The three members of the West African genus *Anabathmis* are small to medium-sized sunbirds. All three share two key morphological features: a thickset, decurved bill; and a graduated tail.

Reichenbach's Sunbird differs from its congeners, however, in possessing pectoral tufts and being only very slightly sexually dichromatic. Both sexes have a dark metallic blue head and throat, with a violet and green sheen; a pale grey breast and upper belly; and yellow pectoral tufts, lower belly and undertail-coverts. The female only differs from the male in being slightly smaller and having duller pectoral tufts. Such male-type plumage is very unusual for sunbirds that lack sexual pronounced dichromatism.

[*Anabathmis reichenbachii*, Limbe Botanical Gardens, Cameroon.
Photo: Ketil Knudsen]



Current taxonomy treats *Anthobaphes* as a monotypic genus, comprising the **Orange-breasted Sunbird**. Recent DNA analysis, however, has introduced a modicum of doubt, the species emerging as genetically closer to some *Cinnyris* sunbirds than some members of this genus are to each other. Whatever its taxonomic relationships, the male Orange-breasted Sunbird is a striking bird, with its elongated central tail feathers and metallic green head, throat, upper breast and mantle. A subtle violet breastband separates the throat from otherwise orangish underparts. The female shows none of the male's finery.

[*Anthobaphes violacea*, South Africa.
Photo: Michael Gore]

The African genus *Cyanomitra* comprises eight medium-sized species with fairly long, hefty, decurved bills. The **Mouse-coloured Sunbird** is, as its name suggests, one of the duller species. The sexes are alike, being grey-brown above, with a metallic blue-green sheen in two races, and dull greyish-olive below. All *Cyanomitra* have pectoral tufts, but the **Mouse-coloured Sunbird** differs from all but one of its congeners in that both sexes have them, rather than just the male. The pectoral tufts are used to good effect in display, when birds will expose the tufts while fluttering the wings and raising the tail.

[*Cyanomitra veroxii*
veroxii,
Nkwale Valley,
KwaZulu-Natal,
South Africa.
Photo: Guy Upfold]

The genus *Chalcomitra* consists of seven African species. All are medium-sized and rather heavily-built, with a long, strong, markedly decurved bill. Members of this genus are predominantly dark brown, with iridescence generally restricted to the male's head, but the male **Hunter's Sunbird** is very attractively attired. It has a vivid scarlet lower throat and breast, a green moustachial stripe and purple gloss to the lesser wing-coverts and uppertail-coverts that feature prominently on an otherwise black plumage. As with all congeners bar one, **Hunter's Sunbird** shows strong sexual dichromatism.

[*Chalcomitra hunteri*
hunteri,
Kenya.
Photo: Arthur Morris/
Birds As Art]

Sunbirds form a superspecies. The Purple-rumped Sunbird (*Leptocoma zeylonica*) is probably close to the first pair. Below the species level, the rather uniform "brasilianna group" of subspecies of the Purple-throated Sunbird may perhaps warrant separation as a species, distinct from the rather varied "nominate group". As mentioned within the preceding paragraphs, it has been suggested that the Amani Sunbird, an Afrotropical species currently placed in *Anthodiaeta*, may, in fact, be closer to this Asiatic genus, but the Amani Sunbird not only has a different plumage from that of *Leptocoma* but also a much shorter bill than that of the latter genus.

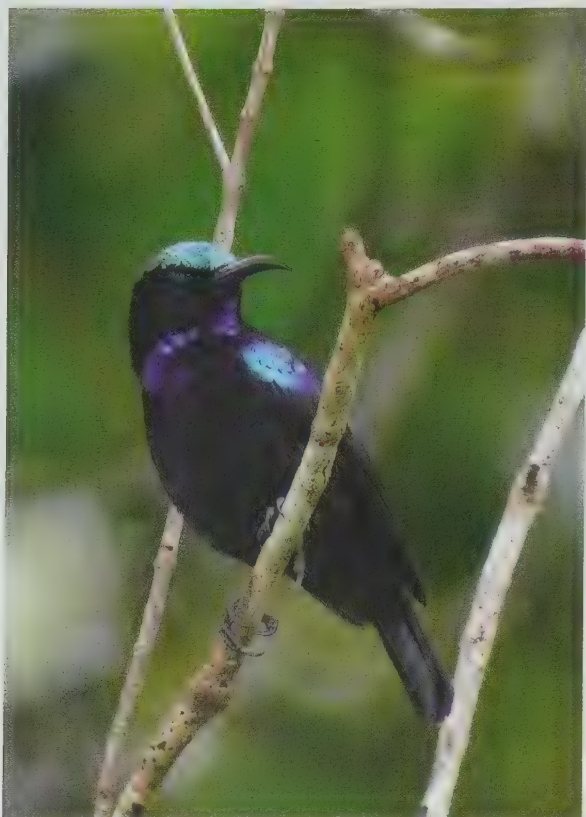
The genus *Nectarinia* comprises six medium-sized, sleek African sunbirds with a rather straight or curved bill of medium to long length. The tongue is very long and narrow, with the edges rolled inwards to form a tube; the distal tenth is bifurcated, opening out to form two tubes of helical structure with somewhat jagged edges. Males in this genus exhibit much iridescence in the plumage, and have the tail square-ended or graduated, with the central rectrices elongated and protruding 45–130 mm beyond the next longest pair. Males of two of the species have pectoral tufts. The females have dull-coloured plumage, chiefly olive above and pale yellowish to greyish below, with an iridescent dark tail. Bocage's (*Nectarinia bocagii*), Purple-breasted (*Nectarinia purpureiventris*) and Tacazze Sunbirds (*Nectarinia tacazze*) possibly constitute a superspecies, and the Red-tufted (*Nectarinia johnstoni*) and Malachite Sunbirds (*Nectarinia famosa*) another. The Bronze Sunbird seems to be more isolated. Bowie's DNA-based research indicates a link between *famosa* and *johnstoni*, and suggests also a grouping of the Purple-breasted, Tacazze and Bronze Sunbirds, but, interestingly, it places the Golden-winged Sunbird (*Drepanorhynchus reichenowi*) within this latter group.

The Golden-winged Sunbird, an African highland species, is the sole member of the genus *Drepanorhynchus*. It is a rather large sunbird, with a markedly decurved bill. The male has a long tail, the central feathers of which are greatly elongated. Uniquely among sunbirds, both sexes have large golden patches on the wings and tail. Both also have a V-shaped unfeathered area extending from the bill base through the forehead to the forecrown; this groove accumulates pollen as the bird probes in flowers, and it increases in size with wear, becoming up to 9.5 mm long and up to 3.2 mm across at its widest point, near the bill.



Fifty species are contained in *Cinnyris*, making this by far the biggest genus in the family. Its range covers Africa, Madagascar, the Indian Ocean islands, the Middle East, tropical Asia, the New Guinea region and Australia. These are for the most part medium-sized sunbirds with a fine, slightly or strongly decurved, short or medium-length bill. The tongue is long and narrow, the sides curving inwards to form two tubes; the distal 15% or so is split to form two separate tubes, with no obvious fimbriations except at the very tip. The males have iridescent





plumage, especially on the upperside, and they usually possess pectoral tufts, whereas the females are plain and lack pectoral tufts. The males of four of the 50 species have markedly elongated central rectrices. The genus can be divided into six groups, as follows: 16 species of double-collared sunbird; twelve purple-banded species; four maroon species, based on the colour of the underparts of the Superb Sunbird (*Cinnyris superbus*) and its two close relatives, and with the somewhat arbitrary inclusion of the Rufous-winged Sunbird (*Cinnyris rufipennis*); four species of white-bellied sunbird; two olive species, namely Ursula's (*Cinnyris ursulae*) and Bates's Sunbirds (*Cinnyris batesi*); and twelve species in a miscellaneous group comprising the Copper Sunbird (*Cinnyris cupreus*) and species which do not occur on the African mainland.

The first of these groups contains three possible superspecies. The Miombo Double-collared (*Cinnyris manoensis*) and Southern Double-collared Sunbirds (*Cinnyris chalybeus*) form one of these, Stuhlmann's Double-collared (*Cinnyris stuhlmanni*), Prigogine's Double-collared (*Cinnyris prigoginei*), the Montane Double-collared (*Cinnyris ludovicensis*) and the Greater Double-collared Sunbirds (*Cinnyris afer*) perhaps form a second superspecies, and the Eastern Double-collared (*Cinnyris mediocris*), Moreau's (*Cinnyris moreaui*) and Loveridge's Sunbirds (*Cinnyris loveridgei*) constitute a third. Close relationships among this last trio are supported by Bowie's findings from nuclear and mitochondrial DNA analyses, which also link the Southern Double-collared and Northern Double-collared Sunbirds (*Cinnyris reichenowi*) to these three and, more distantly, to the Greater Double-collared and Regal Sunbirds (*Cinnyris regius*). Further studies of mitochondrial DNA, carried out by Bowie and colleagues, indicate that Moreau's Sunbird, rather than being a hybrid between Eastern Double-collared and Loveridge's Sunbirds as had been suggested, is indeed a valid taxon. They indicate also that the Eastern Double-collared Sunbird should be divided into three species, with the nominate race, *usambarica* and *fuelleborni* each accorded species status, although the position of the southernmost race, *bensoni*, is unclear. In this analysis, *moreaui*, *loveridgei* and *fuelleborni* were found to form a sister-clade to *mediocris* and *usambarica*. In 2005, Irwin treated the two subspecies of Shelley's Sunbird (*Cinnyris shelleyi*) as separate species, a decision taken on morphological grounds and

on the basis that their distributions possibly overlap in southern Tanzania. In addition, it has recently been suggested that the subspecies *pintoii* of the Miombo Double-collared Sunbird should be considered a separate species, as it and the nominate race overlap geographically but not ecologically in Zambia. Also, an undescribed taxon apparently closely related to the Greater Double-collared Sunbird, but probably closer to the Montane Double-collared of the subspecies *whytei* or to the Miombo Double-collared Sunbird, has recently been discovered in the Eastern Arc mountains of Tanzania and in north-east Zambia. In Tanzania, it seems to be fairly common at some localities in the Udzungwas and the Rubeho Mountains, occurring at forest edges and towards the rainshadow north-west of the mountains. Populations of this taxon in Zambia have been found nesting at Mutinondo and Kipiri Mposhi, building nests of grass and laying eggs that were pale and freckled. This contrasts with the Miombo Double-collared Sunbird, which, in Zambia, makes its nests from *Usnea* lichen and lays dark plain olive or chocolate-coloured eggs.

Finally, DNA analysis suggests a relationship between the Olive-bellied Sunbird (*Cinnyris chloropygius*) and the Tiny Sunbird (*Cinnyris minullus*), but also links them with two species from the "maroon group", namely the Superb and Rufous-winged Sunbirds.

The second group, the purple-banded species, contains four superspecies: the first consists of the Mariqua (*Cinnyris mariquensis*) and Shelley's Sunbirds; the second, the Congo (*Cinnyris congensis*) and Red-chested Sunbirds; the third, the Common Purple-banded (*Cinnyris bifasciatus*) and Tsavo Purple-banded Sunbirds (*Cinnyris tsavoensis*); and the fourth, the Violet-breasted (*Cinnyris chalcopelas*) and Pemba Sunbirds (*Cinnyris pembae*). A close relationship of *erythrocercus*, the Red-chested Sunbird, with *bifasciatus* and *mariquensis* is supported by Bowie's study of nuclear and mitochondrial DNA. This study further indicates a relationship between the Palestine (*Cinnyris osea*) and Orange-tufted Sunbirds (*Cinnyris bouvieri*). The "white-bellied group" contains one superspecies, comprising Oustalet's (*Cinnyris oustaleti*) and the White-breasted Sunbirds (*Cinnyris talatala*); interestingly, other DNA work suggests a relationship between these two and, from the "purple-banded group", the Palestine and Orange-tufted Sunbirds.



The five species of *Leptocoma* occur over a broad band stretching from India east to New Guinea. All have a relatively long, slight, decurved bill, but tail length and shape varies considerably among species. The males are very striking, their mainly black plumage providing the backdrop to patches of vivid colour and metallic sheen. All five species are sexually dichromatic, with the female considerably drabber. The male **Black Sunbird** is predominantly velvet-black, with a metallic gloss to the crown, upperwing-coverts, mantle, uppertail-coverts and throat, the colours of which vary according to race.

[*Leptocoma sericea*
aspioides,
Ambon, Moluccas.
Photo: Ron Hoff]

The **Golden-winged Sunbird** is the sole member of the genus *Drepanorhynchus*. It inhabits uplands in East Africa and eastern parts of West Africa. This large, striking nectariniid has a sharply decurved bill and substantial golden areas on the wing and tail. The tail in both sexes is long and graduated, particularly in the male, where the central rectrices extend 70 mm beyond the others and can form a third of the bird's overall length. Both sexes have a V-shaped, unfeathered groove between the bill and the forehead, which can measure nearly 1 cm. As the bird reaches inside flowers, pollen accumulates in this unusual feature.

[*Drepanorhynchus*
reichenowi *reichenowi*,
Mount Kenya National
Park, Kenya.
Photo: Walter Mankel]

The genus *Nectarinia* has often been extended to include a large proportion of sunbird species, but nowadays it is normally defined much more narrowly.

As such, it comprises six African species, all medium-sized and slim. Bill shape varies among the species, being straight in some and decurved in others. Male tail shape also differs: it is square-ended in some species, but graduated in others, such as the **Tacazze Sunbird**. Males of all species have elongated central rectrices, those of the Tacazze Sunbird extending rather less than those of most of its congeners. All *Nectarinia* are sexually dichromatic, although the males of some, including the Tacazze Sunbird, assume a less gaudy plumage outside the breeding season.

[*Nectarinia tacazze jacksoni*,
Ngorongoro crater,
Tanzania.

Photo: Günter Ziesler]



In the "miscellaneous group" there are two apparent super-species. The first contains the Olive-backed (*Cinnyris jugularis*) and Apricot-breasted Sunbirds (*Cinnyris buettikoferi*), and could possibly include also the Flame-breasted Sunbird (*Cinnyris solaris*), although this and the Olive-backed Sunbird overlap considerably in range. These species are Asian in distribution, the first extending to Australia. The second superspecies contains the Souimanga (*Cinnyris sovimanga*), Humblot's (*Cinnyris*

humbloti) and Anjouan Sunbirds (*Cinnyris comorensis*) from the Malagasy Region. A close relationship among these three is suggested by Bowie's studies, and subsequent mitochondrial DNA studies by Warren and co-workers place the Seychelles Sunbird (*Cinnyris dussumieri*) in this clade, with the Orange-tufted, Variable (*Cinnyris venustus*) and the white-bellied species as a sister-group. Bowie's molecular-genetic investigations also indicate a close relationship between the Copper Sunbird and the Beautiful Sunbird (*Cinnyris pulchellus*), the latter belonging to the "double-banded group". Warren and colleagues found that the Long-billed Green Sunbird of the Malagasy Region was apparently closely related not only to the Red-chested Sunbird, but also to the Scarlet-chested and Buff-throated Sunbirds, both in the genus *Chalcomitra*, and the Bronze Sunbird, in *Nectarinia*. Further, and supported by geological evidence, the latter studies indicate two invasions of the Indian Ocean islands by sunbirds since about 3·9 million years ago. One, involving the "notatus clade", colonized first the Comoro Archipelago, and then Madagascar. The second, the "sovimanga clade", invaded the Comoros, and subsequently evolved several lineages, including four extant ones. The first of these four reached the Seychelles (*C. dussumieri*), the second (*C. coquerellii*) is found on Mayotte, and the third (*C. humbloti*) on Grand Comoro and Mohéli; finally, the fourth lineage evolved on the Comoro island of Anjouan (*C. comorensis*), and then invaded Madagascar (nominate race of *C. sovimanga*) and finally the Aldabra atoll (races *abbotti*, *aldabrensis* and *buchenorum* of *C. sovimanga*).

With 18 species in total, *Aethopyga* is the second largest genus in the family. It is restricted to tropical Asia, where eight of the species occur in the Philippines. Seven of these are, indeed, confined to that archipelago, which is where the genus exhibits its greatest radiation, and which is perhaps its area of origin. The bill of *Aethopyga* is slightly longer than the head, and is decurved, with a ridged culmen; the nostrils are bare, longitudinal and operculate. The long tongue is rolled inwards at the sides to form a tube, which towards the tip has two lateral splits forming two groove-like structures, and with a ventral plate which may be used to convert the two lateral grooves into two separate tubes. The tail is graduated, and the males of many species have the central rectrices projecting far beyond the others. The sexes differ in plumage. The male almost invariably has a contrasting yel-

Some 50 species, more than one-third of all sunbirds, are currently placed in the genus *Cinnyris*, making it far the largest genus in the family. It is also the most widespread, with a cumulative range extending from the Middle East, to Africa and from tropical Asia to Australia. Most of its members are medium-sized, and have a fine, decurved, short to medium-length bill. The genus can be split into six groups. The **Mariqua Sunbird** is one of twelve purple-banded species, so termed because of their violet-blue breastband. Within this group, as with many *Cinnyris*, males have bright iridescent plumage while the females are much duller.



[*Cinnyris mariquensis*
mariquensis,
Nylsvley Nature Reserve,
Limpopo, South Africa.
Photo: Warwick Tarboton]

low patch of variable size on the lower back and rump, and the female frequently has this feature. Four superspecies are recognized. The Apo (*Aethopyga boltoni*) and Lina's Sunbirds (*Aethopyga linaraborae*) form one, and this may possibly include also the Flaming Sunbird (*Aethopyga flagrans*). The Lovely (*Aethopyga shelleyi*) and Handsome Sunbirds (*Aethopyga bella*), previously considered conspecific, constitute another superspecies, and Vigors's Sunbird (*Aethopyga vigorsii*) and the Crimson Sunbird (*Aethopyga siparaja*), likewise previously considered conspecific, form a third. The fourth superspecies in this genus consists of the Javan (*Aethopyga mystacalis*) and Temminck's Sunbirds (*Aethopyga temminckii*), which were previously united under the name "Scarlet Sunbird".

Last in the current sequence of nectariniid genera is *Arachnothera*, containing the ten species of spiderhunter. All of these are inhabitants of tropical Asia. They are robust, and larger than almost all of the sunbirds. The sexes are similar and, unlike the majority of sunbirds, both sexes incubate. Most of the spiderhunters have greenish plumage, and all of them lack iridescence. The bill is long or very long, at least twice the length of the head, stout, strongly decurved, and with a ridge between the nostrils. The long tongue is rolled to form a complete tube for most of its length, but it has two lateral splits on its distal tenth, and these also are inwardly rolled to form two tubes, which are completed by the ventral section, as is the case with the *Aethopyga* sunbirds. The Grey-breasted (*Arachnothera modesta*) and Streaky-breasted Spiderhunters (*Arachnothera affinis*) are sometimes considered to form a superspecies. Although the nominate

race of the former and the subspecies *everetti* of the latter overlap in range in Borneo, *everetti* is generally found at higher altitudes than those frequented by the Grey-breasted Spiderhunter. These two species, incidentally, have in the past sometimes been treated as conspecific or, perhaps more often, *everetti* was considered a separate, monotypic species, and all other taxa combined under *A. affinis*.

As a final point, some suspicions have been expressed that an undescribed nectariniid species occurs in Djibouti, on the north-east African coast of the Red Sea. Cheke and Mann, in their 2001 monograph, put forward the view that the individual birds reported were probably of a known species, such as a Shining Sunbird (*Cinnyris habessinicus*) or a Mariqua Sunbird, the crown of which had become dusted with yellow pollen.

It is quite apparent that there remains much to be learnt about the relationships of the species within this family. Many of the newer approaches to the classification of these birds have been based almost entirely on molecular-genetic evidence, and continuation of such investigative research will no doubt throw up further reasons for modifying the existing taxonomy. It is worth bearing in mind, however, that evidence derived from anatomical and morphological studies, studies of vocal and breeding behaviour and other phenomena could prove of equal interest and scientific value.

Morphological Aspects

The members of this family are small to very small, the sunbirds generally ranging in length from 8 cm to 16 cm, with the exception of the Sao Tome Sunbird, which reaches 23 cm, and the very long-tailed male of the Fire-tailed Sunbird (*Aethopyga ignicauda*), which attains 20 cm. Recorded masses of sunbirds are from 4 g to 21.6 g. The spiderhunters range up to 22 cm in length, and to 49 g in mass.

Characteristically, the bill is narrow, sharply pointed and, except in the case of the Ruby-cheeked Sunbird, finely serrated near the tip. It is usually decurved, and it varies in length from being slightly shorter than the head, as with the Ruby-cheeked Sunbird, to being about three times the length of the head, as illustrated by the Long-billed Spiderhunter (*Arachnothera robusta*); in the sunbirds, there is a positive correlation between bill length and body mass. The upper mandible has a curvature varying from slight to pronounced; the lower mandible of the Ruby-cheeked Sunbird and the two species of *Deleornis* is straight, but in all other members of the family it is curved, at least distally. The nostrils are generally oval in shape, more rounded in some species and elongate in others, and are in a groove, protected from pollen by opercula. Rictal bristles are absent.

With the exception of the Ruby-cheeked Sunbird, which has a flattened tongue, the nectariniid tongue is tubular, and is bifurcate distally. It has fimbriated or frayed edges, allowing nectar to be taken into the bill by capillary action. Two grooves in the palate, coupled with the tubular structure of the tongue, facilitate the action of the tongue and bill as a pump during the process of nectar-drinking. In the Ruby-cheeked Sunbird, the tongue is a narrow rectangular plate, concave in transverse section, forming two fimbriated prongs distally, and with the distal edges of the plate also fimbriated. That of *Deleornis* is a long, narrow concave plate tapering distally, with the edges rolled to form two tubes; the distal end forms two prongs, which are rolled to form two complete tubes, fimbriated along their inner edges. Species in *Anthreptes* and *Leptocoma* have a tongue that is rolled for most of its length to form one complete tube, and split at the distal end to form semi-tubes, which are fimbriated on the inner edges. The tongue of *Anthodiaeta* is similar to that of *Deleornis*, but less broad-based, with a narrower unrolled central section, and the lateral tubes are more prominent. In *Hypogramma*, the tongue is a narrow flat plate for much of its length, with the sides rolled to form tubes, and the tip four-pronged, with the inner edges of the outer prongs fimbriated. In *Cyanomitra*, *Chalcomitra*, *Drepanorhynchus* and *Nectarinia*, it is a long narrow tube for much of its length, split towards the tip to form two spiral tubes that are fimbriated on their inner edges. *Anthobaphes* has a long, narrow

While the large majority of sunbirds of the genus *Cinnyris* are brightly coloured, some are rather less so. A good example of the latter is the **Dusky Sunbird**. As its English and scientific names suggest, it is dark brown to black over much of its plumage. While there is some bronze, purple, green and blue iridescence to various parts of the body, the sheen is much less eye-catching than on most of its congeners. It is one of a group of four white-bellied species within *Cinnyris*. At the same time, it is one of 16 species in the genus for which the male has a distinct non-breeding or eclipse plumage. In this species, the iridescence all but disappears and the black feathering is much reduced. The female is dull brown above, darker on the tail and uppertail-coverts, and pale below.

[*Cinnyris fuscus fuscus*, South Africa.
Photo: Roland Seitre]



Just under one-third of the 50 members of the genus *Cinnyris* are grouped together as "double-collared sunbirds", the name referring to the narrow blue and broad red breastbands exhibited by males of the species.

As can be seen here, double-collared sunbirds appear strikingly similar.

The males of the four species shown here all have a decurved bill and follow the same plumage pattern: iridescent green head, throat, upper breast, mantle and wing-coverts; brown remiges; blue and red breastbands; and greyish belly and undertail-coverts.

The **Miombo Double-collared Sunbird** (above left) occurs in three races from Angola east to Mozambique. The **Eastern Double-collared Sunbird** (above right) is restricted to East Africa between Kenya and Mozambique.

The **Greater Double-collared Sunbird** (below left) occurs in southern Africa and may form a superspecies with the **Northern Double-collared Sunbird** (below right) of West and East Africa.

[Above left: *Cinnyris manoensis manoensis*, Stone Hills Game Sanctuary, Matobo, Zimbabwe.
Photo: J. R. Peek.

Above right: *Cinnyris mediocris*, Ngorongoro crater, Tanzania.
Photo: Konrad Wothe.

Below left: *Cinnyris afer*, Greater Addo National Park, South Africa.
Photo: Berndt Fischer/Oxford Scientific Films.

Below right: *Cinnyris reichenowi reichenowi*, Naru Moru Lodge, Kenya.
Photo: Adrian Binns/VIREO]





Racial variation in plumage occurs in many sunbirds. The **Variable Sunbird** is a good example of this, as, of course, its name suggests. Its five subspecies occupy a combined range extending from Senegal in the west to Mozambique in the south-east. Adult males differ notably in plumage coloration among races, as demonstrated by the three subspecies seen here. The lower breast, belly and vent vary from white through two shades of yellow to scarlet, while the male of one race has a metallic green throat, rather than the purple-blue of the other four. In addition to the racial differences, male Variable Sunbirds also go through immature and seasonal plumages. Both of these are similar to the duller plumages of the females, although the eclipse-plumaged male may retain some metallic feathers. Interestingly, some populations of at least two subspecies may lack an eclipse plumage.

[Top: *Cinnerys venustus venustus*, Obudu Cattle Ranch, Cross River State, SE Nigeria. Photo: A. P. Leventis.]

Middle: *Cinnerys venustus falkensteini*, 15 km east of Rusape, Zimbabwe. Photo: Rob Drummond/Lochman Transparencies.]

Bottom: *Cinnerys venustus igniventris*, Rwenzori National Park, Uganda. Photo: Greg & Yvonne Dean/World Wildlife Images]

tongue that is rolled along the sides to form two tubes, bifurcated towards the tip, which consists of two spiral non-fimbriated tubes. In *Cinnyris*, the edges are rolled inwards for most of the length, creating two tubes that separate towards the tip and end in short spikes. In *Aethopyga*, the rolled lateral tubes diverge towards the tip, leaving a narrow central area, which is split to form two spikes, and the lateral tubes end as points, with slightly fimbriated inner edges, producing an overall impression of a narrower *Hypogramma*-like tongue. The tongue of *Arachnothera*, the spiderhunters, forms a perfect tube for most of its length, being bifurcate towards the tip, which consists of two incomplete tubes with much-fimbriated inner edges.

The long bills and tubular tongues possessed by both the hummingbirds (Trochilidae) and the sunbirds may have co-evolved with tubular flowers, whereas the brush tongues of the honeyeaters, which allow them to gather nectar and honeydew over large surfaces, placed no such constraint on plants. The hyoid arms are long and elastic, arising close to the glottis, and they pass up the occiput and, as with woodpeckers (Picidae), are inserted at the base of the upper mandible, above an imaginary line drawn between the eyes.

The oesophagus is narrow and non-distensible, and there is no crop, and thus, unlike the condition in hummingbirds, no place for storage of nectar. The glandular proventriculus is rather variable in its form. In *Chalcomitra* it is a thin-walled sac, only slightly broader than the oesophagus, and hardly distinguishable from it. In the Western Violet-backed and Golden-winged Sunbirds, of the respective genera *Anthreptes* and *Drepanorhynchus*, it is also thin-walled but has a very much larger lumen, and is much broader than the oesophagus. The proventriculus of *Leptocoma*, *Nectarinia* and *Arachnothera* is slightly broader and slightly thicker-walled than the oesophagus. In another *Anthreptes* species, the Brown-throated Sunbird, the lumen is obviously larger, and the walls much thicker than the oesophagus; this condition is found also in species in the genera *Chalcoparia*, *Deleornis*, *Anthodiaeta*, *Hypogramma*, *Anthobaphes*, *Cyanomitra*, *Cinnyris* and *Aethopyga*. Thickened proventricular walls, which may be more muscular, perhaps indicate a diet less dependent on nectar and more dependent on arthropods and/or fruit. The difference in the structure of the proventriculus between the two species of

Anthreptes may indicate that the Asian and African members of this genus represent separate lineages.

Nectariniids have short, sturdy, scutellate tarsi that terminate in short, strong toes with sharp nails. The wing is rounded, and has ten primaries, the outermost of which is much reduced. The tail, with twelve rectrices, may be square, rounded or graduated, and the males of some species have the central rectrices elongated.

Sexual dimorphism is fairly well marked in the Nectariniidae. The males are larger than the females, and their plumage generally exhibits much iridescence, which is absent or greatly reduced in the plumage of females. In species which display little or no sexual dichromatism, both sexes tend towards a female-type plumage with very small areas of iridescence or none at all, as illustrated by the Little Green, Eastern Olive and Grey-hooded Sunbirds (*Aethopyga primigenia*) and the spiderhunters. Four species which lack sexual dichromatism or in which this is reduced have plumage that is not of female type. These four are Reichenbach's, Sao Tome, Cameroon and Blue-headed Sunbirds.

Pectoral tufts may be possessed by males alone, by both sexes or by neither sex. They are found in about 54% of the sunbirds and spiderhunters, but in less than 5% do they occur in both sexes. Among the species in which both sexes have tufts, those of the female are usually less bright than the male's and are reduced in size. Pectoral tufts range in colour from white or grey to yellow, orange or some shade of red, or are a mixture of two or even three colours. They are absent in the monotypic genera *Chalcoparia*, *Hypogramma*, *Dreptes* and *Drepanorhynchus*. In both species of *Deleornis* they are present only on the males. Ten of the 14 species of *Anthreptes* have tufts, but in the male plumage only, except in the case of the Violet-tailed Sunbird, both sexes of which possess them. Two of the four species of *Anthodiaeta*, namely the Collared and Amani Sunbirds, also have tufts, once again confined to the males. Only one of the three *Anabathmis* species has them, and likewise only in the male plumage, and the monotypic genus *Anthobaphes* similarly has pectoral tufts in males alone. All eight species in *Cyanomitra* have pectoral tufts, but only in two, the Eastern Olive and the Mouse-coloured Sunbirds, are they present in both sexes. One species of *Chalcomitra*, the Carmelite Sunbird, carries such adornments;

Sunbird moult patterns are complex, with variation between and within species. The males of some species have an intermediate immature plumage, into which they moult after the juvenile stage but before assuming definitive adult dress.

The males of some species have a distinct eclipse plumage outside the breeding season, in which they lose their more spectacular colours and assume female-type coloration. The male **Southern Double-collared Sunbird** has such a plumage, being mainly grey-olive but retaining a metallic sheen to the lesser wing-coverts and upperparts, plus isolated metallic feathers on the head and remnants of a red breastband.

[*Cinnyris chalybeus*
chalybeus,
Kirstenbosch, Cape Town,
South Africa.
Photo: Peter Ryan]





The second most speciose genus in the Nectariniidae is *Aethopyga*, with all of its 18 species residing in tropical Asia. These are rather svelte sunbirds with a relatively long, decurved bill and a long, graduated tail. The effect of the tail is augmented in the males of most species, because they have elongated central rectrices. Members of this genus are sexually dichromatic, with the female less resplendent in plumage than the male. While there is substantial variation in plumage coloration across the genus, males of all species are united in having a bright yellow area in the region of the lower back and rump. The genus contains four superspecies, one being formed by the **Crimson Sunbird** and Vigors's Sunbird (*Aethopyga vigorsii*), which until recently were considered conspecific. The male **Crimson Sunbird** is a striking bird, mainly crimson with a purple-blue or purple-green forehead, lores, moustachial stripe and central tail feathers. The male **Green-tailed Sunbird** displays a greater variety in colour than the **Crimson Sunbird**. It shares a yellow-chestnut breast, belly and undertail-coverts with several congeners, and has maroon neck sides and upper mantle, with a green or blue-green head, darkest on the throat.

[Above: *Aethopyga siparaja siparaja*, Mandai Orchid Garden, Singapore.
Photo: Jimmy Chew.

Below: *Aethopyga nipalensis angkanensis*, Doi Inthanon National Park, Chiang Mai, Thailand.
Photo: Kanit Khanikul]

The ten species of spiderhunter are all placed in the genus *Arachnothera*. Unlike the more widespread sunbirds, spiderhunters occur only in tropical Asia. Morphologically, the genus is rather homogeneous. All species are rather stocky and most are considerably larger than most sunbirds: the heaviest spiderhunter weighs as much as twelve times the lightest sunbird on record. The bill of the spiderhunters is long or very long, as in the case of the **Little Spiderhunter**, and is at least twice the head length. It is decurved and rather deep-based, narrowing only gradually towards the tip; there is a basal ridge between the two nostrils. The Little Spiderhunter is one of four members of its genus to have pectoral tufts.

[*Arachnothera longirostris*
cinireicollis,
Fraser's Hill, Malaysia.
Photo: John & Jemi
Holmes]



its congener the Amethyst Sunbird occasionally does so, but in this case the tufts are restricted to males. Males of two of the five species of *Leptocoma*, the Crimson-backed and Copper-throated Sunbirds, have tufts, but these are not possessed by the females in this genus. Of the six *Nectarinia* species, males of the Malachite and Red-tufted Sunbirds, and the female of the latter species, are so adorned. Although 36 species of *Cinnyris* have pectoral tufts, they are present in the females of only three. Fifteen *Aethopyga* species are without tufts and, of the three species that do possess them, namely the Apo Sunbird, Lina's Sunbird and the White-flanked Sunbird (*Aethopyga eximia*), only the last has them in both sexes. Finally, in the genus *Arachnothera*, males of the Little (*Arachnothera longirostris*), Thick-billed (*Arachnothera crassirostris*), Long-billed and Yellow-eared Spiderhunters (*Arachnothera chrysogenys*) have pectoral tufts; the remaining six spiderhunter species lack them completely.

Another character in which the sexes may differ is that of tail length. In 21 species of sunbird divided among the genera *Anthodiaeta*, *Anthobaphes*, *Nectarinia*, *Drepanorhynchus*, *Cinnyris* and *Aethopyga*, the males have the central tail feathers elongated, whereas the females do not. Examples are the Pygmy, Orange-breasted, Tacazze, Golden-winged, Beautiful and Gould's Sunbirds (*Aethopyga gouldiae*). In the case of the Crimson Sunbird, the males of some subspecies have elongated central tail feathers, but those of other races do not. The male Fork-tailed Sunbird (*Aethopyga christinae*) has two prongs that project some way beyond the end of the tail, this feature being absent in the female. In three other *Aethopyga* species, the Lovely, Handsome and Vigors's Sunbirds, the tail of the male is somewhat longer and is much more graduated than that of the female.

An immature plumage has been described for the majority of the members of the family, and in all cases this differs from the adult plumage. When the adults exhibit sexual dichromatism, the immatures tend to resemble females. The differences may be very slight, as with the Grey-headed, Pygmy and Moreau's Sunbirds

and the Little Spiderhunter, or they may be more obvious, as with Anchieta's, Carmelite and Fork-tailed Sunbirds. In 24 species, among them the Violet-breasted, Regal and Green-headed Sunbirds, the young bird is markedly different in plumage from the adults of both sexes.

Moult regimes of the Nectariniidae are varied, and not fully known. The males of some species do not have an intermediate immature plumage but, instead, moult directly from juvenile to breeding plumage. They do, however, have a non-breeding plumage, which they acquire between periods of breeding. Examples of such species include, among others, the Crimson-backed Sunbird, the nominate race but not the subspecies *dartmouthi* of the Red-tufted Sunbird, the Golden-winged Sunbird, 16 species of *Cinnyris*, including the Black-bellied (*Cinnyris nectarinioides*), Dusky (*Cinnyris fuscus*) and Purple Sunbirds (*Cinnyris asiaticus*), and, in the genus *Anthodiaeta*, the Pygmy and Nile Valley Sunbirds. The males of other species have a juvenile or immature plumage, but no special non-breeding dress. This situation is illustrated by, for example, the Angolan population of Bocage's Sunbird but not the Congolese one, by Moreau's Sunbird and its congeners the Splendid (*Cinnyris coccinigastrus*), Shining, Pemba and Regal Sunbirds, by four *Chalcomitra* species, namely the Amethyst, Green-throated, Scarlet-chested and Hunter's Sunbirds, and by the Fire-tailed Sunbird.

In yet other species, the males have no intermediate immature plumage and no distinct non-breeding plumage. This is a characteristic of, for example, the Ruby-cheeked Sunbird, both species of *Deleornis*, the Purple-naped Sunbird, the Bronze Sunbird, the Golden-winged Sunbird, 22 *Cinnyris* species, including Neergaard's (*Cinnyris neergaardi*), Rockefeller's (*Cinnyris rockefelleri*) and Johanna's Sunbirds (*Cinnyris johannae*), probably all species of *Cyanomitra* except perhaps the Mouse-coloured Sunbird, the Socotra Sunbird in the genus *Chalcomitra*, the Collared and Amani Sunbirds in *Anthodiaeta*, all species of *Anthreptes* except perhaps the Straight-billed Green Sunbird, all species of *Leptocoma*, probably all *Aethopyga* ex-

cept the Fire-tailed, Crimson and Vigors's Sunbirds, and all of the spiderhunters.

The males of some nectariniids have an immature plumage and also a non-breeding plumage. Examples are, in the genus *Nectarinia*, the Congolese population of Bocage's Sunbird, and the Purple-breasted, Malachite and Tacaze Sunbirds, and, in *Cinnyris*, the Beautiful, White-breasted and Variable Sunbirds. Vigors's Sunbird and the Crimson Sunbird have an intermediate plumage that could be interpreted as being a transitional stage, rather than being a discrete plumage, but they both lack a distinct non-breeding plumage.

It is not known to which group the Principe and Newton's Sunbirds belong. In general, those species associated with ever-green forest and having less seasonally affected nesting periods tend not to have a recognizable non-breeding plumage. The groups are not clear-cut, however, and it is difficult to assign most species of *Chalcomitra* to any particular category.

Habitat

The Nectariniidae as a whole are generalists in terms of their habitat requirements. Members of this family can be found from sea-level up to at least 4900 m. Some, such as the Greater Double-collared Sunbird, are recorded from both lowlands and highlands, and many inhabit a considerable range of altitudes. The Palestine Sunbird, for example, is recorded from sea-level to 3200 m. The elevational range of a species can vary depending on geographical distribution. This is demonstrated by the Malachite Sunbird, the known range of which is from sea-level to 3000 m, but this sunbird is usually found above 2000 m, and only in South Africa does it descend to sea-level. The Western Violet-backed Sunbird normally occurs below 1000 m, but in southern Africa it is usually found above 1000 m. The altitudinal levels occupied by nectariniids in the Himalayan ranges may depend on season. As examples, Gould's Sunbird is generally

present at 1200–4300 m, but is found at 330–2700 m during the winter months, and the Fire-tailed Sunbird lives at 3000–4900 m, but in winter occurs at 610–2900 m. Another species of wide altitudinal range is the Green-tailed Sunbird (*Aethopyga nipalensis*), occurring at 300–3700 m for much of the year, but in winter leaving the higher parts of the mountains for the less harsh conditions at lower levels.

Twelve species, including the Red-throated, Buff-throated, Apricot-breasted and Flame-breasted Sunbirds, have not been recorded above 1000 m, and some species are confined to islands of low elevation. Fifteen sunbird species, including the Socotra, Hunter's, Black and Metallic-winged Sunbirds (*Aethopyga pulcherrima*), and two spiderhunters, the Thick-billed and Grey-breasted Spiderhunters, range from sea-level to between 1200 m and 1500 m, depending on species. A further 13 species of sunbird and four of spiderhunter are recorded from "lowlands" to various altitudes up to a maximum of 2000 m, some of them not unequivocally stated as reaching sea-level; examples are the Scarlet-tufted, Newton's, Shining and Temminck's Sunbirds and the Streaky-breasted Spiderhunter. Ten sunbirds and two spiderhunters are found from the lowlands up to between 2100 m and 2400 m, these including the Long-billed Green, Loten's (*Cinnyris lotenius*) and Crimson-backed Sunbirds and the Little Spiderhunter.

Several nectariniids are described as "montane" species, but with no precise altitudinal ranges recorded. These are the Sao Tome, Montane Double-collared, Eastern Double-collared and Rufous-winged Sunbirds. Seven sunbirds, including the Orange-tufted, Ursula's, Apo and Javan Sunbirds, and Whitehead's Spiderhunter (*Arachnothera juliae*) have a minimum recorded altitude of between 700 m and 950 m. A further seven, among them the Bronze and White-flanked Sunbirds, are not known to occur below 1000 m, and two others, the Black-throated (*Aethopyga saturata*) and Gould's Sunbirds, occur below this level only in winter. Moreau's Sunbird lives at 1300–1850 m and the Regal Sunbird at 1500–3100 m, whereas Bocage's Sunbird is



Whereas many species of sunbird are brightly coloured, spiderhunters have predominantly fairly dim olive-green plumage. Five spiderhunter species have relatively unmarked plumage, with patterning restricted to orbital rings or other areas of the head. The other five have streaked plumage, the intensity and extent of which varies between species. The **Streaked Spiderhunter** has heavy black shaft streaks on both upperparts and underparts. This species has five races, but these are poorly differentiated, with variation restricted to subtle plumage tones and clarity of streaking. The race *pagodarum*, seen here, is of questionable validity, as it may not be sufficiently diagnosable.

[*Arachnothera magna pagodarum*, Fraser's Hill, Peninsular Malaysia. Photo: Ong Kiem Sian]

The nectariniids exhibit substantial sexual dimorphism, males being larger than females. The majority of sunbirds, but not spiderhunters (Arachnothera), are also sexually dichromatic. In such sunbirds, males are more brightly coloured than females and usually exhibit areas of feathering with a distinct metallic sheen or iridescence. In some species, the female also has some iridescent plumage, but usually over a smaller area.

A good example is the **Green-headed Sunbird**, which occurs from Senegal east to Malawi. Both sexes have olive-coloured upperparts and grey underparts, but they differ in the extent of iridescence. The male (left) has the entire head, nape, throat and upper breast metallic blue-green.

The female (right), in contrast, has the throat and upper breast more or less concolorous with the remainder of the underparts.

[*Cyanomitra verticalis viridisplendens*, Semliki NP, Uganda. Photos: G. & Y. Dean/World Wildlife Images]



found mainly around 1500 m. A minimum altitude of 1800–1900 m is noted for four African species, these being the Blue-headed, Tacazze, Purple-breasted and Prigogine's Double-collared Sunbirds, and neither Rockefeller's Sunbird nor Stuhlmann's Double-collared Sunbird has been observed below 2000 m.

Seventeen sunbirds, including the Copper, Souimanga and Purple Sunbirds, and three spiderhunters, including Whitehead's, reach their maximum altitude somewhere between 2100 m and 2400 m. The Collared, Cameroon, Variable and Northern Double-collared Sunbirds do not ascend above 2600–2800 m. At higher elevations, seven species reach between 3000 m and 3300 m, examples being the White-flanked, Palestine and Rockefeller's Sunbirds. Only six members of the family have been found at 3700 m or above. The Green-tailed and Stuhlmann's Double-collared Sunbirds reach that altitude, and the Tacazze Sunbird ascends to 4200 m, Gould's Sunbird to 4300 m, the Red-tufted Sunbird to 4500 m and the Fire-tailed Sunbird to 4900 m.

With regard to habitat choice, the majority of the species are very catholic in their preferences and are opportunistic. If flowering plants providing nectar and invertebrate prey are present within the family's altitudinal and geographical ranges, then sunbirds and spiderhunters are likely also to be present. A few species are generally found only in association with forests, this being typical of, for instance, the Grey-headed, Blue-headed, Purple-breasted, Rufous-winged, Grey-hooded and Apo Sunbirds, as well as Whitehead's Spiderhunter. Some nectariniids, such as Anchieta's Sunbird, are restricted to more open forms of wooded country. Certain species are normally found only in more open habitats such as savanna or scrub, examples of these being the Nile Valley, Hunter's, Greater Double-collared, Beautiful and Black-bellied Sunbirds, or, in a few cases, in association with water, as illustrated by the Violet-tailed, Reichenbach's and Congo Sunbirds.

Most members of the family occupy a variety of habitats. The preferred habitat of those having extensive continental ranges or occurring over large archipelagos may vary geographically. For example, the Western Violet-backed Sunbird in West and

East Africa occurs in acacia (*Acacia*) woodland, in gallery forest running through savanna, and in mangroves and gardens, but in Zambia it is normally found only in miombo woodland, and in Angola, Malawi and Zimbabwe in miombo and *Uapaca* woodland. Similarly, the Northern Double-collared Sunbird occurs in heathland on Mount Cameroon and Bioko, whereas in East Africa it prefers forest, plantations and gardens. Most nectariniids are tolerant of man-made or man-influenced habitats, and many appear to thrive in such situations, as demonstrated by, for example, the Ruby-cheeked, Brown-throated, Olive-backed and Seychelles Sunbirds. For a few, such as the Rufous-winged Sunbird, there is no documented evidence for the usage of habitats created by human activities, but this is usually due to the fact that the distribution of these species is extremely restricted and the opportunity has not yet presented itself. The Socotra and Pemba Sunbirds occupy all habitats within their respective single-island ranges, and the Black Sunbird is similarly catholic in its habitat selection on the south Moluccan island of Buru, although it avoids the interior of forests.

Ninety-five species have been recorded in primary forest, and 26–30 of these do not occur in secondary forest. Only five of the 60 or so species known from secondary forest have not been seen in primary forest. Twelve species are restricted, or almost restricted, to forest-edge habitats and are absent from the interior.

Members of the Nectariniidae exploit all available forest types, at all elevations, within the distributional area of the family. Lowland dipterocarp forest is utilized by nine Asian species, including the Ruby-cheeked and Temminck's Sunbirds and the Thick-billed Spiderhunter. The same number can be found in hill dipterocarp forest, and there is some overlap in species, but three of them, the Javan Sunbird and the Streaky-breasted and Whitehead's Spiderhunters, are known from this higher-elevation forest but not from lowland dipterocarp. Lower montane or submontane forest holds 15 species in each of the Afrotropical and the Oriental Regions, and in Asia includes some species also occurring in hill dipterocarp. African species living in forest at this altitude include the Uluguru Violet-backed, Sao Tome and Montane



Although foraging and parental duties take up the bulk of their time, all birds set aside time each day for preening. During the day's work, feather barbs that normally interlock may become disengaged or tangled. Preening is essential for repairing damage to feathers and for ensuring that they are in optimal condition for flying. This **Purple-throated Sunbird** is rectifying a problem with the underside of its secondaries, to which it gains access by raising its wing. It is a female, as evidenced by its largely olive and yellow plumage. The male of the race shown here (*brasiliensis*) differs from the nominate by dint of its black mantle; metallic purple-blue rump and shoulder patch; and maroon breast and upper belly.

[*Leptocoma sperata brasiliensis*,
Tanjung Puting NP,
Kalimantan, Borneo.
Photo: Hanne & Jens
Eriksen]

Double-collared Sunbirds. No fewer than 26 nectariniids inhabit montane forest, examples including the Cameroon and Apo Sunbirds and the Streaked Spiderhunter (*Arachnothera magna*), but some, such as the Bronze and Golden-winged Sunbirds, occur only at the edge and do not penetrate the interior. A few, such as the Green-tailed and Fire-tailed Sunbirds, also reach upper montane forest. In Asia, alluvial forest has much the same selection of species as lowland dipterocarp, although one species found in the former, the Copper-throated Sunbird, is not present in lowland dipterocarp. In the Oriental Region, peat-swamp-forest, harbouring twelve species, overlaps in its species content with lowland dipterocarp forest, but species such as the Purple-throated and Crimson Sunbirds are more likely to be found in peat-swamp than in lowland dipterocarp.

Seventeen species of sunbird are found in African gallery forest. Four of these, the Western Violet-backed, Blue-throated Brown, Green-throated and Scarlet-chested Sunbirds, occur where such forest runs through savanna. Riverine or riparian forests may be utilized by Plain-backed, Uluguru Violet-backed, Violet-tailed, Bannerman's, Mouse-coloured, Western Olive, Amethyst, Mariqua, Congo, Common Purple-banded and White-breasted Sunbirds in Africa, and in the highlands by the Blue-headed Sunbird. Such forests in Asia are home to the Brown-throated, Purple-naped, Purple-throated, Olive-backed and Crimson Sunbirds.

Twenty-four species of sunbird and two of spiderhunter make regular use of mangroves, particularly *Avicennia* and *Rhizophora* stands, and a third spiderhunter has been recorded once in this habitat. Only the Mouse-brown Sunbird, however, seems to favour mangroves over other habitats where a choice is available. Other species commonly associated with this habitat include the Plain-throated, Violet-tailed, Copper-throated and Olive-backed Sunbirds. It is frequently the case that the species found in mangroves also favour disturbed and degraded habitats and secondary growth.

Kerangas forest, often referred to as "heath forest" although it contains no heathers (Ericaceae), is a well-drained forest type growing on coarse, sandy, podzolic soils in South-east Asia, and the very similar kerapah forests, which have impeded drainage, are characterized by a few species of dipterocarp tree and, sometimes, the large conifer *Agathis*. These forests are known to har-

bour five species of sunbird, including the Purple-naped and Copper-throated Sunbirds, and the Little Spiderhunter. Another habitat in this region, *Melaleuca* forest, is utilized, at least at times, by the Ruby-cheeked, Plain-throated, Purple-throated and Crimson Sunbirds. Asian coniferous forests are used only by Gould's and Fire-tailed Sunbirds and Long-billed Spiderhunters. Coastal forest or strand forest is frequented by the Ruby-cheeked, Brown-throated and Plain Sunbirds and the Grey-breasted Spiderhunter in Asia, and by the Collared, Blue-throated Brown, Mouse-coloured and Southern Double-collared Sunbirds in Africa. Asian deciduous forests form part of the known habitat of Purple, Gould's, and Green-tailed Sunbirds, as well as that of the Little and Streaked Spiderhunters.

In Africa, Violet-tailed and Prigogine's Double-collared Sunbirds occur in alluvial forest and Bannerman's and Common Purple-banded Sunbirds in moist evergreen forest, while the Streaked Spiderhunter is known from the latter habitat in Asia. African freshwater swamp-forests are utilized by Violet-tailed and Straight-billed Green Sunbirds, and the Mariqua Sunbird is found at the edges; the Purple-naped Sunbird exploits this habitat in Asia. The Eastern Olive Sunbird in Africa may be found in dune-forests, and in the same continent *Hagenia-Hypericum* forest may hold Red-tufted and Stuhlmann's Double-collared Sunbirds and *Cryptosepalum* forest the Miombo Double-collared Sunbird. Dry forests are home to the Common Purple-banded Sunbird in Africa, the Long-billed Green Sunbird in Madagascar and the Purple Sunbird in Asia.

Secondary forest and other secondary growth form part of the habitat of at least 60 members of the family. The Long-billed Spiderhunter is only occasionally found in such habitat, whereas some species, such as the Straight-billed Green Sunbird, select it in preference to primary forest. The disturbed nature of such areas results in a greater abundance and more constant supply of plants in flower, particularly herbs and bushes, than would be found within primary forest, hence making secondary growth more attractive to nectariniids. Similarly, forest edge and clearings are often more productive for this family than the forest interior, where flowering herbaceous plants are far less common, while tree flowers are high in the canopy, and epiphytes are much less reliable sources of nectar or invertebrates. More than 70 species of sunbird and spiderhunter are found at edges or in clearings.

This **Yellow-eared Spiderhunter** has found a suitable perch on which to rest and preen. Preening is the most basic form of feather care. Birds use their bill to restore feather structure, clean their plumage, apply oil from the uropygial gland above the rump, or simply realign displaced feathers. This spiderhunter is attending to feathers on its breast sides and flanks. Its long bill means that it has to go through various contortions to reach the desired spots. Depending on the type of maintenance needed, the bird will use its bill in one of two ways: it will either "nibble" the feather gently; or wipe the bill across its surface. Nibbling seeks to restore the placement of barbs and barbules, remove foreign bodies or stale oil, or apply fresh oil. Wiping serves to rearrange or dry feathers, or to coat them with uropygial oil.

[*Arachnothera chrysogenys*
chrysogenys,
Mandai, Singapore.
Photo: Teo Nam Siang]



Throughout the range of the family, various types of woodland are utilized by a wide variety of sunbirds, as well as by the Little Spiderhunter. In the Afrotropics, Newton's Sunbird is found in woodland, but only on steep hillsides; Neergaard's Sunbird occupies dry woodland, whereas the Greater Double-collared

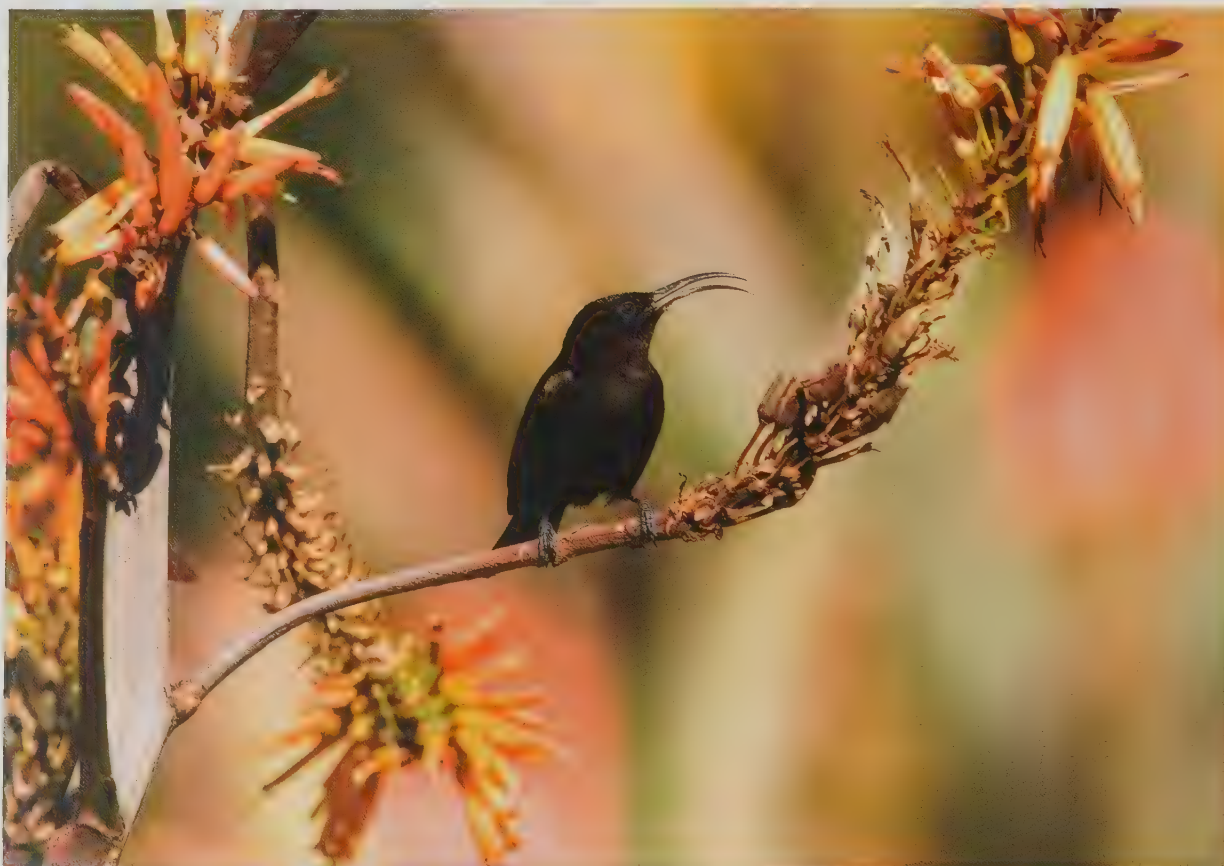
Sunbird prefers damper conditions such as are found in coastal woodland, where the Carmelite Sunbird may also be found, and the Mariqua Sunbird inhabits acacia-mopane woodland. The last-mentioned is home also to seven other species, although the Tsavo Purple-banded Sunbird occurs in such habitat only along rivers. *Uapaca* woodland is recorded as a habitat for the Western Violet-backed and Collared Sunbirds. *Brachystegia-Isoberlinia*-miombo woodland is exploited by about 15 African nectariniids, including the Banded, Bannerman's, Scarlet-chested, Bocage's, Miombo Double-collared, Shelley's and Oustalet's Sunbirds, and *Baikiaea* woodland provides a habitat for the Amethyst, Bocage's and Shelley's Sunbirds. Riverine woodland is occupied by the Kenya Violet-backed, Bannerman's, Miombo Double-collared, Southern Double-collared and Copper Sunbirds in Africa, but in Asia evidently only by the Little Spiderhunter. Asian deciduous woodlands are exploited by Purple-rumped and Vigors's Sunbirds, and the latter can be found also in evergreen woodland. In the African continent, highland acacia woodland claims the Tacazze Sunbird as a denizen, whereas highland *Leucospermum* woodland harbours the Miombo Double-collared Sunbird. Juniper (*Juniperus*) woodland may attract the Palestine Sunbird, which sometimes enters *Cupressus* groves, and casuarina (*Casuarina*) groves in Asia occasionally host the Brown-throated Sunbird. Several species occur in natural coconut (*Cocos nucifera*) groves, three in Africa and nine in Asia, and ten have been recorded in coconut plantations, among them the Crimson Sunbird and the Spectacled Spiderhunter (*Arachnothera flavigaster*), both of which are found also in natural coconut groves. Nine species have been observed in bamboo in Africa, namely the Tacazze, Malachite, Red-tufted, Golden-winged, Stuhlmann's Double-collared, Regal, Rockefeller's, Eastern Double-collared and Loveridge's Sunbirds, and two in Asia, the Elegant Sunbird (*Aethopyga duyvenbodei*) and the Little Spiderhunter.

Thick bush and various types of scrub, including scrub-jungle and thorn-scrub, attract 25 species of sunbird in Africa, where such habitats are more widespread, and ten sunbirds and two spiderhunters in Asia. In the former continent, the list includes the Nile Valley, Green-headed, Shining, Oustalet's, Humblot's

Scratching is a common form of comfort behaviour among birds. It is a natural response to a minor irritation, such as an itch. Scratching also assists with preening, enabling a bird to realign feathers. Headscratching, as demonstrated by this **Red-chested Sunbird**, may also be important during moult, serving to dislodge and remove old feathers. Arboreal birds, such as nectariniids, tend to scratch their heads by the "indirect method", which involves extending the leg over the wing. In contrast, terrestrial birds tend to headscratch using the "direct method", reaching to the head from under the wing. Ornithologists once thought that each species used only one of the two methods, which could thus serve as a taxonomic tool, a suggestion that was undermined when many species were found to deploy both methods.

[*Cinnyris erythrocerus*,
Queen Elizabeth
National Park, Uganda.
Photo: G. & Y. Dean/
World Wildlife Images]





Nectariniids are rather vocal birds, frequently calling to announce their arrival at a new foraging spot, or to communicate among social groups. While not effusive songsters, sunbirds and spiderhunters do sing to attract mates and defend territories. The rather complex song of the **Amethyst Sunbird** comprises rapid twittering that ascends and descends. While singing tends to be the prerogative of the male nectariniid, females of some species also sing. Indeed, members of an Amethyst Sunbird pair will duet, the female warbling in response to the male's more forthright vocal outpouring. The bird seen here can be sexed as a male on account of its black plumage with small iridescent areas.

[*Chalcomitra amethystina amethystina*, Modimolle, Limpopo, South Africa. Photo: Warwick Tarboton]

and Dusky Sunbirds, and in Asia the Apricot-breasted and Flame-breasted Sunbirds and the Naked-faced (*Arachnothera clarae*) and Streaked Spiderhunters.

Low beach or coastal vegetation, as distinct from woodland or forest, is a recorded habitat of the Ruby-cheeked Sunbird, three *Anthreptes* species, two of *Leptocoma*, one *Cinnyris* sunbird and the Grey-breasted Spiderhunter in Asia, and of ten African species, although one of the latter, the Dusky Sunbird, is found in such habitat only in arid areas. The Southern Double-collared Sunbird is known to use dune-thickets in Africa.

High-altitude montane thickets and scrub attract Western Olive, Bronze, Olive-bellied, Greater Double-collared, Regal and Montane Double-collared Sunbirds in Africa, whereas similar habitats in Asia are utilized by four members of the genus *Aethopyga*, namely the White-flanked, Green-tailed, Black-throated and Fire-tailed Sunbirds. The Montane Double-collared Sunbird can be found also in high-altitude bracken-briar. Highland scrub, including *Hypericum*, is colonized by the Red-tufted, Stuhlmann's Double-collared, Olive-bellied, Greater Double-collared and Regal Sunbirds in Africa, and in the same continent Afro-alpine grassland, moorland and heaths are home to nine nectariniids, including the Green-throated, Tacazze, Malachite and Red-tufted Sunbirds, and, where there are bushes, the Golden-winged and Bronze Sunbirds also may occur. In southern Africa, protea (*Protea*) moorland is a habitat of the Malachite, Red-tufted and Southern Double-collared Sunbirds, and Red-tufted Sunbirds can be found also in protea grassland. The Kenya Violet-backed Sunbird occurs in juniper at highland forest edge.

A variety of more open habitats is favoured by a host of sunbirds and a few spiderhunters. "Open country" in general is recorded as a habitat of the Greater Double-collared, Olive-backed, Mayotte (*Cinnyris coquerellii*) and Crimson Sunbirds. Various forms of savanna are inhabited by some 23 members of the family in Africa, one of these being found in similar surroundings also in the Middle East. The list includes the Mouse-brown, Collared, Carmelite, Amethyst, Scarlet-chested, Greater Double-collared, Kenya Violet-breasted, Palestine, Splendid and Copper Sunbirds. Gallery forest running through savanna may be utilized by the Western Violet-backed Sunbird. Wooded savanna

attracts the Violet-tailed, Pygmy, Newton's, Green-headed, Orange-tufted, Olive-bellied and Superb Sunbirds, whereas the Miombo Double-collared Sunbird prefers more open savanna. The Red-chested Sunbird can be found in savanna near water, whereas the Black-bellied Sunbird prefers acacia savanna, and the Tsavo Purple-banded Sunbird savanna with acacia and



Whereas the songs of many sunbirds are relatively simple, those of the genus *Cinnyris* are frequently more complex and last longer. The song of the **White-breasted Sunbird** fits this mould, comprising a melodic warble and a trill framed on either side by a variety of abrupt notes. This sunbird is also one of just a handful that have the ability to mimic other birds. Species that feature in the White-breasted Sunbird's versatile repertoire include the Common Bulbul (*Pycnonotus barbatus*), the Chestnut-vented Warbler (*Sylvia subcaerulea*), two species of *cisticola* (*Cisticola*) and the Bronze Mannikin (*Lonchura cucullata*), all of which inhabit the White-breasted Sunbird's domain in the woodlands, gardens and parks of the southern half of sub-Saharan Africa.

[*Cinnyris talatala*, Kruger National Park, South Africa. Photo: Alejandro Torés]

Cinnyris sunbirds often have relatively complex songs. In comparison, the song of **Stuhlmann's Double-collared Sunbird** is perhaps rather uninspired. It comprises a warble that rises in tone shortly before the end prior to descending. Singing from an exposed perch provides the bird with the opportunity to display its spectacular plumage and, in this case, its vivid yellow pectoral tufts, which are otherwise usually concealed. Stuhlmann's Double-collared Sunbird is one of 16 species of double-collared sunbird and forms a superspecies with Prigogine's Double-collared Sunbird (*Cinnyris prigoginei*) and the Montane Double-collared Sunbird (*C. ludovicensis*).

[*Cinnyris stuhlmanni schubotzi*,
Nyungwe Forest Reserve,
Rwanda.
Photo: Cyril Ruoso/Bios]



Commiphora. The Variable Sunbird is found in a variety of savanna types, including montane, and forest-grassland mosaic attracts several species, among them the Little Green, Green-headed and Tiny Sunbirds.

Dry and semi-arid bush country is favoured by the Kenya Violet-backed, Pygmy, Nile Valley, Scarlet-chested, Socotra, Southern Double-collared, Neergaard's, Mariqua, Palestine, Variable and Dusky Sunbirds, and the Beautiful Sunbird may sometimes be seen near water in such habitat. Only three species, the Dusky, Nile Valley and Souimanga Sunbirds, can be found in semi-desert. The Common Purple-banded and Orange-tufted Sunbirds occur in grassland with moderate rainfall, but in drier semi-arid grassland Hunter's and Variable Sunbirds can be seen. In southern Africa, fynbos holds very few nectariniids, one of which, the Orange-breasted Sunbird, is almost restricted to this habitat. Also in southern Africa, karoo vegetation is used by the Malachite Sunbird, while the Greater Double-collared Sunbird may be found in areas of succulents, and the Orange-breasted Sunbird occasionally wanders into such places. Low riverine vegetation may be host to 15 or so sunbird species, including the Sao Tome, Black, Prigogine's and Black-throated Sunbirds, and the Little Spiderhunter. In dry country, the Black-bellied and Dusky Sunbirds also occur in such habitat.

Marshes and open swamps can provide habitats for Brown-throated, Collared, Purple-naped, Red-chested, Carmelite and Copper Sunbirds, and in places where such habitats are mixed with grassland the Red-chested Sunbird may occur. In marshes with bushy edges Bocage's and Bronze Sunbirds can be found, and coastal swamps are utilized by the Mouse-brown Sunbird.

Cultivations and gardens attract at least 75 nectariniid species, although one of these, Johanna's Sunbird, is only rarely recorded in such habitats, and another, the Fork-tailed Sunbird, is said to be only an occasional visitor to them. The abundance of flowering plants provides a cornucopia of nectar and invertebrate prey, and it is probable that any member of the family will eventually be found to take advantage of such food sources as humans encroach more upon their natural habitats.

Fifty species of sunbird and spiderhunter are known to occur in plantations, the majority probably attracted to the same

food sources as they would otherwise find in secondary or primary forests. In many, if not most, cases, the other forms of secondary growth associated with the plantation, rather than the crop plants themselves, are probably the chief attraction. Rubber, particularly older, abandoned plots, hosts ten species. As this crop is grown more widely in Asia than in Africa, the majority of these ten are Asian, such as the Plain and Purple-naped Sunbirds and the Spectacled Spiderhunter. Similarly, *Albizia* is a plantation species in Asia, where six sunbirds and five spiderhunters, including the Ruby-cheeked Sunbird and the Thick-billed and Long-billed Spiderhunters, have been recorded as utilizing it. Cocoa plantations are exploited by eleven species of sunbird, only three being Asian, reflecting the greater presence of cocoa in Africa than in Asia. Seven African species, including the Cameroon and Tacaze Sunbirds, and the Long-billed Green Sunbird of Madagascar, can be found in exotic eucalypt (*Eucalyptus*) stands, which in Asia are visited also by three species of spiderhunter, including the Yellow-eared. Shade trees in tea plantations attract the Uluguru Violet-backed Sunbird in Africa and the Crimson-backed Sunbird in the Western Ghats of India. Coffee plantations are a recorded habitat of ten African species, including Newton's and Carmelite Sunbirds, whereas the aforementioned Indian species again utilizes shade trees in such plantations. Five species of sunbird and four of spiderhunter occur in banana plantations, reflecting the fondness of spiderhunters in general for wild plantains (*Musa*). Other types of plantation, such as oil palm (*Elaeis guineensis*), coconut, clove (*Syzygium*), acacia, *Trema orientalis*, casuarina, *Gmelina*, maize (*Zea*), nutmeg (*Myristica fragrans*), ginger (*Zingiberaceae*), cardamom (*Elettaria cardamomum*), tobacco (*Nicotiana tabacum*) and abaca (*Musa textilis*), as well as various fruit trees, mixed plantations and tree nurseries, each support one or two members of the family.

Throughout most of the range of the family, any particular habitat is likely to be utilized simultaneously by more than one species of sunbird or spiderhunter, but there is little evidence of resource-partitioning among the species. Interspecific competition has, however, been recorded on Siau, north of Sulawesi, and on Bacan, in the Moluccas, the Black Sunbird being replaced by



Flowers are the most important source of food for sunbirds and spiderhunters, so an open flower in a sunlit area quickly attracts the attentions of this male **Purple-throated Sunbird**. Sunbirds commonly visit flowers to extract nectar, as is recalled in the family's scientific name. To facilitate access to its chosen flower, the Purple-throated Sunbird may hover, perch on a branch, or even hang from the flower itself. Once in a suitable position, the sunbird inserts its bill into the flower and sucks the nectar, in contrast to hummingbirds (*Trochilidae*), which lick it. Nectariniids' internal morphology is such that, unlike hummingbirds, they are unable to store nectar, and thus must feed frequently.

[*Leptocoma sperata*
brasiliana,
Tanjung Puting NP,
Kalimantan, Borneo.
Photo: Hanne & Jens
Eriksen]

the Olive-backed Sunbird at lower altitudes. Although height preferences in forests have been determined for some species, such as the Straight-billed Green Sunbird, seldom recorded below 20 m, the Banded Sunbird, living in the subcanopy and canopy, and the Purple-naped, Principe and Eastern Olive Sunbirds, all usually found low down, a considerable number of forest-dwelling nectariniids utilize all storeys; nevertheless, there is a general tendency to favour the lower levels, the higher strata being exploited only when food there becomes more abundant. The Purple-naped Sunbird, incidentally, is often more numerous in recently logged forest than in pristine forest, as the former habitat is likely to be richer in flowering herbs and shrubs. The Brown-throated Sunbird is less common than its congener the Red-throated Sunbird in plantations in South-east Asia and the Greater Sundas, where the two species are sympatric. In Africa, the Superb Sunbird is found in secondary forest more often than is Johanna's Sunbird in areas of sympatry.

In the mountains of east-central Africa, the Blue-headed and Green-headed Sunbirds are found at similar altitudes on Lendu Plateau, in north-east DR Congo, but elsewhere in its range the Blue-headed Sunbird ascends to higher elevations. The two species overlap in elevational range in the Itombwe Mountains and in the mountains west of Lake Kivu, but there appears to be no overlap at all between them on the Virungas and in Rugege Forest.

General Habits

Sunbirds and spiderhunters are diurnal nectarivores and insectivores and occasional frugivores. Members of this family are generally encountered as singletons or in pairs, or, shortly after breeding, as family groups. Their membership of bird waves, however, is also commonplace. The Grey-headed Sunbird joins such groups in forest canopies. Other interspecific socializers include the Scarlet-tufted Sunbird, at least eight species of *Anthreptes*, the Collared Sunbird, the Orange-breasted Sunbird, Newton's and Reichenbach's Sunbirds in the genus *Anabathmis*, the Green-headed, Blue-throated Brown, Western Olive and

Mouse-coloured Sunbirds in *Cyanomitra*, the Amethyst and Scarlet-chested Sunbirds in *Chalcomitra*, at least seven species of *Cinnyris* and, in the genus *Aethopyga*, the Fire-tailed Sunbird. Sunbirds also join other birds to mob potential predators, and Variable Sunbirds have been seen to mob a chameleon (*Chamaeleonidae*) in the company of babblers, bulbuls, sparrows (*Passer*), an apalis (*Apalis*), weavers (*Ploceidae*) and white-eyes.

Occasionally, sunbirds will congregate in a particular place. A tree with plentiful blossoms will attract sunbirds, as will a zone of flowering proteas or aloes (*Aloe*). Groups of White-breasted Sunbirds and Amethyst Sunbirds have been seen while migrating together, and some forest-dwelling species associate at leks (see Breeding). Sunbirds tend to fly on an undulating flightpath, often calling as they do so. Many of the forest species and the spiderhunters can be difficult to observe when they are feeding on flowers in the canopy.

Groups of conspecifics may be small, not exceeding six individuals, as is the case with, for example, the Grey-headed, Collared, Western Olive, Green-throated and Olive-bellied Sunbirds. With some other species, however, much larger groups have been recorded. Examples include flocks of 40–50 Purple Sunbirds at times when gnats (*Diptera*) are abundant; up to 60 Banded Sunbirds; up to 70 Nile Valley Sunbirds in the non-breeding season at flowering *Bombax* trees; 50–100 Orange-breasted Sunbirds outside the breeding season; up to 100 Violet-breasted Sunbirds at acacia flowers; up to 75 Shining Sunbirds together; "large congregations" of Tacazze Sunbirds at nectar sources outside the breeding season; and, somewhat astoundingly, as many as 1350 Malachite Sunbirds per hectare in areas of wild dagga (*Leonotis leonurus*), a plant known also as "lion's tail" or "lion's ear". Comparable groups have been documented for nine other species of sunbird, but no such aggregations are recorded for spiderhunters.

Apart from the period immediately after breeding, when fledglings return to their nests to roost, nectariniids do not roost communally. Those sunbird species that live at high altitudes or in places where temperatures may drop to below freezing point have evolved thermoregulatory systems enabling them to cope with cold nights. The Tacazze Sunbird, Malachite Sunbird, Eastern Double-collared Sunbird, Collared Sunbird and Orange-breasted

While flowers that have already opened evidently provide easier access to the nectar within, sunbirds are not deterred by closed flowers. They use the bill to prise apart petals, and then deploy its length and curvature to advantage in order to reach the sugar source, as this **Beautiful Sunbird** is doing.

At times, the sunbird may appear to be putting its whole head inside the flower. The **Beautiful Sunbird** has been observed visiting flowers of more than 20 plant genera, including those as varied as Jacaranda (Bignoniaceae), Acacia (Leguminosae), Aloe (Liliaceae) and Lantana (Verbenaceae). Such relatively catholic taste seems to be common amongst the Nectariniidae.

[*Cinnyris pulchellus melanogastrus*, Kenya.

Photo: Arthur Morris/ Birds As Art]



Sunbird are known to lower the body temperature by up to 17°C under field conditions. In one study of Malachite Sunbirds fitted with surgically implanted transmitters, such nocturnal hypothermia was described as torpor, a state of inactivity and reduced responsiveness. Laboratory studies have shown that, in addition, the Kenya Violet-backed, Bronze, Mouse-coloured, Buff-throated, Amethyst, Scarlet-chested, Southern Double-collared, Common Purple-banded, Variable, Bates's, Fork-tailed and Crimson Sunbirds are thermolabile, meaning that their temperature varies with that of the ambient. At ambient temperatures of 10–25°C, ten species of sunbird studied in Uganda maintained their body temperatures, and no differences in basal metabolic rate were found between forest-dwelling species and those frequenting open habitats. For the five smallest species in the study, however, thermal conductance did vary with ambient temperature. Furthermore, thermal conductance, which is a measure of how easily heat can be exchanged with the environment, being the converse of insulation, was habitat-dependent. The minimal thermal conductance of open-habitat species was significantly less than that of forest species, meaning that, at low ambient temperatures, open-habitat species need less energy than forest species to maintain constant body temperatures.

Other aspects of the behaviour of the Nectariniidae are not particularly well known, but a few details are available. After feeding, sunbirds often wipe the bill on branches or twigs. They regularly preen, and they sometimes bathe in birdbaths provided for the purpose. A Malachite Sunbird took advantage of a garden hose in order to douse itself. Anting has been recorded for a few species, including the Bronze Sunbird and the Collared Sunbird.

Voice

The arrival of a sunbird at a particular spot is usually heralded by characteristic “chip”, “tseep” or “tsk” calls, and such sounds often accompany movements of sunbirds from one foodplant to another. Other calls are uttered for contact among socially cohesive groups, by and to chicks, and in alarm. While not renowned for having melodious songs, sunbirds and spiderhunters do pro-

duce a variety of vocalizations associated with territorial defence and sexual advertisement. Songs range from short trills and whistles and frequently repeated simple notes, usually high and metallic ones, to complex melodious utterances lasting for several minutes, these latter songs being common among *Cinnyris* species. Different dialects have been identified within the standard song repertoire of certain species, such as the Splendid Sunbird, while some, including the White-breasted Sunbird, are known mimics of the songs of other birds. Among *Cyanomitra* species, social singing, with choruses by groups of assembled males in leks, is performed by, for example, the Blue-throated Brown Sunbird. Males of all sunbirds and spiderhunters sing songs, and a few also utter subsongs. In some cases, females, too, are known to sing, and duetting is a feature of the Amethyst Sunbird.

Recent research has shown that the vocalizations of flowerpeckers, sunbirds and spiderhunters carry taxonomic signals that, in general, concur with the view that the flowerpeckers are the most primitive and that the sunbirds originated in the Indian Subcontinent, rather than in Africa. This is in line with phylogenies based on mitochondrial DNA.

The song of the Ruby-cheeked Sunbird is a trill, while those of the two *Deleornis* species consist of elaborations of these birds' “tseep” or “tserr” calls. *Anthreptes* species utter high-pitched “seep” calls, and they deliver simple songs involving repetitions of notes strung together in a sequence, usually ascending and descending in pitch during the performance. One of the more vocal members of this genus is Anchieta's Sunbird, the usual song of which consists of “tseu-werr, tsoo-wit, tser-wit-tsui-tsi, chip-choo-chip, witchoo-witchoo, chip-chip, chip-up-chip-up, chipyoo-chipyoo” and variations, repeated up to 40 times. Songs of *Anthodiaeta* sunbirds are slightly more complex, involving whistles and trills.

Placed in a monotypic genus, *Hypogramma*, the Purple-naped Sunbird makes typical high-pitched “schewp” calls and repetitions of “sweet” and “tsit-tsit” notes, but its vocalizations are poorly documented. The three *Anabathmis* species produce lengthy complicated songs involving high-pitched jangling, trills, slurs and whistles. The song of the Sao Tome Sunbird, in another monotypic genus, consists of repetitions of a three-note sequence,



Giant lobelias reaching three metres in height are a characteristic sight on the slopes of Mount Kenya. Equally characteristic is the sight of a **Red-tufted Sunbird** scampering up the inflorescences of the endemic *Lobelia teleki* and *L. keniensis*, for this sunbird exploits the array of food resources offered by the lobelias. It derives nutrition directly from the plant by extracting nectar and pollen. But it also searches for spiders (*Araneae*) and insects such as bibionid flies that lurk in the plant's crevices. It even has a taste for chironomid larvae that inhabit the small water pools trapped in the rosettes of *L. keniensis*. The Red-tufted Sunbird does visit plants other than lobelias in its Afro-alpine moorland habitat at altitudes of 1900–4400 m. Other particular favourites include red-hot pokers (*Kniphofia*), aloes (*Aloe*), proteas (*Protea*), groundsels (*Senecio*) and heaths (*Erica*). The Red-tufted Sunbird derives its English name from the male's scarlet pectoral tufts, which are normally concealed beneath otherwise principally metallic dark green and black plumage. The female also has pectoral tufts, but these are much smaller than the male's, and are generally orange rather than red.

[*Nectarinia johnstoni*
johnstoni,
 Mount Kenya
 National Park, Kenya.
 Photo: Günter Ziesler]

Feeding in flight provides an additional mechanism for sunbirds to access food resources when there is no convenient perch nearby. Some 40 nectariniids across ten genera have been observed hovering in order to feed. Many sunbirds do so to reach the nectar within flowers.

Others hover while searching for insects.

Either objective is possible for this male

Souimanga Sunbird, as the species' diet contains not only nectar but also a variety of insects, such as beetles (Coleoptera), bugs (Hemiptera) and wasps or bees (Hymenoptera). In addition to flowers, the Souimanga Sunbird hovers at spider webs, from which it steals trapped insects. It feeds in pairs, small groups and as a part of mixed-species flocks.

[*Cinnyris sovimanga* sovimanga,

Perinet Special Reserve, Madagascar.

Photo: Ian Merrill]



sometimes followed by a chuckling "chut, chut, chit chit". This large island species, moreover, is one of the few sunbirds for which lekking behaviour is known; gatherings of males utter harsh "tic-tic-tic-tic-tic" sequences, followed by series of "tsi-tsu-huee, tsi-tsiu-tsiu" or "huit-huit-rruit-rruit". Males of the Orange-breasted Sunbird, in the monotypic genus *Anthobaphes*, chase each other while uttering a bell-like tinkle; they also produce a characteristic "sskrring-sskrring-sskrring" call, the females calling "sshraynk". The male's song consists of a complicated high-pitched chatter with melodious sections, whistling "piou" notes, and a descending "tzzurr" or "jeeeu" interspersed at irregular intervals. Males also have a shy subsong mixed with "sshraynk" calls. In addition, females of this species occasionally sing.

The calls of *Cyanomitra* species are "tsk" or "chuk" notes, and their songs are mostly repetitions of these notes with others, such as "tse", wheezes, trills and melodious sections. The song of the Eastern Olive Sunbird is, perhaps, the most complicated of the genus, being a protracted warble of repeated whistles, rising and falling in pitch, interspersed with melodic renditions of "tsee-tsee-tsee, tseedlee, eedlee-id-id-id-seedle, eedle-ee-ee-ee". This is another species known to indulge in lekking, the competing males singing simultaneously in a "choir" while gathered in a tree, producing a chorus of rising and falling phrases, including "sweetie weety".

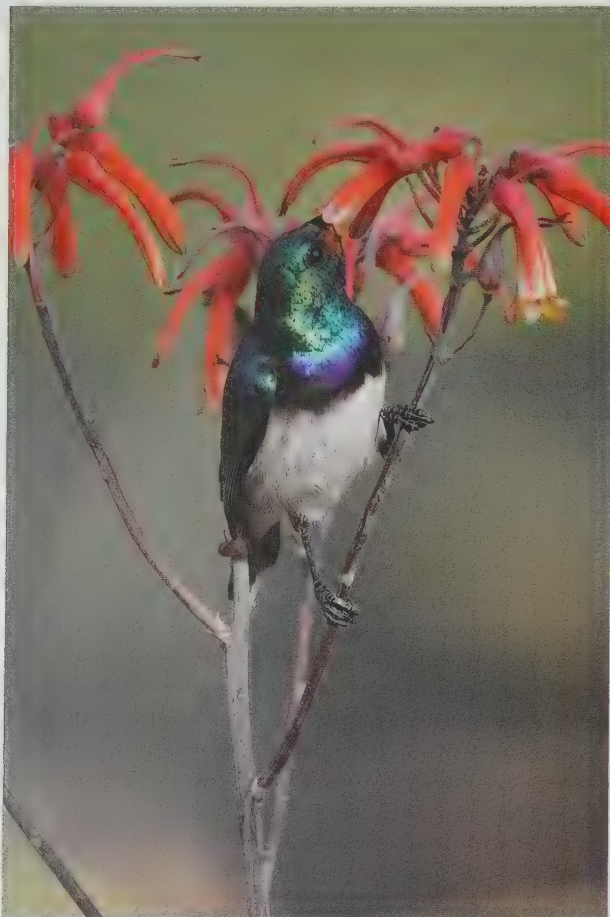
Songs of species of *Chalcomitra* include many trills, and they are among the most complex of those of all sunbirds outside the genus *Cinnyris*. As an example, the song of the Green-throated Sunbird can last for as long as 4 minutes. It opens with a series of "chip" notes at a rate of six per second, these preceding a musical twittering, a 4-second series of "chi" notes at a rate of twelve per second, further twitters, bursts of "chip, chip, chip" series, then a gradually waning trill, yet more twitters, and then repeated sequences of 20 or more "chip" notes, these sometimes speeding up, and the later "chip" sequences preceded by up to nine "chouee" notes.

The vocalizations of *Leptocoma* species are generally weak, high-pitched squeaks and chirps, although the Copper-throated

Sunbird produces a deep trill. Those of *Nectarinia* are bursts of wheezy splutterings, whistles and twitters, with some trills and squeaks. The calls of the Golden-winged Sunbird, in the monotypic genus *Drepanorhynchus*, include a sharp "jwee" and rapid bursts of "cha-cha-cha-cha", and its song is a twittering and chattering mixed with high-pitched "chi-chi-chi" sounds.

Species of *Cinnyris* include some of the best songsters among the sunbirds. For instance, the song of the Southern Double-collared Sunbird starts and finishes with up to twelve hissing "ssssweee" notes or series of "siz, siz, siz", sandwiching a melodic warble of rising and falling "tsee" notes and sequences of rising "weeta witta witta-weeta, witta witta, witta witta wit". Males may sing to one another from perches for 15 minutes or more, sometimes exposing their pectoral tufts as they do so. This is one of the species in which the females, as well as the males, sing. Similarly, the song of the Black-bellied Sunbird begins with up to 20 "tsk", "chip" or "che" notes at rates of six per second, followed by a warble of ascending and descending "tsi" notes speeding up into a final flourish. The sequence is repeated again and again between pauses of up to 12 seconds, in songs lasting for 3 minutes or more. Other members of the genus, such as the Common Purple-banded and Violet-breasted Sunbirds, include more trills in their repertoires. The best-studied sunbird songs are those of the Splendid Sunbird, competing males of which at any one place may sing the same dialect to each other, while at dialect boundaries different dialects are sung at spots as little as 40 m apart. Such variation may be related to habitat patchiness and differences between open habitats and closed habitats in the distances over which vocalizations carry.

The most versatile of the known mimics among the sunbirds is another *Cinnyris* species, the White-breasted Sunbird. This imitates the Common Bulbul (*Pycnonotus barbatus*), Chestnut-vented Warbler (*Sylvia subcaerulea*), Neddicky (*Cisticola fulvicapilla*), Rattling Cisticola (*Cisticola chiniana*), Black-chested Prinia (*Prinia flavicans*), Bronze Mannikin (*Lonchura cucullata*) and Streaky-headed Seedeater (*Serinus gularis*), and perhaps a number of other species. Other mimics include another *Cinnyris* species, namely the Palestine Sunbird, and one species



As nectar-feeders, sunbirds play an important part in plant reproductive processes. In South Africa, for example, some 2% of all flowering plants are pollinated by sunbirds, which is a particularly impressive feat given the country's remarkable plant diversity. As sunbirds insert the bill into the corolla to reach the nectar within, the forehead, lores or bill base touches the anthers and becomes dusted with pollen. When the bird moves to another flowering plant of the same species, it deposits the pollen grains, which contain the male gametes, on the recipient plant's stigma, which leads to the ovules that house the female gametes in the ovary. As this male **White-breasted Sunbird** demonstrates, the build-up of pollen can be quite substantial, powdering a large area of the head.

[*Cinnyris talatala*, Kruger National Park, South Africa. Photos: David Stowe]

in each of the genera *Cyanomitra* and *Chalcomitra*, respectively the Green-headed Sunbird and the Socotra Sunbird.

Calls given by *Aethopyga* species, the final sunbird genus, tend to be high-pitched, metallic "tink" notes or weak "seep" notes, the songs being drawn-out trills. The trilling song of the Elegant Sunbird has been likened to the sound produced by certain insects.

Spiderhunters have simple calls consisting of metallic "chip" or similar short notes. Their songs are repetitions of such notes or, as in the case of the Little Spiderhunter, incessant squeaky whistles. The Naked-faced Spiderhunter utters a high-pitched insect-like "see", a low croaking "crrr", and a variety of rising and falling fast trills. Typically, spiderhunters' songs are monotonous more than melodious.

Food and Feeding

Probably all members of the family eat both animal and plant material. The genus *Deleornis* is mostly insectivorous, although one of its two species, the Grey-headed Sunbird, takes small fruits. Likewise, three *Anthreptes* species, the Mouse-brown, Plain-backed and Western Violet-backed Sunbirds, and one in *Anthodiaeta*, the Collared Sunbird, are to a large extent insectivorous. As the English vernacular name implies, sunbirds like sunny conditions, and a preference for feeding in sunlit places has been shown for the Palestine Sunbird.

Known foodplants of the Nectariniidae include more than 450 species of flowering plant of at least 345 genera, spread across 100 families. Of these, more than 400 species in at least 320 genera of 93 families are known to be exploited in Africa and more than 100 species in over 70 genera across 39 families in Asia. At least seven genera of Acanthaceae, six in Africa and two in Asia, are utilized, with up to three sunbird species recorded per genus. Six genera of Apocyanaceae are known foodplants, eight sunbird species utilizing the African genus *Thevetia*. Seven genera of the African family Asclepiadaceae are

recorded as being used, with up to six sunbird species per genus. Eleven African species of sunbird are known to feed upon at least three species of the balsam *Impatiens* (Balsaminaceae). Eleven genera of the plant family Bignoniaceae are recorded as food sources in Africa, with two of these genera also exploited in Asia, the most utilized being *Jacaranda* and *Kigelia*, visited each by eleven species of sunbird, *Spathodea*, visited by twelve species, and *Tecoma*, attracting as many as 27 nectariniid species. Up to nine species in each of the four genera of Bombaceae are recorded as food sources in Africa and Asia. The pawpaw or papaya plant (*Carica papaya*), in the family Caricaceae, is a known food source for twelve African and two Asian sunbirds. Over 13 species of sunbird utilize more than five species of *Lobelia* in the African family Campanulaceae, nine African sunbirds are known to utilize at least three species of *Combretum* (Combretaceae), and, in the same continent, nine genera of the Compositae are each a source of food for up to five species of sunbird. At least 66 species of *Erica* (Ericaceae) provide food materials for seven species of sunbird. Twelve genera in the Euphorbiaceae are utilized, most importantly: *Euphorbia*, used by eight nectariniids; *Macaranga*, visited by eleven; and *Manihot*, exploited by ten species. In Africa, two genera of the Guttiferae, *Hypericum* and *Symphonia*, are food sources for seven and 13 species, respectively, and up to five sunbird species are recorded for five African genera of the Iridaceae. At least six species of *Leonotis* are used by 28 sunbird species in Africa and one in Asia, and *Salvia*, another member of the Lamiaceae, provides food for ten African nectariniids.

Plants of the family Leguminosae are extremely important food sources for sunbirds. Well over 60 plant species in more than 42 genera are recorded as being used by members of this avian family, with nine genera frequented by eight or more species of sunbird. The five or more species of *Erythrina* recorded provide food to 34 African and nine Asian sunbirds, and the numerous species of *Acacia* are used by 20 species in Africa and nine in Asia. Other leguminous genera popular with sunbirds are *Acrocarpus*, *Bauhinia*, *Caesalpinia*, *Delonix*, *Schotia*, *Crotalaria*

and *Albizia*; indeed, 14 species of sunbird have been recorded as visitors to the last-mentioned genus in Africa.

Nine genera of the plant family Liliaceae are known food sources in Africa, most prominently *Aloe*, with more than eleven species frequented by 26 species of sunbird, and at least four species of *Kniphofia* used by 15 species of sunbird. The mistletoe family Loranthaceae, including *Viscum*, which is sometimes separated as the family Viscaceae, is a very important food resource for sunbirds. Particularly favoured genera are *Agelanthus*, *Englerina*, *Dendrophthoe*, *Tapinanthus* and *Phragmanthera*. Some sunbirds, such as the Variable Sunbird, are known to open closed flowers of *Tapinanthus* in order to reach the nectar. The genera of mistletoes utilized by 45 sunbird species, 36 African and nine Asian, have not been identified.

Seven genera of the Malvaceae are recorded as used by the Nectariniidae, mostly in Africa, with 28 species of sunbirds known to utilize at least three species of *Hibiscus*. Three genera of the Moraceae are documented as food sources, most prominent among them being the fig genus *Ficus*, recorded for ten species of sunbird. Three genera of the family Musaceae are exploited, including plantains and bananas (*Musa*), by 28 species, and *Strelitzia*, by eight species. Five genera of the Myrtaceae are noted as food sources for sunbirds, of which *Callistemon* is used by ten species, *Syzygium* by 15, and the numerous species of *Eucalyptus* by eleven species. Seven sunbirds in Africa use members of the genus *Fuchsia* (Onagraceae) for feeding. At least eight species of palm (Arecaceae), in seven genera, are utilized. The coconut palm (*Cocos*), with six African and four Asian species of sunbird as clients, is the most popular. In Africa, the family Proteaceae is important, with nine sunbird species recorded for the genus *Faurea*, twelve for *Grevillea*, and 15 nectariniids for over twelve species of *Protea*. Five genera of the Rosaceae are utilized, particularly *Prunus*, which is used by nine sunbird species. Over 24 genera of the Rubiaceae, each attracting up to five sunbird species, are recorded as food sources, principally in Africa. Thirteen African species of sunbird are recorded as feeding on *Halleria*, and at least five other genera in the family Scrophulariaceae are

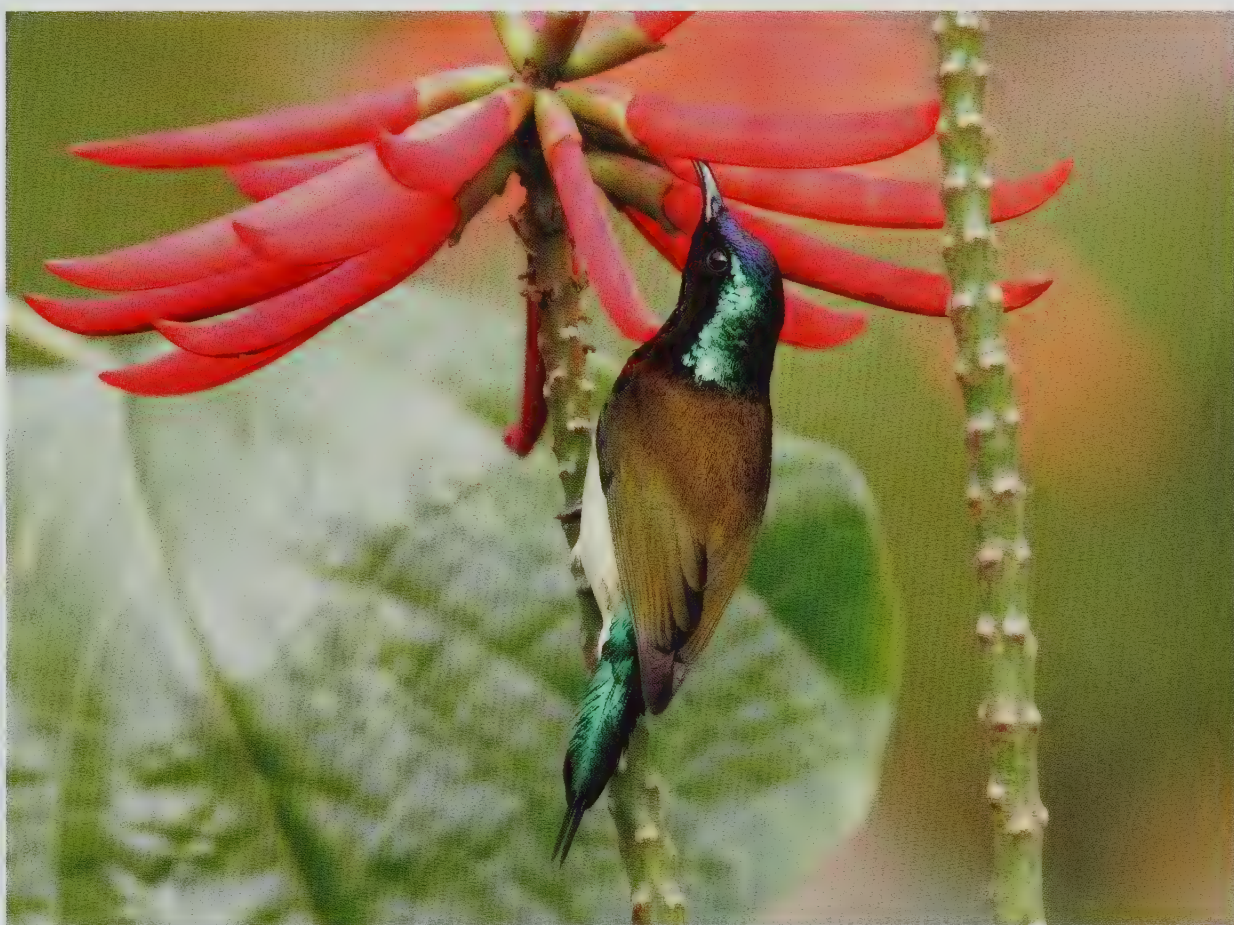
used, as are eight African genera of the Solanaceae. More than nine genera of the Verbenaceae are known food sources, prominent among them being *Lantana*, recorded for ten species of sunbird. The gingers (Zingiberaceae), with more than five genera involved, are particularly important in Asia.

Of the non-flowering plants, the gymnosperm *Juniperus*, the juniper, is known to be utilized for food by one species in Africa. The lichen *Usnea* attracts three African species of sunbird, but these probably exploit it as a source of invertebrate prey or nest-building material.

Nectar is the most important plant product in the diet of sunbirds, being recorded for 93 species, with a further 21 species suspected of nectarivory. When more information becomes available, it will quite possibly be found that all of these species feed to some extent on nectar. A perceived problem of nectarivory is the ingestion of large amounts of water as part of dilute nectar. Experimental work on the Palestine Sunbird revealed that, with increased water ingestion, there was decreased water absorption in the intestinal tract, allowing the birds to take in large amounts of watery nectar or sugar solutions without an increase in glomerular filtration rate in the kidneys, as the rate of filtration is not sensitive to water-loading. The entire glucose filtered load was recovered by the kidneys, and water reabsorption by the kidneys decreased with increased water intake. This contrasts with the circumstances among the hummingbirds, which produce extremely dilute urine. In experimental studies of the Southern Double-collared Sunbird, it was found that this species can digest and absorb the sugars sucrose, glucose and fructose, but that xylose is excreted. Another study on the Palestine Sunbird showed that, as with hummingbirds and honeyeaters, this nectariniid has rather low nitrogen requirements and loses one third of the allometrically predicted value of nitrogen per day, attributable to its low-protein and high-sugar diet. The Southern Double-collared Sunbird manages to obtain its nitrogen requirements from pollen alone.

Sunbirds extract nectar by sucking, as do the sugarbirds, whereas hummingbirds, in contrast, lick nectar. As the sunbird tongue is extruded and retracted, it pushes against the upper man-

Short-billed sunbirds are at a disadvantage compared to long-billed species when seeking nectar from a flower with long corollas. But many such nectariniids circumvent this potential problem by piercing the corolla at its base and then extracting the nectar. This practice is known as nectar-robbing, as the bird gains the benefit of the nectar without being dusted with pollen from the anthers, thereby avoiding contributing to the plant's pollination process. Accordingly, the species that adopt this practice, such as the **Fork-tailed Sunbird**, are termed "nectar-thieves". Some 18 species in six sunbird genera, plus the spiderhunters (Arachnothera), are known nectar-thieves. Plant genera susceptible to nectar-robbing include *Hibiscus* and *Gardenia*.



[*Aethopyga christinae*
latouchii,
Tai Po Kau, Hong Kong.
Photo: Martin Hale]



Although nectariniids are best known for feeding on nectar, all species are thought likely also to consume invertebrates. Nectariniids have been recorded preying on a fair variety of insects, the commonest targets being bugs (Hemiptera), aphids (Aphidoidea), leafhoppers (Homoptera), termites (Isoptera), ants (Formicidae) and beetles (Coleoptera). This male **Palestine Sunbird** is waiting with intent, poised for the best moment to grab the tiny caterpillar crawling beneath it. Sunbirds prefer the larvae of Lepidoptera to the adults.

[*Cinnyris osea osea*, Tawi Atayr, Dhofar, Oman. Photo: Hanne & Jens Eriksen]

dible. Air is expelled from the large cavity in the fleshy part of the tongue as it is pushed forwards and upwards against the palate. The cavity is opened when the muscles pull downwards and backwards as the tongue is retracted. A slight vacuum is created, causing nectar to be drawn up the tongue into the posterior cavity. When the tongue is pushed forwards again, the nectar is forced over the back edge of the tongue and the tubercles, passing along the two grooves in the palate. As the groove in the tongue extends over its entire length, a continuous stream of nectar is pumped through the bill. There is no crop, and the oesophagus is non-distensible, so nectar passes directly in to the proventriculus

and on to the ventriculus (see Morphological Aspects). Thus, nectar cannot be stored, and sunbirds must feed frequently. In contrast, the relatively large crop of the hummingbirds allows for the storing of nectar. In most species of sunbird, however, the proventriculus is rather broader than the oesophagus and has thicker muscular walls (see Morphological Aspects), perhaps an indication of the greater importance of arthropods over nectar in the diet. The amount of sucrose in nectar varies, even within one species of plant. As examples, the nectar of *Banksia marginata*, a member of the Proteaceae, contains an average of 22% sucrose, but the content ranges from 3% to 55%, equivalent to 0.09–2.11 molar (gram molecular mass/dm³ of solution), and in the lamiaceous *Leonotis leonurus* it varies from 16% to 25%, the average being 23%.

In laboratory conditions, and with artificial nectar-feeders used as flower substitutes, Malachite Sunbirds drink larger volumes if the sugar solution is more dilute. In addition, the rate of sugar-solution uptake by Bronze Sunbirds is less if the feeders have longer "corollas", as the amount obtained per "suck" is lower. In captivity, the White-breasted Sunbird, in order to receive a constant intake of sucrose, was found to adjust the intake volume of solution when the concentration varied from 0.25 to 2.5 molar; at concentrations of 0.07–0.1 molar, however, the birds lost mass, as they were unable to ingest sufficient for their energy requirements. Free-water consumption varies, increasing as sucrose concentration in the diet increases, and effectively diluting the most concentrated solutions to an average of 1.05 molar, which is presumably the preferred concentration.

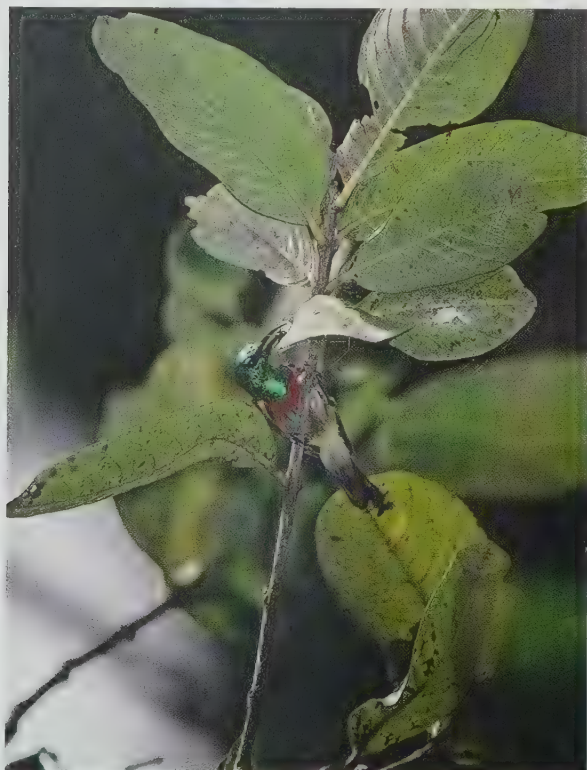
At Zaria, in Nigeria, nectar from 37 species in 34 plant genera was taken by seven species of sunbird. The two principal sunbird species involved, the Pygmy and Scarlet-chested Sunbirds, exploited mainly different species of plant, the shorter-billed Pygmy Sunbird foraging at smaller flowers than those utilized by the longer-billed Scarlet-chested, although there was some overlap, as the Pygmy Sunbird could "nectar-rob" the larger flowers. It was also noted that high night-time temperatures and low humidity could cause the nectar to become "toffee-like", so that it was then available to birds only if they ingested parts of the flowers as well.

Fruits are less important for nectariniids, having been recorded as food for 33 species of sunbird, and seeds have been documented as taken by 21 species. Only ten members of the family

More than 70 species of nectariniid feed on spiders (Araneae), and this prey type is enshrined in the English and scientific names of the spiderhunter genus, *Arachnothera*.

This male **Olive-bellied Sunbird** has gleaned a white spider from the outer foliage of a tree. Leaf-gleaning is a commonly used foraging technique in this family. Sunbirds often defend feeding territories to ensure that they and their kin have access to adequate food resources. Some Olive-bellied Sunbirds fit into this category, defending territories against other sunbirds and even against sphingid moths (*Sphingidae*).

[*Cinnyris chloropygius orphogaster*, Katwe Crater Lake, Uganda. Photo: A. P. Leventis]



are known to feed on pollen, and one more is suspected of so doing, but many more will unwittingly carry pollen on the head and, to some extent, on other parts, such as the feet, and hence act as pollinators. Other vegetable items, such as leaves and flower parts, are of minor importance.

Plant exudates from fig-wasps (*Elisabethiella*) are recorded as a food item for three African species, including the Greater Double-collared Sunbird. The Miombo Double-collared, White-breasted and Common Purple-banded Sunbirds feed on an exudate from beans of the *Cassia singuena* tree that have previously been opened by Common Bulbuls or Black-collared Barbets (*Lybius torquatus*). In this situation, the Miombo Double-collared Sunbird is dominant over the two other sunbirds. The Amethyst Sunbird is known to take oozing coconut sap. Latex balls, particularly from the euphorbiaceous genus *Manihot*, have been found in the stomachs of ten species of sunbird in Africa. In one specimen of the Splendid Sunbird the ball almost filled the stomach, and in a specimen of the Copper Sunbird such a ball was found at least four months after *Manihot glaziovii* had ceased flowering. These observations suggest that the latex is indigestible, and that it was probably accidentally ingested when the bird pierced vascular tissues of the plant while nectar-robbing. Such balls, especially if of substantial size, could be only detrimental to the bird. In Asia, the Purple Sunbird is attracted to toddy palms (*Caryota urens*) when these are being tapped.

Vertebrate prey has been documented for only one member of the family, the Malachite Sunbird, which has been recorded as taking small lizards in Africa. In contrast, it is very likely that all sunbird and spiderhunter species take invertebrate prey, particularly arthropods. Twelve orders of insect are represented in the

nectariniid diet, six of these being prominent. Termites (Isoptera) are known to be eaten by 16 species, and bugs (Hemiptera), particularly cicadas (Cicadoidea), aphids (Aphidoidea) and leafhoppers (Homoptera), are taken by 27 species. Small beetles (Coleoptera) are known prey items of 31 sunbird species, although only one of these is known to take beetle larvae, probably because the majority of such larvae are concealed and would have to be prised from wood or other plant material, or dug from soil. Members of the insect order Hymenoptera are an important food resource, this being particularly so of ants (Formicidae), which are taken by 27 species of sunbird. A variety of true flies (Diptera), including gnats (Culicidae), midges (Chironomidae) and hoverflies (Syrphidae), is eaten by this family. Although a number of nectariniids take moths and butterflies (Lepidoptera), it is the larvae of these insects, the caterpillars, that are particularly favoured, being consumed by 35 species of sunbird. A further 35–43 sunbird species are recorded as taking insects, but with no details of the orders to which the prey belong.

Spiders (Araneae) are popular prey, forming part of the diet for more than 70 species of sunbird and spiderhunter. Other invertebrates taken by small numbers of species include mites (Acari), snails (Gastropoda) and nematodes (Nematoda). Odd items are occasionally noted, such as sand in the stomach of Uluguru Violet-backed Sunbirds, and small shells, quartz, sand and grit in the stomach of Olive-bellied Sunbirds.

Sunbirds pollinate many plants, and it has been calculated that up to 2% of South African flowering plants are pollinated by them. Although some species have preferences for particular plants, there seems to be little evidence of co-evolution of bill length and corolla-tube length that would lead to a particular spe-

Like other birds, nectariniids need to drink if their diet does not provide sufficient water to balance losses through excretion or pulmonary evaporation. This male **Mariqua Sunbird** is drinking by reaching down into the water below, and sucking it upwards into its bill. This technique requires a degree of balance not needed in the drinking technique most commonly deployed by birds, that of taking a sip then tilting the head backwards so that the water trickles down the throat by gravity. Water may be a scarce resource for populations of the Mariqua Sunbird that inhabit dry acacia (*Acacia*) savanna, but a more abundant one for other populations in riverine and swamp-fringing forests. Sunbirds also ingest water when feeding on nectar. Indeed, it is thought that nectarivory may have the undesirable side-effect of taking in too much water in the form of dilute nectar. The Mariqua Sunbird has a varied diet, and consumes nectar, spiders (Araneae) and insects as varied as flies (Diptera) and termites (Isoptera), which it takes by leaf-gleaning, hovering or hawking.



[*Cinnyris mariquensis*
mariquensis,
Nylsvley Nature Reserve,
Limpopo, South Africa.
Photo: Warwick Tarboton]



Like all its congeners, the **Grey-breasted Spiderhunter** has a mixed diet. Inserting its long bill into the corollas of flowering plants, it sucks up nectar. It also feeds on spiders (Araneae) and on insects, such as crickets (Orthoptera) and ants (Formicidae). This individual appears to be searching for arthropods skulking amidst the petals of the inflorescence on which it is perched. Spiderhunters are generally less gregarious than sunbirds, and the Grey-breasted Spiderhunter tends to forage alone or in pairs. It exploits food sources at all levels of the forest, and is often encountered in the lower and middle storeys.

[*Arachnothera modesta modesta*,
Borneo.
Photo: Ong Kiem Sian]

cies of sunbird being closely adapted for the pollination of a certain species of plant. At flowers with deep corollas, longer-billed sunbirds are obviously at an advantage over shorter-billed ones, but the latter may surmount this problem by nectar-robbing, whereby they pierce the base of the corolla and extract the nectar without any pollination occurring. Eighteen species from the genera *Anthreptes*, *Anthodiaeta*, *Cyanomitra*, *Chalcomitra*, *Leptocoma* and *Cinnyris*, and the spiderhunters in *Arachnothera*, are known to be nectar-thieves. The victims, usually large or long flowers such as those of *Hibiscus*, robbed by Purple-rumped, Olive-bellied, Miombo Double-collared, Southern Double-collared, Red-chested, Palestine and Seychelles Sunbirds, and those of *Gardenia*, robbed by Eastern Olive, Southern Double-collared and Variable Sunbirds, have the corolla pierced at the base by the sunbird's bill; the bird thus withdraws the nectar without necessarily touching the anthers and being dusted with pollen. The Souimanga Sunbird pierces unopened flower buds to reach the nectar. Other nectar-thieves include the Brown-throated, Stuhlmann's Double-collared, Montane Double-collared and Loten's Sunbirds. One suggestion of co-evolution in Africa is that between the Golden-winged Sunbird and the lion's claw (*Crotalaria agatiflora*), the bird frequently having a coating of this plant's pollen on the crown and, in particular, in the medial groove between the feathers of the crown. Another example of co-evolution between plants and sunbirds is the specialized bird perch, in the form of a vertical protrusion resembling the tail of a rat, of the appropriately named rat's-tail plant (*Babiana ringens*). The Malachite Sunbird perches on this in order to reach down to probe the inflorescences of this South African Cape endemic member of the Iridaceae, thereby picking up pollen on its breast for later transfer to other plants of the species.

The role of this family in pollinating flowers is important, and sometimes the forehead of the sunbird is heavily encrusted with pollen. When feeding on nectar, many sunbirds will probe into the corolla from the top, and may thus effect pollination, but there is not much evidence of specific relationships between particular sunbirds and plants, although the Brown-throated Sunbird is a known pollinator of the spice plant *Nicolaia elatior*. The Purple Sunbird is an important pollinator of various mistletoes such as *Loranthus longiflorus*, which it does by gentle squeezing of the bud tip to open it, and then it probes for nectar. The Purple-

rumped Sunbird inserts its bill into the deep slits of the corolla of *L. longiflorus*, which triggers the separation of the fused elements, thereby exposing the pollen. The Orange-breasted Sunbird is recorded as feeding on 66 species of *Erica*, the florets of which it probes while clinging to the stems. It is suggested that it may have co-evolved with *Erica*, because the ornithophilous (bird-pollinated) species are thicker-stemmed than both the entomophilous (insect-pollinated) and anemophilous (wind-pollinated) species, and the stem girth of the ornithophilous species is greater



Spiderhunters have longer bills than sunbirds and deploy them to good effect when foraging. The longer the spiderhunter's bill, the deeper it can penetrate into the corollas of flowering plants to access the nectar lying within. The **Streaked Spiderhunter** is particularly fond of the nectar of the inflorescences of banana (*Musa*) trees. Like most of its congeners, this species usually forages singly or in pairs, but also joins mixed-species flocks. It inhabits various types of forest, displaying a preference for feeding in the canopy but also willing to descend to lower levels. As well as nectar, the Streaked Spiderhunter forages for insects and spiders (Araneae), even extracting the latter from their webs, a feat that requires considerable dexterity.

[*Arachnothera magna pagodarum*,
Kaeng Krachan NP,
Phetchburi, Thailand.
Photo: Kaniit Khanikul]

For most of its length, the long tongue of the spider-hunters forms a perfect tube, but towards the tip it splits off into two incomplete tubes with fimbriated inner edges. While distinctive in its own way, this structure does not differ greatly from that found in most of the sunbird genera, and this sort of tongue serves as a very good tool for extracting nectar. Effectively, as the tongue is moved in and out, it is pushed against the upper mandible to create a vacuum, which sucks the nectar up off the flower. The

Grey-breasted Spiderhunter feeds on a variety of arthropods as well as nectar. It forages singly or in pairs in all storeys of the forest. It is the lowland counterpart of the **Streaky-breasted Spiderhunter** (*Arachnothera affinis*), and these two may form a superspecies.

[*Arachnothera modesta*
modesta,
Danum Valley, Sabah, Borneo.
Photo: Günter Ziesler]



than would be required merely for flower support or for nectar production.

Pollinia, packets of pollen with mechanical clips for attachment, are produced by orchids and milkweeds (Asclepiadaceae) and are vehicles for pollination by specific insects. Pollinia of the milkweed *Microloma sagittatum* have been found on the tongue of the Southern Double-collared Sunbird, and the pollinia of an unidentified milkweed or orchid were discovered on the tongue of an Orange-breasted Sunbird. Both of these occurrences



Most sunbirds are territorial during the breeding season. Males defend their territories by singing from exposed locations. Such positions serve a dual purpose: they enable the territory-holder to survey his domain for intruders; and permit any potential rivals or mates to see that the territory already has an owner. Should a sunbird stray into the territory of a conspecific, it is likely to be the recipient of aggressive behaviour from the incumbent. Territorial male **Collared Sunbirds** chase each other while clicking their wings.

[*Anthodiaeta collaris*
elachior,
Masai Mara National Park,
Kenya.
Photo: Morten Strange]

were in South Africa. The first case was attributed to the presence of a specialized groove on the tongue (see Morphological Aspects), and the pollinia were detached mechanically on arrival at the next plant; the second example, however, appeared to be accidental, as the tongue was being prevented from curling properly into a tube by the presence of the pollinia, which almost certainly had a detrimental effect on the sunbird's feeding. The orchids *Disa chrysostachya* and *Disa satyriopsis*, however, are also pollinated by sunbirds. In South Africa, the first of those two is pollinated by Malachite Sunbirds, and probably also by Amethyst, White-breasted and Greater Double-collared Sunbirds; and in Malawi, *Disa satyriopsis* is visited, and probably pollinated, by Malachite Sunbirds and Montane Double-Collared Sunbirds. Pollinaria of these orchids become attached firmly to the bird's toes when it perches on the tall narrow inflorescences in order to probe flowers on them. Sunbirds perching on flowers of *Strelitzia* may also pollinate with their feet.

In addition to breeding territories (see Breeding), many sunbirds defend feeding territories. The tree-like plant *Balthasaria schliebenii*, a member of the Theaceae family, is defended by Blue-headed Sunbirds in Africa. *Leonotis leonurus*, the wild dagga, is defended by the Eastern Olive Sunbird against conspecifics and other sunbirds, whereas, in places where this plant grows in abundance, up to 1350 Malachite Sunbirds can be found in an area of just 1 ha; the Bronze Sunbird often has members of the plant genus *Leonotis* within its breeding territory. The Western Olive Sunbird defends feeding territories around both *Symphonia globulifera* and *Syzygium congolense* trees, and both sexes of the Purple-breasted Sunbird hold territories against conspecifics around the former, although up to twelve individuals of this species may feed together. Mistletoes are associated with a number of sunbird species. The Rufous-winged Sunbird holds a feeding territory around these plants, and may defend several clumps of mistletoe at once against other species of sunbird, and the Kenya Violet-backed Sunbird is said to depend on mistletoes, dominating Black-bellied Sunbirds at the flowers. Beautiful, Gould's and Brown-throated Sunbirds, too, feed on mistletoes, the last being known to nectar-rob them. The Purple Sunbird is usually found close to mistletoes and is an important pollinator, and the Purple-rumped Sunbird is also known to propagate them.



The division of nectariniid parental responsibilities is such that females take sole charge of nest construction. This female **Purple Sunbird** has collected some fibres, possibly animal hair, which she will use to build the basic structure of her nest. From start to finish, nest preparation may take as few as five days or as many as 15. In addition to fibres, the female Purple Sunbird collects soft grass, leaves and spider webs as core building materials. When applying the finishing touches, the female seeks out bark, caterpillar frass and other such objects to provide decoration. Finally, she lines the nest with seed-down, to provide eggs and nestlings with comfort and insulation.

[*Cinnyris asiaticus brevirostris*, Muscat, Oman. Photo: Hanne & Jens Eriksen]

Flowering rhododendrons (*Rhododendron*) in the Himalayan ranges attract Gould's and Fire-tailed Sunbirds, and perhaps other congeners. In equatorial regions of Africa the Bronze Sunbird is closely associated with *Erythrina abyssinica*. The Souimanga Sunbird guards aloe flowers and is aggressive towards the Long-billed Green Sunbird, but only the female of the former is regarded as disputing flowers of *Bakerella* species. The Green-headed Sunbird is known to gather in groups of up to 30 males in *Xylopia aethiopica* trees, each male defending an area of 2–4 m in diameter. Experimental work has shown that the Eastern Olive Sunbird expends 5.4 kJ of energy per day in defending clumps of *Leonotis leonurus* against both intraspecific and interspecific competitors, and that it gains 57 kJ per day from the nectar. Male Crimson-backed Sunbirds defend flowering trees against conspecifics and flowerpeckers.

Protea is important to both Orange-breasted and Bronze Sunbirds, and the latter has increased in the highlands of Zimbabwe following the commercial growing of this plant. The Red-tufted, Malachite and Tacaze Sunbirds defend territories that contain *Protea* inflorescences. It has been calculated that the Golden-winged Sunbird, which defends extensive patches of *Leonotis nepetifolia*, can obtain 76% of its energy requirements from such territories. Male Olive-bellied Sunbirds, which prefer pink *Hibiscus rosa-sinensis* flowers to red ones, probably because the latter are nectar-depleted by butterflies, sometimes hold feeding territories which they defend against other sunbirds and against sphingid moths. So far as the defending of feeding territories is concerned, the Tiny Sunbird is erratic, its behaviour being dependent on flower availability. The Mariqua Sunbird defends such territories throughout the year, and there is some evidence of territoriality among Superb Sunbirds. Miombo Double-collared Sunbirds defend feeding territories against each other. In Madagascar, male Long-billed Green Sunbirds are territorial at flowering trees.

Less seems to be known about the territorial behaviour of foraging spiderhunters. An apparent pair of Yellow-eared Spiderhunters has been noted as defending a flowering patch of canopy lianes against other spiderhunters.

Wild gingers attract Thick-billed, Grey-breasted and Streaked Spiderhunters, whereas banana flowers are favoured by the Superb Sunbird in Africa and, in Asia, by the Little, Thick-billed,

Yellow-eared, Naked-faced, Streaky-breasted, Grey-breasted and Streaked Spiderhunters. Whitehead's Spiderhunter is known to frequent orchids (Orchidaceae). For well-studied nectariniid species the total number of foodplants can be quite large. The Souimanga Sunbird, for example, is associated with at least 26 species.

Thirty-eight species of sunbird and two species of spiderhunter have been observed to hover while foraging. Among the sunbirds, this habit is recorded for members of the genera *Chalcoparia*,



As with other sunbirds, it is the female **Olive-backed Sunbird** that takes control of building the nest in which to raise her brood. This species' nest is a hanging oval purse that is normally 30–60 cm in length, the variation usually depending on the length of the dangling "beard" that can be seen in this photograph. Principal building materials include grass, moss, cotton, lichen, vegetable fibres and spider webs. This female is putting the finishing touches to the nest, returning with a feather to provide a snug, soft inner lining. The nest is normally suspended 1 m or so above ground, hanging from a plant or man-made object.

[*Cinnyris jugularis ornatus*, Mandai Orchid Garden, Singapore. Photo: Jimmy Chew]

In a family where nest-construction is almost entirely the prerogative of the female, the **Purple-rumped Sunbird** stands out as an exception. In this species, the male (seen here) assists the female with collecting suitable nest material and weaving it together. The nest is not dissimilar in shape to that of other sunbirds, being an oval or pear-shaped purse, often with a porch or hood above the entrance hole. The exact building materials of course depend on what is available locally in the Purple-rumped Sunbird's habitat. Grass and fibres form the basis of most nests, which are subsequently lined with soft plant down. External decoration is provided by materials such as lichen, bark, moss and caterpillar frass. The nest is usually suspended from the tip of a branch, some 2–15 m above the ground, but some nests hang from artificial constructs such as buildings and even, in one recorded instance, a light bulb. Nectariniids nesting outside the tropics tend to time their breeding to coincide with the wet season. Within the tropics, particularly near the Equator, sunbirds are more likely to breed in any month. Resident in India, Bangladesh and Sri Lanka, the Purple-rumped Sunbird has been recorded egg-laying in all months, with breeding peaks varying according to region and the exact timing of the monsoon.

[*Leptocoma zeylonica flaviventris*,
Vedanhangal,
Tamil Nadu, India.
Photo: Hanne & Jens
Eriksen]





Anthreptes, *Anthodiaeta*, *Dreptes*, *Cyanomitra*, *Chalcomitra*, *Leptocoma*, *Nectarinia* and *Cinnyris*. Many sunbirds hover at flowers while taking nectar, and some use hovering as a method of obtaining insects, as with the hover-gleaning practised by the Olive-backed, Humblot's and Purple-rumped Sunbirds. Others, such as the Ruby-cheeked and Bronze Sunbirds and the Little Spiderhunter, hover at spider webs, when spiders may also be the intended prey. Hovering at ant nests has also been recorded, and the Little Green Sunbird hovers while probing figs.

Hawking and sallying for insects are techniques noted for 38 species from the sunbird genera *Anthreptes*, *Anthodiaeta*,

Anabathmis, *Anthobaphes*, *Cyanomitra*, *Chalcomitra*, *Nectarinia*, *Drepanorhynchus*, *Cinnyris* and *Aethopyga*. Reichenbach's Sunbird is one such example. This species sits for long periods on the same perch, to which it returns repeatedly after hawking for insects.

Leaf-gleaning, sometimes carried out during hovering, is a common and widespread method of gathering insects and spiders. It has been recorded for all nectariniid genera except *Hypogramma*, *Anthobaphes* and *Arachnothera*, and it is probable that members of these genera also use it.

Less usual methods of feeding have been recorded. The Orange-breasted Sunbird has been observed to stand on the ground and probe in grass in a manner reminiscent of a wader or shorebird (Charadriiformes). The Kenya Violet-backed, Sao Tome, Eastern Olive, Scarlet-chested, Splendid and Seychelles Sunbirds and the Yellow-eared Spiderhunter are known to probe bark. This behaviour, believed to be undertaken in search of insects, has been likened to that of a tree creeper (Certhiidae), for example in the Sao Tome Sunbird, and the Splendid Sunbird has been recorded as probing for oozing sap on the trunks of oil palms. The Red-tufted Sunbird runs up the inflorescences of giant lobelias (*Lobelia teleki* and *L. keniensis*), taking not only nectar but also small insects. When feeding at *Lobelia keniensis*, this species seeks out chironomid larvae in water pools formed in the rosettes of this plant, and also seizes bibionid flies. Both of these food items are important in its diet, the latter recorded as constituting up to 90% of the stomach contents of Red-tufted Sunbirds in Kenya.

Some members of the family often visit houses and other buildings for the purpose of foraging, tending to feed particularly on insects at window panes or on spiders taken from their webs. Remarkably, an individual Bronze Sunbird was once observed taking spiders from a web within an occupied school classroom.

There are other interesting details in the foraging behaviour of the Nectariniidae. For example, Reichenbach's Sunbird probes the corollas of the mistletoe *Globimetula braunii*, the flower petals of which have specialized edges; these respond to probing by causing the corolla tube to split open and the stamens to coil inwards explosively, thus enhancing pollination chances. The Orange-breasted Sunbird clings to the side of the flower of *Protea lepidocarpodendron* and probes, with its bill at right angles, into the bracts to reach the nectar. In fynbos, this species competes with the Cape Sugarbird (*Promerops cafer*) for the nectar of protea species. The Western Olive Sunbird competes at flowers of the yellow trumpetbush (*Tecoma stans*) with the honeybee (*Apis mellifera*), the insect attempting to deter the sunbird by flying at

Nectariniids often place their nests in rather exposed positions, such as at the tip of a branch a few metres above ground level. Such prominent sites risk attracting the attention of predators and brood parasites such as cuckoos (Cuculidae). Nest disguise is thus an important consideration, so the outer layer of the nest is often designed to meet such requirements. Dead leaves make up much of the construction material for the nest of the **Western Violet-backed Sunbird** and provide fairly effective concealment. The remainder of the nest comprises bark, grass and spider webs.

[*Anthreptes longuemarei* angolensis, Mutinondo Wilderness Area, Zambia. Photo: Warwick Tarboton]



Whereas sunbird nests are frequently located in highly visible locations, those of spiderhunters tend to be more concealed. This **Long billed Spiderhunter** has placed its nest on the underside of a large banana (*Musa*) leaf. The bird uses spider webs to attach the nest to the leaf or, alternatively, sews together the leaf edges to form a tube. The nest tends to be bottle-shaped with a cup at one end and can be more than 40 cm long; a wide entrance hole leads via a lengthy tunnel to the nest chamber. Such concealment has advantages, but one of the costs is that if a parent wants to alight alongside its nest, it is obliged to do so upside-down.

[*Arachnothera robusta* robusta, Taman Negara, Peninsular Malaysia. Photo: Ong Kiem Sian]

Sunbird nests commonly have a porch over the entrance, offering shade from the sun and shelter from the rain, as in this nest of **Loten's Sunbird**.

This species' nest is a rather ragged, pendulous pouch that hangs from a twig or branch up to 3 m above the ground. Nests, as in this instance, are frequently surrounded by spider webs. The nest is constructed from plant matter such as lichens, leaves, grass, moss and rootlets; wool or plant down provides a suitably soft and warm lining for the eggs and, subsequently, nestlings. In India, Loten's Sunbird has been recorded breeding in all months of the year, but with a peak between March and May (January to May in Kerala). In Sri Lanka, it appears to vary its breeding season in accordance with location and climate. In the damp highlands, it breeds between August and December, whereas in the dry lowlands, the breeding season is from February to May. Average clutch size is 2–3 eggs, but, rather surprisingly for a fairly common species, nothing is known about the incubation or nestling periods, or even parental responsibilities.



[*Cinnyris lotenius lotenius*,
Sri Lanka .
Photo: Rolf Kunz]

its face. This nectariniid, incidentally, has been known to become fatally entangled in spider webs. In contrast, a pair of Amethyst Sunbirds has been observed to take over an active spider nest for its own use, the birds feeding on the numerous spiderlings crawling over the nest.

The Purple-rumped and Purple Sunbirds include grapes in their diets. They pierce these fruits and suck out the juices. In the Hyderabad area of peninsular India, their depredations, particularly on the peripheries of vineyards, are such that they are considered pests (see Relationship with Man).

Breeding

Outside equatorial regions, the majority of sunbird species breed during wet seasons, when there are sufficient insects available to feed their young. Some, however, nest in the dry season, and yet others breed throughout the year. One dry-season nester, the Pygmy Sunbird, migrates south to do so. In East Africa this species breeds from October to December, and in West Africa it lays eggs from December to April. The reasons why such species nest in dry periods are unclear, but they are probably linked with the flowering of favoured foodplants, such as *Bombax* species, *Ceiba pentandra* and *Erythrina senegalensis*, and the associated flush of insects that permits so many insectivorous migrants from the Palearctic to survive the harsh conditions (Moreau's Paradox). The Pygmy Sunbird breeds in the savanna, but some forest-dwelling species also nest in the dry season, as does the Buff-throated Sunbird in Nigeria.

Many bird species inhabiting equatorial zones may breed at any time of the year, examples among the Nectariniidae being the Purple-breasted Sunbird and the Golden-winged Sunbird.



Typical wet-season breeders include the Copper Sunbird and the Splendid Sunbird. Those species breeding in all months tend to have peaks of activity at some period during the year. For instance, although the Orange-breasted Sunbird may nest during any month, it does so more commonly during May to August. Such species can exploit the conditions and be double-brooded or even triple-brooded.

The majority of sunbirds are territorial in the breeding season. The extent of the area defended varies with species and habitat, singing males of the Palestine Sunbird occurring at densities of 6.4 per hectare but those of the Splendid Sunbird being spaced at 0.16 males per hectare. Territories are defended by males, which sing from vantage points such as treetops and demonstrate aggressive behaviour towards conspecific intruders. Males of the Scarlet-tufted Sunbird display aggressively to other males by uttering shrill calls, projecting the head and tail forwards, spreading the tail, drooping the wings, thereby exposing the pectoral tufts, and opening the bill to expose a red-orange mouth. The Purple-rumped Sunbird defends an area with a radius of up to 250 m, using a similar display. Territories of the Red-tufted Sunbird vary in size from 1700 m² to 3300 m² according to altitude and available resources. Interspecific encounters also occur among territorial sunbirds, the last-mentioned species chasing away Montane Double-collared Sunbirds. In this respect the Copper Sunbird is notorious, having been seen to drive out of its territory many different species, among them the African Masked Weaver (*Ploceus velatus*), the Village Weaver (*Ploceus cucullatus*), the House Sparrow (*Passer domesticus*), the Common Bulbul, the Scarlet-chested Sunbird, the Common Fiscal (*Lanius collaris*), the Kurrichane Thrush (*Turdus libonyanus*) and the Diederik Cuckoo (*Chrysococcyx caprius*). Defence is most intense during periods when eggs are being incubated.

For those species for which the information is available, the mating system is normally a monogamous one, involving simple pairs. Co-operative behaviour has been recorded for a few species, and it may prove to be commonplace. The Straight-billed Green Sunbird is suspected of being a co-operative breeder, as helpers have been seen to attend the young of this species. Helpers have been reported also among Seychelles and Violet-tailed Sunbirds, and co-operative feeding of the young by more than two adults has been noted for the Purple-rumped Sunbird. Extra-pair copulations have been witnessed in the case of the Purple-rumped Sunbird, the Palestine Sunbird and the Malachite Sunbird.

Copulation usually follows some elaborate displays by males. Those possessing pectoral tufts, such as the Malachite Sunbird, will expose these tufts while raising the tail and fluttering the wings. Courtship by the Plain-backed Sunbird involves the male in chasing a female until the latter perches; the male then lands above her, flicks his wings, exposes the pectoral tufts and sings while the female quivers her wings. In the case of the Collared Sunbird, courting males lean forwards and jump from side to side while flapping their wings and calling "chi-chi". A male may display simultaneously to more than one female. With the Nile Valley Sunbird, display-dances and display-flights are involved in courtship rituals. The Purple-rumped Sunbird copulates in trees, bushes or creepers. One pair was seen to mate three times within a four-hour period.

What appears to be lekking behaviour is known to be practised by Sao Tome Sunbirds, Blue-throated Brown Sunbirds, Eastern Olive Sunbirds and Western Olive Sunbirds. Blue-throated Brown Sunbirds gather in groups of normally 4–7 individuals, but up to 45 singing males have been observed together at the beginning of the rains in Gabon. In this case, the birds perched on dead branches or in fruiting or blooming *Xylopia* trees, where they hopped from branch to branch, and faced each other with the pectoral tufts exposed and the chest inflated; during this display they sang, holding the head thrown back, the bill wide open, the wings drooping, and the lowered tail spread. Female Blue-throated Brown Sunbirds were present, but merely as observers, and they did not take part in the displays or indulge in copulation.

Nest-building is a task delegated to the female. Nests of spiderhunters are distinctive in being quite unlike those of sunbirds. The Little Spiderhunter and the Streaked Spiderhunter

Unlike most nectariniids, the male **Malachite Sunbird** plays a role in nest construction—albeit not a particularly active one. The male simply accompanies his partner as she searches for suitable building material such as grass, fibres, twigs and rootlets for the basic form; lichen for external decoration; and feathers, down and wool for the lining. Nest construction usually takes 7–30 days, although a particularly diligent female may complete the task within just three days. The nest is a relatively neat oval, some having a porch, a straggling "beard", or both. Many sunbirds suspend the nest from a branch or twig, but the Malachite Sunbird often sites its nest within a bush, frequently above water. The male has a rather elaborate courtship display, during which he makes good use of his elongated central tail feathers.

[*Nectarinia famosa famosa*,
Hermanus, South Africa.
Photo: J. A. Bailey/Ardea]

This incubating female **Collared Sunbird** is likely to be sitting on anything up to four eggs. This species is unusual among the Nectariniidae in that the male sometimes helps with incubation duties.

Once the eggs have hatched, after 17–19 days, both parents provision the chicks for around two weeks, and the brooding female may receive food from the male. The female,

however, takes sole responsibility for building the nest in which to raise the brood. Construction may take as few as one-and-a-half days or as many as seven. The nest is pear-shaped, with a side entrance hole, porch and, sometimes, a dangling "beard" comprising dead leaves and spider webs.

This female has chosen to suspend her nest from a spiny Euphorbia. The spines may provide natural protection against mammalian predators, and certainly monkeys are known to predate Collared Sunbird nestlings.

This species ranges over most of sub-Saharan Africa. Such a wide distribution, covering varied topography and habitat, provides the backdrop for considerable taxonomic uncertainty.

Nine subspecies are currently recognized, but one or more further species actually may be involved.

[*Anthodiaeta collaris zuluensis*,
Mkuzi Game Reserve,
KwaZulu-Natal,
South Africa.
Photo: Alan Weaving/
Ardea]





Spiderhunter nests tend to be rather neat constructions. That of the **Spectacled Spiderhunter** is a compact, circular cup, sometimes with a spout, and is made from compacted plant fibre. In common with congeners, and in contrast to most sunbirds, the Spectacled Spiderhunter conceals its nest by attaching it to the underside of large leaves, for example those of palms or rubber. As this species normally forages in the middle or upper storeys, it is not surprising that it places its nest at least 5 m above ground—higher than most nectariniids. Like most spiderhunters for which data exist, the Spectacled Spiderhunter lays two eggs.

[*Arachnothera flavigaster*, Panti Forest, Peninsular Malaysia. Photo: Jimmy Chew]

construct a cup which they attach to the underside of a banana leaf or palm frond. The Yellow-eared Spiderhunter places its nest similarly, but the nest itself is an elongated tube attached to the leaf by sewing with cobweb, and that of the Long-billed Spiderhunter is bottle-shaped and made of grass stems. Most sunbird nests, in contrast, are purse-shaped or flask-shaped ovals woven from grass, and are suspended; all are enclosed. Some have a porch over the entrance, and a “beard” trailing below the nest is a frequent feature. Exceptions to this general pattern include the nests of the Orange-breasted Sunbird, which are placed in protea bushes, and those of the Pygmy Sunbird, which are usually attached to branches within the body of a thornbush such as acacia, *Bougainvillea*, *Balanites aegyptiaca* or *Dichrostachys cinerea*. Some sunbird nests, such as those of the Collared, Scarlet-chested and Mariqua Sunbirds, are sometimes protected by their placement, being built near nests of stinging wasps.

Some members of the family associate with human habitations, nesting on houses, on verandahs or even inside huts. The Palestine Sunbird has been found to nest in houses, and one pair chose to build its nest inside the trouser leg of a pair of shorts left hanging to dry. Other species found nest-building inside houses include the Mouse-coloured Sunbird, the Eastern Olive Sunbird and Hunter’s Sunbird. Nectariniids which often nest on or close to houses include the Copper Sunbird and the Miombo Double-collared Sunbird.

An unusual Purple Sunbird nest was discovered in 2005 in India. This was suspended from hanging wire in a corridor of the Department of Zoology at the University of Jodhpur, in Rajasthan. The exterior of the nest was constructed from spider webs, grass pieces, leaves and thin strips of polythene, the last applied solidly in a crisscross pattern. Once the sunbirds had completed the breeding attempt, successfully, the nest was dismantled, when it was found to consist of 60% spider webs, 20% white polythene strips and 15% grass leaves, the remaining 5% being made up of small pieces of paper and the down feathers of birds. The lining consisted of small strips of polythene, paper and down. Although it is not uncommon for birds of many species to make use of artificial materials for nest-building, the utilization of polythene by Purple Sunbirds does seem somewhat extraordinary.

Many sunbird nests are concealed by decorations consisting of a variety of materials, including dead leaves, lichen, mosses, insect frass and cobwebs. The most remarkable of such nests is

that of the Blue-throated Brown Sunbird, which may be up to 1 m in height and has the appearance of a tangle of dead vegetation. The nest itself is in the middle, and the whole structure built of stems, twigs, dead leaves, *Marasmius* fungus, spider webs, fibres and moss. The deep cup is lined with bark fibres and sometimes with mammal hairs, including those of gorilla (*Gorilla gorilla*), and the entrance is protected by a short porch made from bark. The nests of approximately 15% of sunbird species have apparently not yet been described.

Sunbird eggs are generally shaped like miniature hen’s eggs. Some, however, are elongated, as is so with the largest of the sunbirds, the Sao Tome Sunbird, the eggs of which are 21.5 mm long and 15 mm wide, and white, with small red spots. The eggs of spiderhunters are also large, with a maximum size of 22 ×



Female nectariniids tend to take most of the responsibility for feeding the offspring. However, males also play a role, particularly once the young have fledged. This male **Olive-backed Sunbird**—sexed by its iridescent throat and upper breast—is taking a spider (Araneae) to provision its growing offspring. In Australia, the Olive-backed Sunbird nests in all months, but with a peak in the drier period between October and March. The breeding season is more concentrated elsewhere in the species’ range.

[*Cinnyris jugularis frenatus*, Townsville, Queensland, Australia. Photo: Clifford & Dawn Frith]

With two growing nestlings to feed, this female **Malachite Sunbird** has plenty to keep her busy. Like other sunbirds, the female does most of the provisioning for the 2–3 week nestling period, sometimes assisted by the male. The labour is shared more evenly once the chicks have fledged. The fledglings gradually become independent, roosting in the nest for the first fortnight after leaving it. Once the fledglings have departed, their parents may be able to set about raising another family: the Malachite Sunbird is double- or triple-brooded. The male cannot always be certain that he has fathered the brood he raises, for extra-pair copulations have been observed, as has cloaca-pecking.

[*Nectarinia famosa*.
Photo: J. J. Brooks/
Photo Access]



16 mm recorded for eggs of the Long-billed Spiderhunter. The smallest eggs are those of the Crimson Sunbird, with dimensions of 12.2–17.3 × 10.2–12.7 mm, and those of the Handsome Sunbird, measuring 12.7–13.5 × 9.7–9.9 mm. Eggs vary in colour, from white to almost black; the ground colour is often decorated with a variety of spots, stripes, striations, blotches and other markings, the patterning frequently concentrated at the larger pole. The eggs of about 20% of nectariniids have not been described.

Whereas incubation of the eggs is carried out by both sexes of the spiderhunters, the eggs of sunbirds are nearly always incubated by the female alone, although there are reports of males of the Collared Sunbird and the Copper Sunbird sitting on eggs. Incubation usually lasts for about two weeks. The nestlings are naked, often black, or covered with short grey down, the interior

of the mouth being yellow, orange or red, without dark spots. Collared Sunbird nestlings have black down, sometimes with iridescent green on the head and mantle, and the nestling of Reichenbach's Sunbird is olive above and yellow below, with a grey throat. Those of the Southern Double-collared Sunbird are dark pink with a white gape and a dark-tipped dark horn bill. Females do the bulk of the work in the provisioning of the young, but the males often help, particularly after the offspring have fledged. Often, the fledglings return to roost in the nest for up to two weeks after their first flights.

Fledging success of the Seychelles Sunbird is 44.4–75.8%. The breeding biology of the Palestine Sunbird has been well studied. This species achieves a hatching rate of 67%, and in one study 47% of eggs laid produced fledglings. Clutches of three eggs were the most successful, returning an average of 1.5 young. Losses of eggs were due to infertility, desertion, breakage and embryonic deaths, and chicks were lost to predation, disturbance, infanticide and starvation.

A common cause of nest failure is parasitism by cuckoos, honeyguides (Indicatoridae) or honeybirds. In Africa, the Diederik Cuckoo has been recorded as parasitizing the Bronze Sunbird, the Mariqua Sunbird and the Copper Sunbird. Klaas's Cuckoo (*Chrysococcyx klaas*) is a brood parasite of the Collared, Orange-breasted, Green-headed, Cameroon, Western Olive, Amethyst, Scarlet-chested, Tacazze, Bronze, Malachite, Southern Double-collared, Greater Double-collared, Mariqua, Variable, Dusky and Copper Sunbirds. The African Emerald Cuckoo (*Chrysococcyx cupreus*) lays its eggs in nests of Newton's, Eastern Olive, Western Olive, Scarlet-chested, Amethyst and Copper Sunbirds, and the Red-chested Cuckoo (*Cuculus solitarius*) is known to parasitize the Malachite Sunbird and the Olive-bellied Sunbird. The Eastern Green-backed Honeyguide (*Prodotiscus zambesiae*) lays in nests of the Amethyst Sunbird, and the closely related Western Green-backed Honeyguide (*Prodotiscus insignis*) similarly parasitizes the Olive-bellied Sunbird. Greater Honeyguides (*Indicator indicator*) parasitize the Scarlet-chested Sunbird, a pair of which was seen also to chase away a Brown-backed Honeyguide (*Prodotiscus regulus*), but nest parasitism of sunbirds by this latter species remains unproven. In addition, the young of an unidentified honeyguide has been found in the nest of a Western Olive Sunbird.

In Asia, the Plaintive Cuckoo (*Cacomantis merulinus*) parasitizes the Purple-rumped Sunbird and the Purple Sunbird.

Compared to most nectariniids, which raise one or two broods per year, the **Bronze Sunbird** is a prolific breeder. Near the Equator, it may raise four or five broods in a twelve-month period. Given that each breeding cycle takes 40–50 days, a particularly fecund pair may devote two-thirds of their adult life to the business of procreation. As with other sunbirds, the female Bronze Sunbird has the main responsibility for raising the young, but, as we see here, the male also assists with provisioning duties.

[*Nectarinia kilimensis arturi*,
Vumba, E Zimbabwe.
Photo: Geoff McIlhlon]





The Asian Emerald Cuckoo (*Chrysococcyx maculatus*) lays in nests of Gould's, Green-tailed and Crimson Sunbirds, and the Violet Cuckoo (*Chrysococcyx xanthorhynchus*) is a brood parasite of the Ruby-cheeked Sunbird and Brown-throated Sunbird. The Little Spiderhunter is parasitized by the Violet Cuckoo, the Asian Emerald Cuckoo, the Common Cuckoo (*Cuculus canorus*), the Large Hawk-cuckoo (*Cuculus sparveroides*) and Hodgson's Hawk-cuckoo (*Cuculus fugax*); adults of this spiderhunter were

seen to feed a semi-dependent fledgling Violet Cuckoo in Peninsular Malaysia in late June. The Streaked Spiderhunter is likewise exploited by the Large Hawk-cuckoo, the Indian Cuckoo (*Cuculus micropterus*), the Common Cuckoo and the Asian Lesser Cuckoo (*Cuculus poliocephalus*).

Finally, there is one nectariniid species in Australia, the Olive-backed Sunbird. This, too, is host to several parasitic cuckoos, in this case the Shining (*Chrysococcyx lucidus*) and Horsfield's Bronze-cuckoos (*Chrysococcyx basalis*) and the race *russatus* of the Little Bronze-cuckoo (*Chrysococcyx minutillus*).

Movements

For a little under half of all species in this family, there is no certain record of movements. Whether such species are truly sedentary or whether the impression given is due merely to a lack of knowledge will be revealed only by further research. In those instances where nectariniids are known to undertake movements, these are often complex and little understood, and they vary within a species from one area to another.

Altitudinal shifts in response to seasonal changes in weather conditions are reported for species breeding at higher elevations. This phenomenon is particularly noticeable in the Himalayan region, where five species of *Aethopyga*, including Gould's, Green-tailed and Fire-tailed Sunbirds, make such movements, as does the Streaked Spiderhunter. Similar elevational displacements are recorded also in the Nilgiris of southern India, involving the Crimson-backed Sunbird and the Little Spiderhunter. The latter has been found to move altitudinally on Mount Mulu, in northern Borneo.

In Africa, the Collared Sunbird is recorded as making vertical movements in the Drakensbergs of South Africa, although not over the rest of its large range in that continent. Still in South Africa, the Orange-breasted Sunbird moves at least 320 m upwards during the austral summer in response to flower availability, and in the same country the Greater Double-collared Sunbird

The nestling period of the **Olive-backed Sunbird** lasts 13–16 days; judging from its largely olive and yellow juvenile plumage, this chick is probably only a few days short of fledging. There may be only one nestling in this brood, which could be because the female laid only a single egg or because one or two other chicks have perished. In Borneo, the normal clutch size is two, but only one chick usually fledges. Predation is a common cause of the other chick's demise: predators include monitor lizards (*Varanus*) and possibly ground squirrels (*Sciuridae*) and rats (*Rattus*).

[*Cinnyris jugularis frenatus*, Coquette Point, estuary of Johnstone River, NE Queensland, Australia. Photo: Stanley Breeden/Lochman Transparencies]



Rather surprisingly for a species distributed across much of sub-Saharan Africa, there is no solid information regarding the duration of the incubation or nestling periods of the **Common Purple-banded Sunbird**. What is known, however, is that both parents feed the nestlings. These photos offer a striking example of the contrast in plumage between the drab female (left) and the resplendent male (right). This pair's nest is fairly typical of the species: an oval construction, usually suspended from a branch, extensively decorated and camouflaged with leaves and lichen.

[*Cinnyris bifasciatus microrhynchus*, Nkwaleni Valley, KwaZulu-Natal, South Africa. Photos: Guy Upfold]

In common with most passerines, nectariniid nestlings excrete their alimentary waste encased in gelatinous white faecal sacs. In order to avoid contaminating the interior of the nest and attracting the attention of predators, adult sunbirds must extract and remove each sac as soon as the nestling produces it. This male **Black-throated Sunbird** is deftly removing the faecal sac prior to disposing of it at a safe distance from the nest. Such nest sanitation activity is particularly common in species with open nests that are especially vulnerable to predation.

[*Aethopyga saturata wrayi*,
Fraser's Hill,
Peninsular Malaysia.
Photo: Jimmy Chew]

wanders into and out of mountains in search of food. On Mount Cameroon, in West Africa, the Cameroon Sunbird moves altitudinally with the seasons. On the same mountain, the Northern Double-collared Sunbird moves down from its breeding area during the wet season in July to September, and it is absent also from Mount Elgon, in Kenya, at certain times. The Tacazze Sunbird shifts altitude on Mount Elgon and leaves mountains in southern Sudan when its main foodplant, *Lobelia*, is not in flower. Similarly, the Malachite, Red-tufted and Golden-winged Sunbirds have been demonstrated to make such movements in connection with the flowering of their favoured plants. In the Middle East, the nominate race of the Palestine Sunbird is an altitudinal migrant in Jordan, Saudi Arabia and Oman, and in Sudan the subspecies *decorsei* moves to higher levels in September–January to breed on Jebel Marra.

Movements associated with rains are common in Africa. One example is that of the Pygmy Sunbird, which in West Africa migrates during the dry season southwards from the Sahel to the savannas of Ghana, Togo and Nigeria, where it breeds in October–April or, in Ghana, sometimes as early as August. The pattern of movements, however, is not straightforward, as the species is present in north-west Nigeria only in the rains, presumably as a visitor from south-west Niger. It may also move from Sudan to the grasslands of Uelle, in DR Congo, during late December to March, and is a breeding visitor to north-west Uganda in October–March. This sunbird is known to gather in loose premigratory flocks of 20–30 individuals. It is also somewhat nomadic, moving in response to food supply. Another example is provided by the Scarlet-chested Sunbird, which exhibits a variety of movement patterns in different parts of its range, being recorded as sedentary, nomadic and migratory, both laterally and altitudinally. In West Africa it apparently moves north with the rains, occurring in Mauritania mostly during the wet season. It is known to move into both Kenya and Zimbabwe during dry periods, and in Namibia it is present during November–April. In the far northern parts of West Africa the Beautiful Sunbird arrives with the rains and proceeds to breed, and the Splendid Sunbird is similarly only



a wet-season visitor to the savannas of that region. The Southern Double-collared Sunbird is absent from the arid western region of South Africa during July–December, and is found in Eastern Cape Province during May–November. Likewise, the Mariqua Sunbird leaves the arid Kalahari during droughts. The White-breasted Sunbird exhibits a rather complex pattern of movements, in part associated with the rainfall regime. It moves during the dry period from the more arid southerly areas of southern Africa,

In most nectariniids for which data are available, young birds become independent a few weeks after fledging. During this period, the parents will continue to feed their offspring, as seen with these **Eastern Olive Sunbirds**. The link of sunbird fledglings with their natal patch remains strong; this individual is perched atop the nest in which it hatched and it will probably roost there until it feels sufficiently confident to leave its parents' territory. The Eastern Olive Sunbird is one of four nectariniids known to exhibit lekking behaviour. Leks contain 10–20 singing males that perform fluttering display flights and compete for the highest perches. Unusually for a lekking species, the male Eastern Olive Sunbird does not entirely neglect his parental responsibilities, for he joins in feeding the nestlings.

[*Cyanomitra olivacea*
olivacea,
Eshowe, KwaZulu-Natal,
South Africa.
Photo: Guy Upfold]





Once young nectariniids have fledged, the focus of the parental role shifts from provisioning their offspring towards preparing them for an independent life. Adults continue to feed fledglings for a couple of weeks, during which time they will gradually venture further from the nest. This female **Ruby-cheeked Sunbird** is feeding the well-grown fledgling away from the nest, familiarizing it with its wider surroundings.

[*Chalcoparia singalensis singalensis*,
Peninsular Malaysia.
Photo: Ong Kiem Sian]

where it breeds in the austral summer, to the wetter eastern and northern parts of its range. If there is further rainfall in the summer, it may spend the non-breeding season in areas farther west. Passage has been recorded in north Botswana, where White-breasted Sunbirds have been observed to be moving north-eastwards in April. In some areas, this species seems to be nomadic. The Dusky Sunbird is known to irrupt into Western Cape Province of South Africa in response to droughts.

Patterns of movement made by the Variable Sunbird are similarly complex, and the species is regarded as being variously resident, nomadic and a partial intra-African migrant in different areas. In Nigeria, it is resident in coastal savanna in the south, but elsewhere in southern Nigeria it is absent during the April–October rains, when it is present in the north of the country. Passage is recorded in northern Nigeria in April–July, with a return in September. The Copper Sunbird is another species that moves into the northerly savannas of West Africa to breed in the wet season in April–October, and occurs in Mauritania only in the wet from August to October. In Madagascar, the Long-billed Green Sunbird is absent from the dry forest in the south-west of the island for long periods. Finally, in Australia, the Olive-backed Sunbird is more abundant around Townsville, in northern Queensland, in the wet summer months than it is in the dry winter months.

Movements that are directly linked with flowering patterns of certain plants have been observed. In Mauritania, the Pygmy Sunbird moves from one area to another in relation to the abundance of mistletoes that parasitize acacia trees. The Beautiful Sunbird and the Shining Sunbird make similar displacements in relation to the supply of mistletoes, and in south Sudan the Tacazze Sunbird is absent from mountains when the *Lobelia* plants are not in flower. The Souimanga Sunbird of Madagascar is abundant when certain plants, such as *Aloe* and *Kalanchoe*, are in flower. At least eleven other nectariniid species are recorded as moving in relation to flowering events, but without specific plants being mentioned.

Few details are available of the recorded distances covered by dispersing or migrating sunbirds. The Olive-backed Sunbird has reached Booby Island, in the Torres Strait, a distance of 24 km from the nearest point in its known range, and the Seychelles Sunbird has colonized Aride Island from Cousin Island, 20 km distant. Some Gould's Sunbirds move from east Nagaland, in

north-east India, and southern China south to Manipur, north Cachar and Myanmar in the non-breeding season, and others travel between mountains in north Thailand. The Fire-tailed Sunbird has been recorded once as a migrant in Thailand, well south of its known breeding range. In addition, a total of 3300 Fire-tailed Sunbirds and 250 Gould's Sunbirds were recorded moving north along a ridge in western Yunnan, China, in November. At least 22 Streaked Spiderhunters were seen moving along another ridge in the same region, also in November.

In the African region, there are influxes of the Nile Valley Sunbird into Egypt in October–March. This species also arrives



Brood parasitism is a frequent problem for breeding nectariniids. Depending on location, the parasites include various species of cuckoo (*Cuculidae*) and honeyguides (*Indicatoridae*). This male **Cameroon Sunbird** has been duped into raising a Klaas's Cuckoo (*Chrysococcyx klaas*), a species that has been recorded parasitizing 15 other sunbird species. Parasitism results in partial or complete nest failure as the female parasite usually ejects one of the host species' eggs as she lays her own and the nestling parasite often dispatches any host species chick in similar fashion.

[*Cyanomitra oritis banoensis*,
Belegete, Obudu District,
Cross River State,
SE Nigeria.
Photo: A. P. Leventis]

Many nectariniids visit gardens to investigate the wide range of additional, often exotic, foodstuffs that are available. Such close contact enables human observers to become familiar with such vividly coloured species as the spectacular **Temminck's Sunbird**. Some sunbird species take their relationship with man one or two steps further, drinking at birdbaths, foraging for insects at windows, or locating their nests on buildings. Some nectariniids are lauded for pollinating commercially important plants; others are treated as pests for assisting the spread of parasitic plants.

[*Aethopyga temminckii*,
Kinabalu Park,
Sabah, Borneo.
Photo: Kaniit Khanikul]



in Saudi Arabia, north of the Tropic of Cancer, from mid-October, and it is present in Oman from November to February. Non-breeding individuals, including perhaps some from Arabia, are present in Somalia and eastern Ethiopia from September to May. South of the equator in Africa, the Amethyst Sunbird has been recorded as moving distances of up to 120 km. In southern Africa, there are documented movements by the Scarlet-chested Sunbird of as much as 360 km, whereas the Malachite Sunbird in the same region has been recorded as migrating up to 500 km. In Malawi, the Red-tufted Sunbird is absent from the Nyika Plateau in May–June, and in north Tanzania it is recorded as a vagrant on the North Pare Mountains, 60 km from the nearest part of its known range, namely Kilimanjaro. Other confirmed movements involve the Golden-winged Sunbird, recorded as migrating up to 101 km in Kenya, this also including an altitudinal shift; the Miombo Double-collared Sunbird, which has moved up to 29 km in Zimbabwe; and the Copper Sunbird, for which displacements of up to 43 km have been documented in South Africa.

Relationship with Man

Sunbirds are common visitors to gardens, where their grace and charm, and the beauty of those species with iridescent plumage, are much appreciated. Common garden flowers, such as *Hibiscus* and *Strelitzia*, are often planted in order to attract them, but only a few species, such as the Collared, Mariqua, Variable and White-breasted Sunbirds, come to drink at birdbaths. The Palestine Sunbird is known in Arabic as *Sultan el-Zahar*, the “King of the flowers”, a name which could be applied to the majority of the members of the family.

Some members of the Nectariniidae associate with human habitations, where they take advantage of the opportunities for nesting provided by houses and other buildings (see Breeding). Others often visit dwellings in order to exploit foraging opportunities, such as insects at window panes (see Food and Feeding). In these circumstances, they are again often welcomed by their human hosts.

The visits of both sunbirds and spiderhunters to the flowers of plants of economic importance contribute to the pollination of these, and this can be significant. This same habit, however, also

assists the spread of parasitic mistletoes. As a consequence, the Scarlet-chested Sunbird is treated as a pest in West African cocoa plantations, where the mistletoe *Tapinanthus bangwensis* reduces yields. The Purple Sunbird is similarly implicated in the spread of mistletoes in commercial *Gmelina*, *Shorea* and teak plantations in India. The Purple Sunbird and the Purple-rumped Sunbird are also pests in vineyards, where they damage the fruit. Other direct damage is caused by the Scarlet-chested Sunbird, in this case to commercially grown protea flowers. On the other hand, the sunbirds and spiderhunters consume large quantities of insects, a fact which renders them beneficial to man, since many of these insects are likely to be pests or human-biters and some of them are conveyors of disease.

In Borneo, spiderhunters are considered by the Dusun people of Merimbun, in Brunei, to be a good omen in all situations when they are seen flying from right to left. One calling from the left-hand side of a person, however, can in certain circumstances be a bad omen, but a spiderhunter heard to call from the right is an encouraging augury to a hunter.

Status and Conservation

On the whole, sunbirds and spiderhunters are adaptable to habitat changes if these are not too severe. Although many of the species are attractively plumaged, they are not regarded as being desirable as cagebirds. This is perhaps because they are not known as songsters pleasing to the human ear, in addition to which they may be difficult to keep in captivity, and they have therefore been saved from the depredations of the cagebird trade. Provided that flowering plants are available to provide nectar and other plant products, and as a habitat for their invertebrate prey, the members of this family will tolerate variable degrees of degradation of their primary habitat. As a consequence, many species spread into plantations, orchards, other agricultural areas, gardens and a variety of secondary habitat types as humans encroach upon their natural habitats. With so little known about the requirements of the Nectariniidae for optimal breeding and survival, it is very difficult to quantify the effects of the habitat degradation that result in a species shifting into man-made habitats for part or even all of its life.



A fair number of nectariniids qualify as restricted-range species, the extent of their range being less than 50,000 km². The **Regal Sunbird** and **Stuhlmann's Double-collared Sunbird** are two of the four sunbird species that occur only within the Albertine Rift Mountains Endemic Bird Area, which spans Burundi, Rwanda, Tanzania, Uganda and DR Congo. The Regal Sunbird is locally common throughout much of its small range, while Stuhlmann's Double-collared Sunbird is abundant at certain sites, particularly at altitudes above 2750 m. Habitats frequented by both species include montane forest, bamboo and clearings; the first two of these are among the key habitat types in the Albertine Rift mountains. In addition to the four sunbirds, some 32 other restricted-range species occur in this EBA. It contains several important protected areas, including parks well known for the conservation of the mountain gorilla (*Gorilla gorilla berengii*) but the remaining habitat continues to be threatened by deforestation, prompted by the price of timber and the need for agricultural land.

[Above: *Cinnyris regius regius*, Ruhija, Bwindi-Impenetrable Forest National Park, Uganda.

Below: *Cinnyris stuhlmanni stuhlmanni*, Rwenzori National Park, Uganda.

Photos: Greg & Yvonne Dean/World Wildlife Images]



The stunning **Crimson-backed Sunbird** is a restricted-range species, occurring only in the Western Ghats Endemic Bird Area of western India.

Reports of this species occurring, and even breeding, in Sri Lanka in the early twentieth century are considered to be erroneous. The Crimson-backed Sunbird is locally common and inhabits evergreen forest, shaded plantations, secondary growth and gardens, particularly in the foothills. The species' ability to utilize habitats that have been modified by man reassures conservationists about its status, so that its future is currently considered secure.

[*Leptocoma minima*, Backwoods Camp, Goa, India.

Photo: Greg & Yvonne Dean/World Wildlife Images]



The common occurrence or, indeed, even the mere presence of a species in areas of modified habitat may give the appearance that a secure, stable, adaptable population of that species is involved. The population concerned may, however, be living in sub-optimal conditions for breeding or overall survival, and only through long-term studies can the true situation be elucidated. Preservation of the species' perceived natural habitat must be a top priority if there is to be some degree of confidence in its continued existence.

Of the 132 species of sunbird and spiderhunter currently recognized, only seven, or 5.3%, are considered by BirdLife International to be globally threatened. Three of these are classified as Endangered and four as Vulnerable, although one presently placed in the latter conservation category may require an uplisting to the category of Endangered. A further eight nectariniids, 6.1%, are listed as Near-threatened. Thus, there is some concern for 15 species, equivalent to about 11.4% of the members of the family. One of the Endangered species is from Kenya and Tanzania, another from east Tanzania and the third from Indonesia. Of the Vulnerable species, one is from the DRCongo, one is confined to the Gulf of Guinea republic of São Tomé and Príncipe, and two are restricted to Tanzania. Four of the eight Near-threatened species hail from the Afrotropical Region, one of these from Cameroon and Bioko, another from Tanzania, a third from South Africa and Mozambique, and the fourth from Kenya, Tanzania, Mozambique and perhaps Zimbabwe. The remaining four are Asian, one from the Sunda region and three from the south Philippine island of Mindanao.

The Amani Sunbird is regarded as Endangered on account of its very small and fragmented range. It occurs only in the Arabuko-Sokoke Forest of Kenya and, in Tanzania, in four areas in the East Usambara Mountains and two areas in the Udzungwa Mountains. This species' global population, which is decreasing, is estimated to lie in the range 10,000–19,999 individuals, and its total geographical range is estimated at 870 km². Although forest-dependent, it has been recorded in very degraded forest, clearings and gardens. Destruction of forest, often carried out illegally, appears to be the principal threat to this sunbird, although competition with a congener, the Collared Sunbird, may also be a factor. Long-term forest conservation through sustainable management and community participation is underway in Arabuko-Sokoke. In Tanzania, there are three active conservation and

development projects in the East Usambaras, together covering at least 121 km²; the Amani Sunbird's known locations in the Udzungwas are relatively well protected by their isolation.

Not too far away, in east Tanzania, another Endangered sunbird survives in the Uluguru Mountains. This is Loveridge's Sunbird, which is restricted to threatened habitats within an elevational range of 1200–2580 m. Its global population, estimated at probably 37,000 individuals, is found entirely within three forest reserves covering a total surface area of some 260 km². There is a need for field research on this species, with the aim of determining the extent to which it is capable of tolerating further degradation of its habitat.

In Asia, the last of the three Endangered nectariniids, the Elegant Sunbird, is confined to the very small island of Sangihe, north of Sulawesi. One specimen was apparently taken on nearby Siau in 1866. Its population, estimated at 2500–9999 individuals, is severely fragmented, and is continuing to decline as a result of habitat loss and degradation. This sunbird's total range is estimated to be 560 km², within which it has been recorded from Talawid Atas, Kedang, Mount Awu, Petta, Manganitu, Mount Sahendaruman, Mount Sahengbalira, Mount Palenti, Kentuhang, Ulung Peliang, Tabukan and Tahuna. In 1998–1999, it was the most commonly encountered forest bird species at Mount Sahendaruman, suggesting locally high population densities, but its absence from large areas of Sangihe indicates that, overall, its numbers are relatively small. The Elegant Sunbird is an inhabitant of primary forest, forest edge, adjacent low scrub and plantations, but is present in the last-mentioned habitat only if hardwoods persist in the vicinity and a scrubby understorey is available; it is found at elevations from 75 m to 1000 m. The tiny remnant of primary forest that exists on Sangihe receives inadequate protection and continues to suffer from agricultural encroachment at its lower fringes. The forest on Mount Sahendaruman is nominally conserved. Since 1995, fieldwork and conservation-awareness programmes have been conducted, and ideas developed for future land use, through agreements between interested parties. There are plans to reclassify the 4 km² of "protection forest" on Mount Sahengbalira as a wildlife reserve, and some forest in the Kentuhang valley is protected as the watershed for a hydro-electric scheme. It has been proposed that a permanent presence of forestry staff be established on the island.

Rockefeller's Sunbird is poorly known and is thought to have a very small population. It is thus classified as Vulnerable, but its conservation category may need to be upgraded to that of Endangered. It has a stable population of 250–999 individuals, and its



Small islands are often replete with endemic birds, and Sumba, in the Lesser Sundas of Indonesia, is no exception.

The **Apricot-breasted Sunbird** is a restricted-range species that occurs only in the Endemic Bird Area formed by this 11,000 km² island. This species is very common at the forest edge, and in secondary forest, cultivation and scrub, particularly in the lowlands. Its abundance and adaptable habitat tastes mean that it is not currently considered to be at risk of extinction.

[*Cinnyris buettikoferi*, Sumba, Lesser Sundas. Photo: Roland Seitre]



The island of Socotra, situated off the north-east coast of Somalia, holds several endemic bird species and thus forms an Endemic Bird Area.

The endemic forms include the **Socotra Sunbird**, seen here perching on *Trichocalyx obovatus* (Acanthaceae), a plant classed as Data-deficient. This restricted-range nectariniid is relatively common, with a population of around 11,000 pairs occurring at a density of 6–12 birds/km². It is present pretty well wherever there is vegetation. Although it is not currently considered to be globally threatened, it could in the future face a considerable threat from the results of overgrazing by goats and cattle.

[*Chalcomitra balfouri*, Wadi Ayhaft, Socotra. Photo: Hanne & Jens Eriksen]

estimated range is 9800 km². It occurs in the northern Itombwe Mountains and mountains to the north and west of Lake Kivu, in the eastern DR Congo, and there are single unconfirmed records from Rwegura, in Burundi, and Nyungwe, in Rwanda. This sunbird inhabits bamboo forest at higher altitudes, especially streamside thickets, and it is found also in montane forest down to 2050 m and in Afro-alpine moorland. Within the Kahuzi-Biéga National Park, west of Lake Kivu, its habitat is protected, although armed militias carried out illegal hunting, logging and mining there in 2001. The Itombwe Mountains receive no protection.



The Banded Sunbird is considered Vulnerable, having a decreasing population estimated at 10,000–19,999 individuals, and a range estimate of 6700 km². It is endemic in Tanzania, being found in five areas of forest in the east of the country: the mountains of Usambara, Nguu, Nguru, Uluguru and Udzungwa, the last including the Ndundulu Mountains. It is common in parts of the Usambaras, but elsewhere is uncommon to rare. It occurs in rainforest at middle altitudes, and more frequently in large glades, disturbed or secondary forest with some surviving large trees, gardens and exotic plantations, but is probably dependent on adjacent primary forest. This nectariniid is threatened over most of its range by forest loss and degradation, resulting from clearance for agriculture, replacement of natural forest with plantations, and tree-cutting for timber and firewood. In the Usambaras and the Ulugurus, the large human population is placing ever greater pressure on land and the forests are fragmented. In the Ulugurus the inaccessible nature of the terrain effectively protects the main block of montane forest, although this covers no more than about 120 km²; conservation projects here are aimed at assisting local initiatives and increasing involvement of local communities in forest management. Forests in the Nguru Mountains, because of their precipitous terrain and the comparatively small human population, are believed not to be currently threatened. In the Usambaras, the East Usambara Catchment Forest Project and the existence of other reserves, such as Mount Nilo Forest Reserve, afford protection to a significant area of middle-altitude forest. In the Udzungwas, the Banded Sunbird is found in the Udzungwa Mountains National Park and the West Kilombero Scarp Forest Reserve.

In terms of its conservation status, the Sao Tome Sunbird is regarded as Vulnerable because it appears to have a small, though stable, population in the range 250–999 individuals, and a limited area of suitable primary-forest habitat estimated at 340 km² in extent. It is confined to the island of São Tomé, in the Gulf of Guinea, where it occurs on the central massif, north towards Ponta Figo, south-west to the area around the rivers São Miguel, Xufexufe and Quija, and east to Formoso Grande and the Formoso Pequeno and the valley of the Ana Chaves river. Although locally common, its total population is probably small as the island contains only a relatively small area of available habitat. The Sao Tome Sunbird occurs in both lowland and montane primary forest up to at least 2000 m, and is occasionally observed in for-

The **Seychelles Sunbird** is the only nectariniid that is to be found in the Seychelles. This restricted-range species occurs in the Granitic Seychelles Endemic Bird Area. It can be found in almost all habitats, natural or man-made, up to altitudes of around 900 m. Generally common and not considered globally threatened, the Seychelles Sunbird may be expanding its range, as birds ringed on Cousin Island were found subsequently to have recolonized Aride. This species is one of the less spectacular members of the Nectariniidae, the male's only colourful areas being a glossy blue throat and yellow, orange or red pectoral tufts. The female lacks even these modest adornments.

[*Cinnyris dussumieri*, Frégate, Seychelles. Photo: Robert Cheke]

The **Mayotte Sunbird** is one of three restricted-range nectariniids that occur in the Comoro Islands Endemic Bird Area. It has a tiny range, restricted only to the island of Mayotte and nearby islets. Nevertheless, it is not considered globally threatened as it is a common inhabitant of open areas as well as forest edge, so is at no particular risk from deforestation. A similar situation applies to this species' congeners elsewhere in the Endemic Bird Area: the Anjouan Sunbird (*Cinnyris comorensis*) is common on the island of Anjouan; and Humblot's Sunbird (*C. humbloti*) is common on Grand Comoro and Mohéli.

[*Cinnyris coquerellii*, Mayotte, Comoro Islands. Photo: Roland Seitre]



est-edge cultivation. Large areas of lowland and middle-altitude forest have already been lost to cocoa and coffee plantations, while the number of small farms has increased, and tree clearance has accelerated as a result of land privatization. Clearance of forest, not only for cultivation, but also for timber and fuelwood supplies, is an additional threat, as also are road developments along the east and west coasts allowing increased human access to previously remote areas. There are proposals to protect the primary forest by designating it an ecological zone and a national park, but at present the forest remains unprotected. A law providing for the listing of protected areas and for the protection of threatened species has still to be ratified.

Currently listed as Vulnerable, the Rufous-winged Sunbird has a small range and is known from only eight locations, all of which, fortunately, lie within well-protected areas. In intervening, non-protected areas, any suitable habitat is probably declining in extent or quality as a result of deforestation and forest degradation. This sunbird is found only in Tanzania, occurring in the forests of Mwanihana and Iwonde, both in Udzungwa Mountains National Park, and in forests at Ukami, Ndundulu and Nymbanitu, in the West Kilombero Scarp Forest Reserve, and in Katemele, Kiranzi-Kitungulu and Uzungwa Scarp Forest Reserves. Its decreasing population is estimated to number 10,000–19,999 individuals, and its known range covers 3360 km². It is found in the forest interior and at the edges of gaps in natural forest, most commonly at 1500–1700 m, but it descends to lower elevations, below 1500 m, during the cooler non-breeding season in June–August. The Rufous-winged Sunbird would face serious danger if protected-area status were to be removed from the forests which it inhabits, particularly at lower elevations.

The Plain-backed Sunbird is considered Near-threatened. It has a disjunct distribution in the coastal lowlands of Kenya and north-eastern Tanzania, in Mozambique and in Zimbabwe. Generally uncommon in forest below 500 m, but ascending to 1000 m in the East Usambaras of Tanzania, it reaches its highest density in Arabuko-Sokoke Forest, in Kenya. In Tanzania, it occurs also southwards to Kiono Forest Reserve, where it is common, and Pande Forest Reserve, where it is rare. In southern Mozambique it is uncommon, with a total population of fewer than 500 individuals, all in dense coastal forest and ironwood (*Androschachys*) forests, and declining as a result of deforestation. There

are few records from south-eastern Zimbabwe, from *Acacia* bush, riverine thicket and riparian forest, but there is a possibility that some of these, at least, may be the result of misidentification of the Variable Sunbird. The Plain-backed Sunbird is a little-known species, and nowhere common. Its population is declining in some areas, and the species may be at risk from clearance of lowland forest throughout its range.

Another *Anthreptes* species, the Red-throated Sunbird, is likewise classed as Near-threatened. It is restricted to the lowlands of south Tenasserim, in southernmost Myanmar, the Malay Pe-

Eight species of nectariniid, representing about 6% of the family, are considered Near-threatened at the global level. While such species are not immediate priorities for conservation concern, they are "birds to watch", as habitat destruction or deterioration, among other pressures, could cause populations to decline to serious levels. One such example is the **Plain-backed Sunbird**, which has a fragmented distribution in the coastal lowlands from Kenya south to South Africa. Nowhere is it common, and its near-dependence on forest means that it is particularly susceptible to habitat transformation.

[*Anthreptes reichenowi yokanae*, Arabuko-Sokoke Forest Reserve, E Kenya. Photo: A. P. Leventis]





The **Red-throated Sunbird** is considered rare to uncommon throughout its range in South-east Asia, Sumatra, Borneo and, possibly, Palawan, in the west Philippines. Its preference for lowland forest below 900 m places it at risk from the widespread deforestation going on in the region. However, it also inhabits less pristine habitat, such as secondary growth, plantations and coastal vegetation. This tolerance of sub-optimal habitat has led conservationists to consider that the species is not under immediate threat of extinction, but it is currently listed as Near-threatened.

[*Anthreptes rhodolaemus*, Panti Forest, Peninsular Malaysia. Photo: Morten Strange]

ninsula, Sumatra and Borneo, although it has possibly been recorded also on Palawan, in the west Philippines. It is uncommon to rare throughout its range, where it occurs in broadleaf evergreen forest to 900 m. Destruction of lowland forest in southern Asia gives cause for concern, but this species' use of submontane and secondary forests, forest edge and plantations implies that it is not immediately threatened.

Ursula's Sunbird is found in forest near Dschang, on Mount Manenguba, Mount Nlonako and Mount Kupé, in the Bakossi Mountains and Rumpi Hills and on Mount Cameroon, all in west Cameroon, and also on Bioko, which is part of Equatorial Guinea. On Bioko there are only a few records, all from primary forest between 1000 m and 1200 m. In Cameroon, it occurs from 950 m to 2050 m in mature forest and forest clearings. In 1991 and 1992 it was common in the Rumpi Hills, and in 1998 it was common down to at least 1100 m in the Bakossi Mountains; in the 1980s it was frequent to common on Mount Cameroon and Mount Nlonako, and throughout the 1990s it was common in all of the forest on Mount Kupé. As this species appears to be dependent on largely undisturbed forest within quite a small range, it is potentially at risk from further forest clearance and is classified as Near-threatened.

Two other *Cinnyris* species are placed in the conservation category of Near-threatened. One, Moreau's Sunbird, is restricted to Tanzania, where it has a small range in the Nguru, Nguu, Uvidunda, Ukaguru and Udzungwa Mountains, occurring in montane forest usually at 1300–1850 m, but at up to 2500 m in the Udzungwas. Healthy numbers of this sunbird have been found in the Nguu and Ukaguru Mountains. Owing to the precipitous terrain and the low human population density in the forests, this species' habitat is not immediately threatened. Moreau's Sunbird occurs within the well-protected Udzungwa Mountains National Park. As it appears to be forest-dependent, it is likely to be sensitive to destruction or degradation of forest habitat elsewhere in its limited range. The other Near-threatened *Cinnyris* species is found from Inhambane, in southern Mozambique, southwards to northern KwaZulu-Natal, in north-east South Africa. Here, Neergaard's Sunbird is a nomadic, sometimes common species of woodland, especially dry, dense forest on sandy soil at low elevations, but apparently avoiding fragmented coastal forest. Much of its range in KwaZulu-Natal is within nature reserves,

but in Mozambique its coastal-forest habitat is highly threatened, particularly by commercial logging and afforestation with non-native tree species.

All three of the remaining nectariniids currently considered to be Near-threatened are in the genus *Aethopyga*, and all are confined to the island of Mindanao, in the south Philippines. The



Three of the eight species of sunbird considered Near-threatened are endemic to the island of Mindanao, in the Philippines, and thus also qualify as restricted-range species. They include the **Apo Sunbird**, which is common in montane forest, usually above 1500 m. Forest at this elevation on Mindanao is relatively secure from anthropogenic pressure. This nectariniid's conservation classification is thus more of a precautionary measure, based on the species' limited distribution rather than being due to current threats to its population. The three subspecies of Apo Sunbird each inhabit different montane areas of Mindanao; one race was described as recently as 1997.

[*Aethopyga boltoni tibolii*, Baracatan, Davao, Mindanao, Philippines. Photo: Doug Wechsler/VIREO]

Even if *Lina's Sunbird* inhabited all the suitable remaining montane forest above 1200 m in eastern Mindanao, its entire global distribution would not exceed 770 km². This tiny range is the reason for its listing as Near-threatened. Realistically, it is not likely to become globally threatened in the short term, because it is common within largely inaccessible forests that contain few tree species of interest to the commercial logger, and that lie on slopes too steep to serve as agricultural land.

[*Aethopyga linaraborae*, Mt Pasian, Mindanao, Philippines.
Photo: Edward Vercruysee]

Seven of the 132 species of nectariniid are considered globally threatened. Of this group, six are African, while the other is Indonesian. Four are listed as Vulnerable and three as Endangered. The latter include the *Amani Sunbird*, a restricted-range species that occurs in just a handful of highly fragmented and declining populations across two Endemic Bird Areas in Kenya and Tanzania, its total area of occurrence being just 870 km². Fewer than 20,000 *Amani Sunbirds* are estimated to remain. Most populations are threatened by deforestation, and, possibly, by competition from the congeneric *Collared Sunbird* (*Anthodiaeta collaris*).

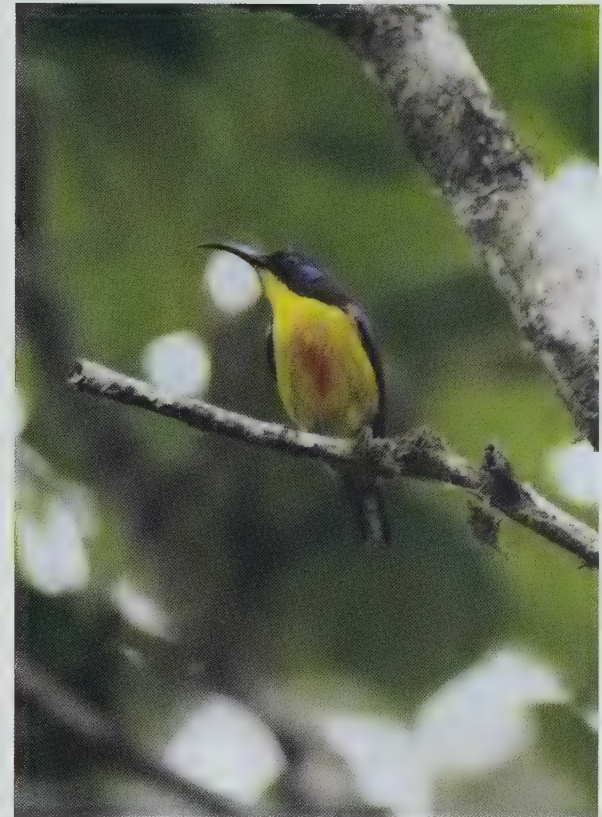
[*Anthodiaeta pallidigaster*, Arabuko-Sokoke Forest Reserve, Kenya.
Photo: Steve Garvie]

Grey-hooded Sunbird is fairly common to common above 1000 m in forest and forest edge, including at Mount Hilong-Hilong, Mount Kitanglad, Civolig, Daggayan, Mount Lamut, Mount Apo and Lake Sebu. It occupies a very small range, but its habitat is apparently secure at present. The Apo Sunbird is apparently fairly common above 1500 m in forest on Mount Malindang, Mount Kitanglad, Mount Apo, Mount Pasian, Lake Sebu, Mount Busa, Mount Matutum, Mount McKinley and Mount Parker. As with the previous species, its range is very small but its habitat appears to be secure. Finally, *Lina's Sunbird* is common in mossy forest above 1200 m on Mount Pasian, Mount Puting Bato and Mount Mayo, in the eastern provinces of Davao del Norte and Davao Oriental. Its total range may be as much as 770 km² if it occupies all available remaining habitat above 1200 m. It is believed unlikely that this species will become seriously threatened in the near future, as it occurs in rugged and inaccessible mountains lacking many commercial tree species and generally too steep for agricultural exploitation.

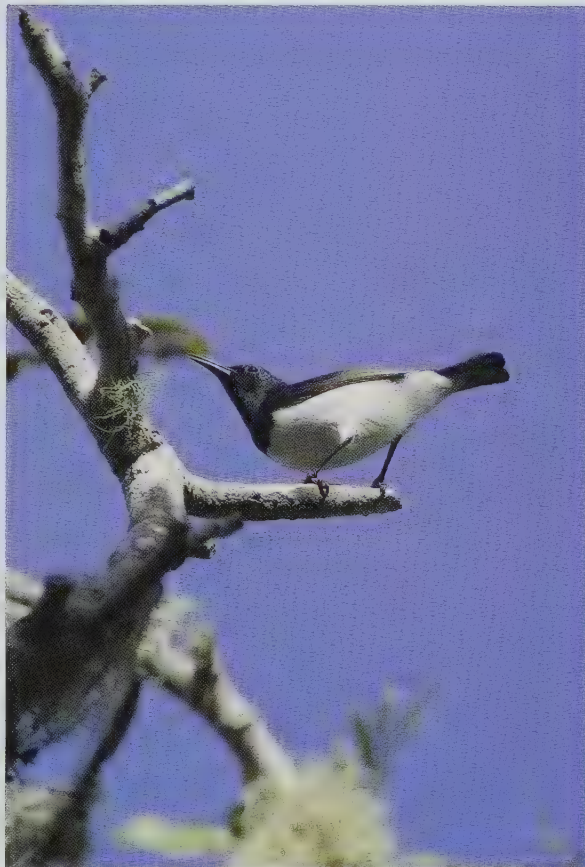
None of the ten species of spiderhunter is thought to be at any risk, at least in the immediate future. Nevertheless, several of them are, at best, uncommon. In the Malay Peninsula and the Greater Sundas, for instance, the Yellow-eared Spiderhunter is local and uncommon to rare and the Long-billed Spiderhunter generally scarce. Whitehead's Spiderhunter is confined to northern Borneo and was formerly rated as Near-threatened, but it has now been found to be locally common.

General Bibliography

Ade (1984), Akinpelu (1989), Alam & Rahman (1988), Ali (1931, 1932), Amadon (1951), Anderson *et al.* (2005), Anon. (2007f), Antaran (1985), Antikainen (1990), Archer & Parker (1993), Beecher (1953), Berlioz (1984), Blackwell & Wells (1965), Bock (1994), Borello (1992), Bowie *et al.* (2004a, 2004b), Brieschke (1990, 1992a, 1992b), Brown (2003), Burd (1995), Chaskda & Mwansat (2006), Cheke (1971a, 1971b, 2003), Cheke & Mann (2001), Clancey (1994a), Classen (1987), Collins (1983b, 1983c), Collins *et al.* (1990), Compton *et al.* (1996), Corlett (1998), Cunningham-van Someren (1996), Das (1963), David & Gosselin (2002b), Davidar (1985a), Delacour (1944), Dickinson (2003), Downs (1997, 2000, 2004), Downs & Brown (2002), Downs & Perrin (1996), Dowsett-Lemaire



(1989a, 1989b, 1996), Durrer & Villiger (1962), Edington & Edington (1983), Eisikowitch & Nahari (1982), Ericson, Christidis, Cooper *et al.* (2002), Ericson, Johansson & Parsons (2000), Evans, M.R. (1991, 1996), Evans, M.R. & Barnard (1995), Evans, M.R. & Hatchwell (1992a, 1992b), Evans, M.R. & Thomas (1992), Evans, T.D. (1996), Farquhar *et al.* (1996), Feehan (1985), Fjelds  & Bowie (2006), Follet (1990), Ford (1995), Fraser & McMahon (1991, 1992), Frost & Frost (1980, 1981), Fry *et al.* (2000), Gadow (1884), Ganguly (1986), Gardner (1925), Gill (1971b, 1985), Gill & Conway (1979), Gill & Wolf (1975a, 1975b, 1977, 1978, 1979), Goldstein, Eisikowitz & Yom-Tov (1986), Goldstein, Verbeek *et al.* (1987), Goodman & Parillo (1997), Greig-Smith (1978), Hall & Moreau (1970), Hamner (1992), Higgins *et al.* (2006b), Irwin (1993, 1995b, 1999, 2004, 2005), Itino *et al.* (1991), Iwarson (1979), Jardine (1843), Johnson & Brown (2004), Kahindi & Kageci (1995), Kirkup (1998), Kumar *et al.* (1984), Lambert (1991, 1992), Leader *et al.* (2000), Leon & Nicolson (1997), Lloyd (1989), Lott (1991), Lotz & Nicolson (1996, 1999), Lucking (1996), Maberley (1997), MacMillen & Carpenter (1977), Mann (2002), Mann & Cheke (2006), Manning (2000), Markman, Pinshow & Wright (1999), Markman, Tadmor-Melamed *et al.* (2006), Markman, Yom-Tov & Wright (1995), Mason & Maxwell-Lefroy (1912), Mayr & Amadon (1951), Mbatha *et al.* (2002), McWhorter *et al.* (2004), Moreau (1942), Nicolson & Fleming (2003), Paton (1982a), Paton & Collins (1989), Pauw (1998), Payne (1978), Paynter (1967), Peck & Peck (1984), Peckover & Filewood (1976), Pettet (1977), Prendergast (1983), Prinzinger & Jackel (1986), Prinzinger, L b ben & Schuchmann (1989), Prinzinger, Sch fer & Schuchmann (1992), Rahman *et al.* (1993), Raju (1998), Raju & Reddi (1989), Rand (1950b, 1967a, 1967b), Rasmussen & Anderton (2005a, 2005b), Rawat & Dookia (2007), Rebelo (1987b, 1991), Ripley (1959a, 1959b), Robson (2004b), Roxburgh & Pinshow (2000), Schlamowitz *et al.* (1976), Schnell *et al.* (1985), Slater (1930), Seavy (2006), Sevastopulo (1980a, 1980b), Sharpe (1885, 1909), Shaw (2001b), Sheldon & Gill (1996), Shelley (1876–80), Sibley (1996), Sibley & Ahlquist (1983, 1990), Sibley & Monroe (1990, 1993), Siegfried *et al.* (1985), Skead (1967), Spottiswoode (1993), Stattersfield & Capper (2000), Steinheimer (2008b), Stuart & van der Willigen (1980), Subramanya & Radhamani (1993), Sundevall (1872), Swynnerton (1916), Symes *et al.* (2008), van Tets & Nicolson (2000), van Tyne & Berger (1959), Underhill & Fraser (1989), Vuilleumier (1993), Waltert & Faber (2000), Warren *et al.* (2003), Welch & Welch (1998), Wells (2007), Wilhelm *et al.* (1980, 1982), Williams (1993a), Winterbottom (1964), Wolf (1975a, 1975b), Wolters (1977, 1979), Wooller (1982), Young (1982), Zimmer (1943).





Genus *CHALCOPARIA* Cabanis, 1851

1. Ruby-cheeked Sunbird

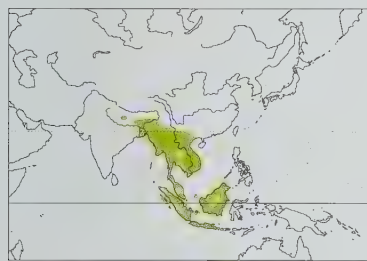
Chalcoparia singalensis

French: Souimanga à joues rubis **Spanish:** Suimanga Carirrubí
German: Rubinwangen-Nektarvogel
Other common names: Rubycheek

Taxonomy. *Motacilla singalensis* J. F. Gmelin, 1789, Ceylon; error = Malacca, Peninsular Malaysia. Genus generally merged with *Anthreptes* in the past, but distinctive tongue morphology unique within family; possibly warrants placement in separate family or subfamily. Geographical variation not well marked; in addition, described race *rubiginentis* (from Cachar, in NE India) considered inseparable from *assamensis*, and *stellae* (from Trat Province, in S Thailand) indistinguishable from *koratensis*. Eleven subspecies recognized.

Subspecies and Distribution.

- C. s. assamensis* Kloss, 1930 – C Nepal (from Chitwan) E to NE India (S from Assam), Bangladesh, N Myanmar, N Thailand and S China (W & S Yunnan).
- C. s. internota* (Deignan, 1955) – S Myanmar and S Thailand (S to Isthmus of Kra).
- C. s. interposita* Robinson & Kloss, 1921 – peninsular Thailand S of Isthmus of Kra.
- C. s. koratensis* Kloss, 1918 – E Thailand and Indochina.
- C. s. singalensis* (J. F. Gmelin, 1789) – Peninsular Malaysia S from N Perak.
- C. s. sumatrana* Kloss, 1921 – mainland Sumatra and Belitung.
- C. s. panopsis* Oberholser, 1912 – islands off W coast of Sumatra.
- C. s. pallida* Chasen, 1935 – N Natuna Is.
- C. s. borneana* Kloss, 1921 – Borneo.
- C. s. bantenensis* (Hoogerwerf, 1967) – W Java.
- C. s. phoenicotis* (Temminck, 1822) – C & E Java.



Descriptive notes. 10–11 cm; male 8.2–9.1 g, female 8–6 g. Male nominate race is dark with brilliant emerald-green iridescence above; upperwing blackish, with blue iridescence on shoulder; tail black with some greenish-blue iridescence; ear-coverts and cheek copper, violet patch bordering throat; throat to upper breast chestnut-red, rest of underparts yellow; iris red; bill blackish; legs greenish-grey. Female is olive-green above, has upperwing dark, with yellow on wing-coverts and edges of remiges, cheek grey, throat and breast rufous, rest of underparts yellow. Juvenile differs from female in having yellow throat concolorous

with rest of underparts. Races differ mainly in coloration of underparts: *assamensis* male differs from nominate in having darker throat, less extensive red below; *internota* is darker than previous, has reddish-brown of throat and breast not clearly defined, yellow below more greenish-tinged; *interposita* male has less chestnut-red on throat and upper breast than nominate, and is less green; *koratensis* male has rufous on throat paler and less extensive than *assamensis*, and well separated from yellow of rest of underside; *sumatrana* male is more bluish above, and darker and more extensively rufous below than *assamensis*; *panopsis* male is as nominate, female has paler, more greenish upperparts and more brightly yellowish posterior underparts than nominate; *pallida* resembles nominate, but reddish below is paler, less extensive and less well defined; *borneana* of both sexes has rufous or chestnut-red of foreneck and upper breast deeper than *interposita*, is more yellow below than previous, also birds from S Borneo are slightly larger than those from N; *bantenensis* has throat and foreneck browner, and area of that colour on chin, throat and foreneck less extensive than in *koratensis*, much clearer greenish-yellow on underparts; *phoenicotis* has rufous of throat merging imperceptibly into yellow of underparts, green gloss on back darker than in *assamensis*, also juvenile less yellow below and duller (less bright olive-green) above than juvenile of last. **VOICE.** Song a shrill rising trill ending in short double note, followed by descending trill ending in 2 separated notes, “tírr-títí, trírrr, tírr, tírr”; another song described as rapid, high “swítí-tí-chí-chú, túsí-tít, swít-swít...”. Call, often in flight, a shrill chirp “seet-seet” or “tear-tear”; described also as thin, shrill, emphatic, upturned “tweest-wit”, second note much higher, also slurred “chúwéést”, and clipped “swít-(swít)”; soft “chí-wíp” by male.

Habitat. Various forest types, including mangroves, regenerating forest, and forest edge, also coastal and riverine vegetation, plantations, coconut groves and gardens. Sea-level to c. 1000 m.

Food and Feeding. Insects, including caterpillars, and probably spiders (Araneae); also fruit, pollen and nectar. Forages in upper storey, occasionally lower. Often feeds at spider webs. Probes flowers for nectar, and gleans insects from leaves.

Breeding. Nest-building in Feb (Mizoram) and laying end Mar to Jun in India; laying Mar and May–Aug in Myanmar, at least Mar–Aug in Malay Peninsula, and Feb–Jul in Java; in Borneo, laying Jan–May and Aug in N (Sabah), nest-building in Jun in S, and juveniles in Aug and Sept in NW (Sarawak) and Jun–Jul in S. Male feeds female in courtship. Nest shaggy and pear-shaped, with porch, made from cobwebs and various plant materials, including roots, fibres, fern stalks, dry grass and moss, suspended from end of drooping twigs of bush 2–8 m above ground, often under steep bank and never in exposed site. Clutch 2 eggs, pink, mauve, white or purplish-grey, marked with clouds, lines or speckles of various shades of brown, grey or purplish-black; no information on duration of incubation and nestling periods; nestlings and fledglings tended by both parents. Nests apparently parasitized by Violet Cuckoo (*Chrysococcyx xanthorhynchus*) in Thailand.

Movements. None recorded. Possibly crosses water to reach Singapore.

Status and Conservation. Not globally threatened. Rare in Nepal and Bhutan, but locally common in other parts of NE Indian Subcontinent; common in Thailand and uncommon to common in Malay Peninsula; common in Sabah, but less common in other parts of Borneo; widespread but uncommon in Sumatra and Java. Reports of this species (race *assamensis*) from N & C India (Uttaranchal and N Andra Pradesh) require confirmation. Occurs in a good many protected areas throughout its range.

Bibliography. Ali & Ripley (1974), Birand & Pawar (2004), Cheke & Mann (2001), Étchécopar & Hùe (1983), Fleming & Traylor (1964), Fleming *et al.* (1976), Hellebrekers & Hoogerwerf (1967), Hoogerwerf (1949, 1950, 1967a), Inskipp & Inskipp (1985), MacKinnon & Phillipps (1993), Mann (1996, 2002, 2008), van Marle & Voous (1988), Medway & Wells (1976), Nash & Nash (1988), Oberholser (1912), Rasmussen & Anderton (2005b), Ripley (1950), Robson (1998, 2000b, 2004b), Sheldon *et al.* (2001), Smythies (1960, 1986), Smythies & Cranbrook (1981), Smythies & Davison (1999), Wells (2007).

Genus *DELEORNIS* Wolters, 1977

2. Scarlet-tufted Sunbird

Deleornis fraseri

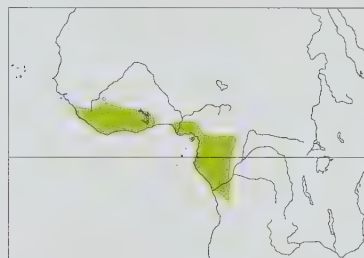
French: Souimanga de Fraser **German:** Laubnektarvogel **Spanish:** Suimanga de Fraser
Other common names: Brown/Fraser's Sunbird

Taxonomy. *Anthreptes fraseri* Jardine and Selby, 1843, Bioko.

Formerly placed in genus *Anthreptes*. Sometimes treated as conspecific with *D. axillaris*, but the two meet in SW DR Congo apparently without intergrading. Three subspecies recognized.

Subspecies and Distribution.

- D. f. idius* (Oberholser, 1899) – SW Guinea and Sierra Leone E to Togo; also recorded in extreme S Mali.
- D. f. cameroonensis* (Bannerman, 1921) – S Nigeria E to SW Central African Republic, S to PR Congo, W DR Congo and NW Angola.
- D. f. fraseri* (Jardine & Selby, 1843) – Bioko I (Fernando Póo).



Descriptive notes. 11.5–12.7 cm; 10.5–15.3 g.

A large dull green sunbird, with long straight bill curved only at tip. Male nominate race is uniformly bright olive-green above, with upperwing and tail brown, outer webs edged yellow-olive; yellow-olive below, pectoral tufts orange-red with yellow at base, axillaries pale yellow, underwing-coverts greyish-white; iris hazel, pale yellow or white eyering; bill dull brown, base of lower mandible olive-yellow; legs olive, claws yellowish-horn. Distinguished from *Cinnyris batesi* and *Anthreptes seimundi* and from female of *Anthreptes rectirostris* mainly by long straight bill (curved only at very tip) and presence of pectoral tufts. Female is as male, but smaller and without pectoral tufts. Juvenile differs from adult in being all pale olive above, paler below, with yellow wash on belly, darker bill. Race *cameroonensis* has duller olive-green underparts with less yellow tinge than nominate; *idius* is smallest and darkest, with darker brown (less green) tail, also iris reddish-brown, upper mandible horn, lower mandible yellowish-horn, and legs greenish-slate with flesh-coloured claws. **VOICE.** Song a series of high-pitched “tserr-tseep” (or just “tseep”) repeated every second, or “tserr” followed by 4–5 “tseep” notes, the whole sequence repeated at c. 5-second intervals. Also, “tzuu-zui-zui-zui”. Calls squeaks, e.g. “psi”.

Habitat. Forest; also in cultivations such as cocoa plantations within forests, and at forest fringes.

Food and Feeding. Small insects and spiders (Araneae); likely to be occasionally frugivorous, but no records of fruits taken, nor of nectarivory. Forages in groups of up to ten individuals; joins mixed-species parties. Mainly in middle storey.

Breeding. Nest-building in Sept–Dec and dependent young seen Jan and Nov in Liberia; dependent young in Mar in Bioko, and Mar and Nov in Gabon; in Cameroon, “breeding activity” recorded in Oct, juvenile and one adult in breeding condition in Mar, and adult with brood patch in Nov (also, birds in Mar and Apr in non-breeding condition and without signs of moult). Male aggressively territorial, displays with shrill calls, and pectoral tufts much in evidence, while head and tail projected forwards, wings drooping, tail spread, bill wide open (revealing red-orange mouth). Nests under construction in Liberia located 9–15 m up in outer twigs of understory trees. Young fed by both parents. No other documented information.

Movements. No data; probably sedentary.

Status and Conservation. Not globally threatened. Common in forests in Liberia; locally common elsewhere in range. Occurs in several protected areas, e.g. Korup National Park, in Cameroon.

Bibliography. Bannerman (1948), Borrow & Demey (2001), Bouet (1942), Brosset & Éard (1986), Chapin (1954), Cheke & Mann (2001), Christy & Clarke (1994), Eisentraut (1963), Fry *et al.* (2000), Gatter (1997), Hall & Moreau (1970), Meise (1958), Pérez del Val (1996), Rand *et al.* (1959), Serle (1957), Traylor (1962).

3. Grey-headed Sunbird

Deleornis axillaris

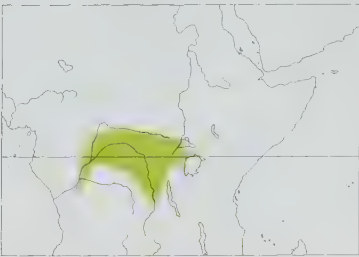
French: Souimanga à tête grise **German:** Graukopf-Nektarvogel **Spanish:** Suimanga Cabecigrís

Taxonomy. *Camaroptera axillaris* Reichenow, 1893, Uvamba, Semliki valley, western Uganda.

Formerly placed in genus *Anthreptes*. Sometimes treated as conspecific with *D. fraseri*, but the two meet in SW DR Congo apparently without intergrading. Monotypic.

Distribution. Congo Basin E to S & E Uganda and extreme NW Tanzania.

Descriptive notes. 11–13 cm; male 11–15 g, female 8.3–13 g. A mostly green sunbird reminiscent of a sylviid warbler, but with long, stout, finely serrated straight bill curved at extreme tip. Male has dark grey head with contrasting paler grey lores, chin and throat; uniformly dull green upperparts, dark brown flight-feathers with bright yellowish-green edges, yellowish-green tail; underparts pale greenish-yellow, flanks dark olive, pectoral tufts bright orange with yellowish at base, axillaries white or with yellow wash; iris variable, from brown or reddish-brown to dull red, orange or sepia; upper mandible black to grey, contrasting pale brown to light grey lower mandible; legs olive-



brown to pale grey, claws yellow. Distinguished from *D. fraseri* mainly by grey head with pale lores to throat. Female is like male but without pectoral tufts, has feet olive-grey, claws and soles greyish. Juvenile has green head with pale yellowish-green supercilium, light brown iris, greenish-olive legs. Voice. Protracted trill of rising and falling notes. **Habitat.** Primary forest, secondary forest and clearings, mainly at 700–1550 m. **Food and Feeding.** Insects, spiders (Araneae) and small fruits. Forages in middle storeys of forest; frequents treetops, creepers on trees and undergrowth at forest edges.

Breeding. Birds in breeding condition in Jul and Oct in DR Congo, in Apr–Aug and Oct–Nov in Uganda and in Nov in Tanzania; fledglings Apr, May and Aug in Uganda. No other information. **Movements.** No information. **Status and Conservation.** Not globally threatened. Common in forests of NE DR Congo; common in forests of Budongo, Kifu and Kasyoha-Kitomi, in Uganda. **Bibliography.** Baker & Baker (2007), Bannerman (1948), Carswell *et al.* (2005), Chapin (1954), Cheke & Mann (2001), Friedmann (1966), Friedmann & Williams (1970, 1971), Fry *et al.* (2000), Hall & Moreau (1970), Sinclair & Ryan (2003).

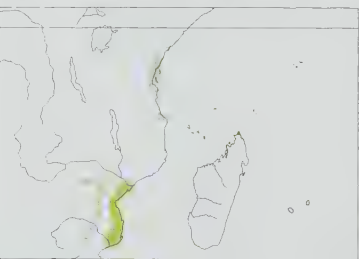
Genus *ANTHREPTES* Swainson, 1832

4. Plain-backed Sunbird

Anthreptes reichenowi

French: Souimanga de Reichenow **Spanish:** Suimanga de Reichenow
German: Blaukehl-Nektarvogel
Other common names: Blue-throated (Little)/Plain-backed Little/Gunning's Sunbird, Zambesi Blue-headed Sunbird; Kenya Sunbird (*yokanae*)

Taxonomy. *Anthreptes reichenowi* Gunning, 1909, Mzimbiti, near Beira, Mozambique. Sometimes regarded as forming a superspecies with *A. anchietae*. Two subspecies recognized. **Subspecies and Distribution.** *A. r. yokanae* van Someren, 1921 – SE Kenya (Soko) S in coastal forests to NE & SE Tanzania. *A. r. reichenowi* Gunning, 1909 – NC & E Zimbabwe, SW & SE Mozambique and NE South Africa.



Descriptive notes. 10–11 cm; 5–10 g. Small sunbird, male with iridescent deep blue throat, looking black in field, with short slightly curved bill. Male nominate race has forecrown, throat and upper breast deep blue with brighter iridescent reflections, yellow borders on sides of throat; mid-crown to nape and on cheek and ear-coverts dull greenish-yellow, diffuse yellowish supercilium, hindneck and upperparts, including uppertail-coverts, bright olive-green, flight-feathers and wing-coverts bright olive-yellow with brighter yellow edges, tail light brownish-green with bright olive-yellow edges; lower breast to undertail-coverts lemon-

yellow with wash of bright yellow, lemon-yellow pectoral tufts; iris brown; bill blackish-horn, bluish-grey at base; legs brown or greyish. Female is like male, but lacks blue on head, has throat dull greenish-grey and underparts paler yellow. Juvenile is like female but more olive; immature male as adult female, but throat a mixture of iridescent blue and pale yellow patches, gains iridescence on forehead and more olive on upperparts when older. Race *yokanae* is smaller than nominate (wing 51–56 mm, as against 53–57 mm of nominate), with greener abdomen, paler pectoral tufts and throat of male more blackish, legs blue-grey. Voice. Song of 3–5 notes repeated 4–6 times, descending from beginning to end. Calls “tic-tic”; alarm call of “wee-wee-wee” or similar. **Habitat.** Forest, usually near coast, but occasionally in inland gallery forest within savanna and both brachystegia (*Brachystegia*) and *Brachylaena* woodlands; also gardens.

Food and Feeding. Mostly insects and spiders (Araneae). Probably feeds also on nectar, as visits flowers of mistletoes (Loranthaceae) and species of genera *Albizia*, *Diospyros*, *Kigelia* and *Mimusops*. **Breeding.** Egg-laying Mar–Nov; breeding recorded in Feb, Mar, Jul and Aug in Tanzania. Territorial male sings from high vantage point; in courtship, male chases female until she perches, he then sits above her while singing, flicking wings to expose pectoral tufts, female quivers wings during this performance. Nest an oval pouch 115 mm tall and 65 mm wide, of grass, leaves, twigs and bark, held together with cobwebs, cocoons sometimes added as decoration, entrance near top 35 mm in diameter and with porch of grass, suspended 5 m above ground. Clutch 2–3 eggs, white with dull red spots, mostly towards blunt end; no information on incubation and nestling periods. **Movements.** No data.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Occurs at only a few sites, where not uncommon. Nominative race recorded in coastal and isolated inland forests from Quelimane S to Maputo, in Mozambique, extending W to near Harare, in Zimbabwe, and in extreme NE South Africa; race *yokanae* in coastal forests from Soko, in SE Kenya, S discontinuously to SE Tanzania. Main threat is habitat loss.

Bibliography. Allan & Tree (1997), Anon. (2007f), Baker & Baker (2007), Bulchart & Stattersfield (2004), Cheke & Mann (2001), Evans (1997), Fry *et al.* (2000), Grant & Mackworth-Praed (1943b), Hall & Moreau (1970), Hipkiss *et al.* (1994), Hockey (1997), Hockey *et al.* (2005), Hustler (1985), Irwin (1995a, 1995b), Jensen *et al.* (2005), Lewis & Pomeroy (1989), Skead (1967), Stattersfield & Capper (2000), Williams (1951c, 1953d).

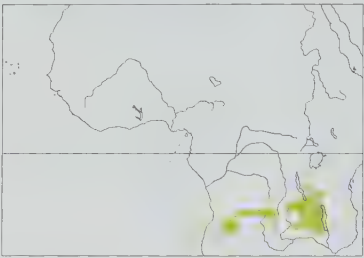
5. Anchieta's Sunbird

Anthreptes anchietae

French: Souimanga d'Anchieta **Spanish:** Suimanga de Anchieta
German: Buntbauch-Nektarvogel

Other common names: Red-and-blue Sunbird

Taxonomy. *Nectarinia anchietae* Bocage, 1878, Caconda [Huila], Angola. Sometimes regarded as forming a superspecies with *A. reichenowi*, Monotypic. **Distribution.** C & E Angola, SE DR Congo, Zambia (Eastern Province, also W of Luangwa Valley and in Northern Province), and SW Tanzania S to Malawi (W of Rift Valley) and adjacent NW Mozambique.



Descriptive notes. 10–12 cm; 8 g. Both sexes unmistakable: mostly brown above and bright orange-red and yellow below. Male has forehead and crown and chin to upper breast dark iridescent blue, lores metallic blue, face, upperparts, wing feathers and tail brown, tail with hint of gloss, primaries edged buff, obscure orange-yellow patch on wing bend; side of breast bright yellow, central breast to upper belly bright orangey red, rest of underparts greyish-brown except for bright orange-red undertail-coverts and yellow pectoral tufts; axillaries and underwing-coverts buffish-brown; iris dark brown; bill and legs black. Female is similar to

male, but lores brown, blue only on forehead, with chin and throat brown (but having dark iridescent blue tips), breast side duller yellow with olive wash, area of orange red on central belly smaller. Immature is like female, but upperparts paler, short off-white supercilium reaching behind eye, off-white area beneath eye; chin to upper breast brownish-olive, rest of underparts pale olive-yellow. Voice. Song complex, including sounds such as “tseu-werr”, “tsoo-wit”, “tser-wit-tsi-tsi”, “chip-choo-chip”, “witchoo-witchoo”, “chip-chip”, “chip-up-chip-up”, “chip-yoo-chip-yoo”, repeated up to 40 times; also a simpler “twi-tsi-tsi-twi” or up to 20 repeats of ascending “tzer-chip-chip-chip”.

Habitat. Brachystegia (*Brachystegia*) woodland and areas of degraded woodland, where favours rocky zones.

Food and Feeding. Insects and nectar; also fruits. Visits flowers of *Crossopertix*, *Erythrina*, *Faurea saligna*, *Protea*, *Syzgium* and *Tecoma*; takes fruits of *Macaranga asas* and *Ochthocosmus africanus*. Forages in canopy.

Breeding. Breeds in Feb, Aug and Sept in Tanzania, and laying in Sept–Dec in Malawi and Apr–May in Zambia. Domed nest, with side entrance, made of flowers, seeds and twigs bound with leaves, lined with fluff from *Faurea saligna*, suspended up to 6–5 m above ground in bush or tree. Clutch 1–2 eggs, blue-white or grey, spotted black and sepia and with grey scrawls, mostly at larger end; no information on incubation and nestling periods.

Movements. Absent from Zambian sites in rainy season, but no data on distances moved; also, local wandering in Malawi.

Status and Conservation. Not globally threatened. Uncommon or locally common in most of range. Occurs in Kasungu National park, Lilongwe Nature Sanctuary and Dzalanyama Reserve, in Malawi.

Bibliography. Baker & Baker (2007), Benson & Benson (1963), Benson & Irwin (1967), Benson *et al.* (1971), Chapin (1954), Cheke & Mann (2001), Dowsett (1977b), Dowsett-Lemaire (1979), Dowsett-Lemaire & Dowsett (2006), Fry *et al.* (2000), Hall & Moreau (1970).

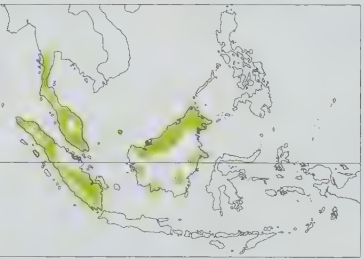
6. Plain Sunbird

Anthreptes simplex

French: Souimanga modeste **German:** Schlichtnektarvogel **Spanish:** Suimanga Sencillo
Other common names: Plain-coloured Sunbird

Taxonomy. *Nectarinia simplex* S. Müller, 1843, Sumatra and Borneo. Birds from Borneo, having different colour gloss on forehead of male, described as race *simplicior*, possibly worthy of recognition. Proposed races *xanthochlora* (from Tenasserim, in S Myanmar) and *euthapsinus* (Bunguran, in Natuna Is) considered indistinguishable from those elsewhere in range. Treated as monotypic.

Distribution. Extreme S Myanmar (S Tenasserim), SW & S Thailand, Peninsular Malaysia, Sumatra (including Nias I), N Natuna Is and Borneo.



Descriptive notes. 12 cm; male 7–10.7 g, female 7.1–11.8 g. Male has metallic blue or green forehead, and dull green-olive crown to hindneck and upperparts; side of head and throat grey; underparts greyish-olive, becoming yellowish-green on centre of belly and undertail-coverts; iris reddish-brown, bill black; legs brown or greenish. Female differs from male in lacking metallic coloration on forehead. Juvenile is browner above and paler below than female; bill pale yellowish-brown to orange-yellow, legs orange-yellow. Voice. Metallic chips and trills; high-pitched “seep”.

Habitat. Various forest types, including peatswamp, mangroves, at forest edge, and in plantations, scrub, including coastal, secondary growth, cultivation and gardens; sea-level to 1200 m.

Food and Feeding. Insects, including caterpillars; also nectar, fruits and seeds. Nectar includes that of durian trees (*Durio*). Gleans leaves for insects.

Breeding. Laying in Mar in Myanmar, Mar, Apr and Jul in Malay Peninsula, and May–Jun in Sumatra (Kru); fledglings in early Apr and birds with enlarged gonads in Feb, Jun and Aug in N Borneo (Sabah); juveniles in May on Nias I (off Sumatra). Nest an untidy mass of grass and fibres and cobwebs, without porch, lined with thickly felted down, one placed 3–5 m up on *Acacia mangium* on forest track. Clutch 2 eggs, white with mauve-grey suffusion, sparsely blotched, spotted and streaked purple-grey all over; no information on incubation and nestling periods.

Movements. None recorded.

Status and Conservation. Not globally threatened. Very rare in Myanmar; uncommon in Thailand and Peninsular Malaysia; locally common in Sumatra and Borneo. Occurs in Taman Negara National Park, in Peninsular Malaysia; Way Kambas National Park, in Sumatra; and several protected areas in Borneo including Gunung Mulu National Park and Danum Valley Conservation Area.

Bibliography. Cheke & Mann (2001), Dymond (1994), Ford (1995), Holmes (1996), Lambert (1991), MacKinnon & Philipps (1993), Mann (1996, 2008), van Marle & Voous (1988), Medway & Wells (1976), Oates (1989a), Robson (2000b), Sheldon *et al.* (2001), Smythies (1986), Thompson (1966), Wells (2007), Yumoto (2000).

7. Brown-throated Sunbird

Anthreptes malacensis

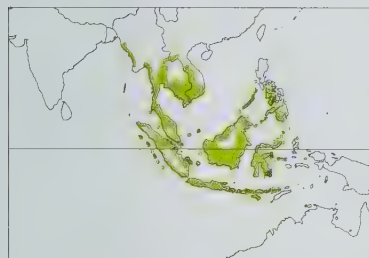
French: Souimanga à gorge brune **Spanish:** Suimanga Gorjipardo
German: Braunkehl-Nektarvogel
Other common names: Plain-throated/Lesser Sunda Sunbird ("chlorigaster group")

Taxonomy. *Certhia malacensis* Scopoli, 1786, Malacca, Peninsular Malaysia.

Forms a superspecies with *A. griseigularis* and often treated as conspecific, but the two exhibit constant differences in plumage and measurements, and no indication of hybridization or introgression; close also to *A. rhodolaemus*. Races form two groups: "*chlorigaster* group" (incorporating also *heliolusius* and *wiglesworthi*), males of which have head and back iridescent dark green and underparts generally olive-green, and "nominate group" (all other races), males having head to rump iridescent violet and underparts bright yellow. Geographical variation otherwise not well marked; races *anambae*, *erixanthus* and *bornensis* possibly better merged with nominate, in which *paraguae* and *mjobergi* were formerly included; *heliolusius* has in the past been synonymized with *chlorigaster*. In addition, population on Lombok (W Lesser Sunda) of uncertain racial affiliation, belongs either with nominate race or with *convergens*; further study required. Birds from Marinduque and Camiguin Sur (C & S Philippines) reported to represent two further races, but to date no descriptions formally published. Other proposed races are, off W Sumatra, *pellipitulus* (from Simeulue I), *pollostus* (Mt Lembu, on Nias I) and *nesaeus* (Pagai Is), all included in nominate, as also are *javanicus* (Java) and *baweanus* (Bawean I, N of Java); *basilanicus* (Basilan, in S Philippines), included in *heliolusius*; *sanghiranus* (Sangihe I, N of Sulawesi), merged with *heliolusius*; and *nesophilus* (Mantehage, off NE Sulawesi) and *citrinus* (described from Wawo, in SE Sulawesi), both synonymized with *celebensis*. Sixteen subspecies currently recognized.

Subspecies and Distribution.

A. m. malacensis (Scopoli, 1786) – SW & S Myanmar, Thailand, Indochina, Peninsular Malaysia and nearby islands, Sumatra and satellites, most of Borneo (Sarawak and Kalimantan), Karimata I (off SW Borneo), Java (including Madura) and Bali.
A. m. anambae Oberholser, 1917 – Anamba Is (E of Peninsular Malaysia).
A. m. erixanthus Oberholser, 1932 – Natuna Is.
A. m. bornensis Riley, 1920 – N Borneo (Sabah and Brunei).
A. m. paraguae Riley, 1920 – Calamian Group (Calauit, Culion), Palawan and Balabac, in W Philippine Is.
A. m. cagayanensis Mearns, 1905 – Cagayan Sulu (S of Palawan).
A. m. chlorigaster Sharpe, 1877 – C Philippines (Lubang, Tablas, Sibuyan, Masbate, Panay, Negros, Cebu, probably also Romblon and Ticao).
A. m. heliolusius Oberholser, 1923 – Basilan and W & C Mindanao (including Talicud), in S Philippines.
A. m. wiglesworthi E. J. O. Hartert, 1902 – Sulu Archipelago (Basbas, Jolo, Tawi-tawi, Sanga-Sanga, Bongao, Simunul, probably also Pangamian).
A. m. iris Parkes, 1971 – SW Sulu Is (Tumindao, Sibutu, probably also Sitanki), in far SW Philippines.
A. m. mjobergi Bangs & Peters, 1927 – Maratua I, off E Borneo
A. m. heliocalus Oberholser, 1923 – Sangihe and Siau, N of Sulawesi.
A. m. celebensis Shelley, 1878 – Sulawesi, including Mantehage, Manadotua, Manterawu, Talisei, Bangka, Togian Is, Labuan Blanda, Kabaena, Muna and Butung.
A. m. extremus Mees, 1966 – Banggai Is and Sula Archipelago.
A. m. convergens Rensch, 1929 – Lesser Sunda (Sumbawa, Komodo, Padar, Flores, Adonara, Satonda, Lomblen, Pantar, Alor).
A. m. rubrigena Rensch, 1931 – Sumba (in SW Lesser Sunda).
Also present on Marinduque and Camiguin Sur (C & S Philippines), possibly representing two further races.



Descriptive notes. 12.1–13.5 cm; male 11.1–13.5 g, female 7.4–13.1 g. Male nominate race is oily metallic purple-green above, with purple or violet back, rump, uppertail-coverts and shoulder; rufous-olive or chestnut on upperwing-coverts and scapulars, brown remiges edged warm olive to greenish-yellow; blackish-brown tail edged glossy blue-green; side of head olive-green to greenish-brown; chin and throat pale pinkish-brown with lateral border of metallic purple, pale pinkish-red on lower forehead; pectoral tufts bright yellow, rest of underparts greenish-yellow, brighter on breast and upper belly; iris red; bill black; legs

grey or olive-brown. Female is greyish olive-green above, with nares, eyering and moustachial stripe yellowish, wing and tail brown, edged greenish-yellow, throat and underparts bright greenish-yellow. Juvenile is similar to female, but has paler bill. Races differ mainly in plumage tone and in colour of iridescence in male plumage: *anambae* male has paler throat, is richer yellow below than nominate; *mjobergi* male differs from nominate in having cheeks concolorous with throat; *bornensis* is smaller than previous, and female is duller below; *erixanthus* is larger than previous, with paler yellow posterior underparts and greyer flanks and crissum in male, paler and yellower above in female, with yellower throat, darker rest of underparts, and medially more golden-yellow; *paraguae* male differs from nominate in having purple-green on head and back, wing edges greenish or slightly orange, lores and postorbital patch greenish-brown (sometimes tinged orange), chin and throat dull reddish, belly duller yellow; *cagayanensis* male has less rufous on greater coverts than previous, and has some green iridescence from head to lower back, which is lacking in *paraguae*; *iris* male has green and purple iridescence of head to back well demarcated from entirely purple rump, rusty only on edges of greater coverts, some orange in pectoral tufts; *celebensis* male has pinkish-brown to dull chestnut on wing-coverts, is rather dull and greenish below, female pale greyish-yellow below; *extremus* is larger, with larger, broader and stronger bill, and male is greener and less yellow below, greyer on throat and generally duller than last; *heliocalus* male is bigger and longer-winged than preceding two races, and male brighter and more yellow below; *convergens* male is more greenish-yellow below than nominate, has greenish-brown edging on remiges; *rubrigena* male differs from last in lack of chestnut on scapulars and greater wing-coverts, has only edges of wing-coverts vivid matt red-brown, is less pure yellow than nominate (but less olive than *celebensis*), and female is greyer on head than any of these other races; *chlorigaster* male has head and back iridescent bottle-green, rump violet, chin and throat more reddish-brown, female tends to be more yellow on breast and belly than those of "nominate group"; *heliolusius* male differs from previous in having olive-brown cheek, paler red wing-coverts and edgings, and is generally brighter; *wiglesworthi* male differs from last in brighter yellow underparts, redder cheek, paler and brighter edges of remiges, female has reddish wash on wing-coverts and edgings. Forms not yet formally

described: in Marinduque birds, male is washed yellow below, has brighter olive-green breast, belly and flanks than *chlorigaster*, remiges lighter brown with brighter olive edgings, brighter dark olive cheek, throat peach-coloured, female generally more grey above and below than other races and less bright than *chlorigaster* (cheek and throat olive-grey, breast, belly and flanks olive-grey with yellow wash); Camiguin Sur birds are larger than *heliolusius* in wing, bill and tail measurements, male differs from that race in having no purple sheen from head to back, darker olive on cheek, lighter brown remiges edged bright olive-yellow, greater and median wing-coverts light rusty, throat lighter red, breast to belly bright olive-green with yellow wash, some orange in pectoral tufts, female has crown to back greener, rump and tail edged bright rusty, edges of remiges bright olive-yellow, throat lightly washed yellow (as opposed to buffy grey), and breast to belly duller and less yellow. **Voice.** Song, from prominent perch, of 2–4 notes, "sweet-sweet", or "sweet-sweet-sweet", or "wee-chew-chew-wee". Calls include much-repeated piercing double note, first rising, second falling, also loud cheerful "kelichap" singly or as random pitch-change sequence; hard "swit", thin drawn-out high-pitched "siuewei", shrill "whiuu" during foraging; soft "twit-twit" in flight, louder and harder "chit-chit-chit" during pursuit-flights; also rapid nasal "tititili" chatter and repeated melodious "wee-chuuw".

Habitat. Various types of forest, but generally not in interior; habitats include mangroves, plantations, scrub, swamp, cultivation, coconut groves, secondary growth and gardens. Sea-level to 1200 m.

Food and Feeding. Insects, including caterpillars, also spiders (Araneae); also fruits, including mistletoes (Loranthaceae), and seeds of *Dillenia suffruticosa*; also nectar of mistletoes and *Hibiscus*, and of the mangroves *Bruguiera* and *Xylocarpus granatum*. Forages singly and in pairs, often in canopy but also at all other levels. Gleans leaves and twigs, and visits spider webs. Often chases other birds away from flowers.

Breeding. Laying Feb–Jul and Sept in Thailand, and Jun in Sumatra; laying Dec/Jan–Aug, fledglings in May, in Peninsular Malaysia; may breed all year in Borneo, where recorded Jan–Mar, May and Jul in N (Sabah) and May and Jul in S (also, active gonads Jan–Mar and Jun–Aug and family parties Apr–Jul in N, juveniles Jul and Aug in S); eggs in all months except Oct in Java; Mar–Nov in Sulawesi, Apr–Aug in Lesser Sunda (Flores); birds with active gonads possibly in Apr and fledged young in at least Jul in Philippines; may be at least double-brooded in Malay Peninsula. Nest a neat, globular to pear-shaped structure, entrance with eave one-third from top, made of grass, plant fibres and twigs, decorated with silk cocoons, *Casuarina* needles, slivers of bark and cobwebs, with or without short dangling "tail", lined with tree cotton, *Imperata* pappus and moss, suspended from leafy twig 1–1.3 m above ground. Clutch 2–3 eggs, shape variable (from slightly pointed oval to considerably elongated to slightly pyriform), matt or slightly glossed, white or creamy white with grey, pale purplish-brown or purplish-black clouds, speckled and blotched dark purplish-brown with black scribbling, particularly at broad end, or dull pink with thick grey scribbling, spotted with black and russet; no information on incubation and nestling periods. Nests parasitized by Violet Cuckoo (*Chrysococcyx xanthorhynchus*) in Malay Peninsula.

Movements. Nothing recorded.

Status and Conservation. Not globally threatened. Common in Thailand, Peninsular Malaysia, Greater Sunda, Philippines, Sulawesi and Sangihe I; scarce to locally common or fairly common in Lesser Sunda. In Philippines, possibly extinct on Cebu (race *chlorigaster*). Acts as pollinator of the mangrove *Bruguiera*.

Bibliography. Adhikerana (1994), Bishop (1992), Blasius (1897), Brooks *et al.* (1995), Brown (2003), Bruce (1987), Cheke & Mann (2001), Classen (1987), Coates & Bishop (1997), Delacour & Mayr (1946), Dickinson *et al.* (1991), Eck (1976), Glenister (1951), Hellebrekers & Hoogerwerf (1967), Holmes & Wood (1980), Hoogerwerf (1949, 1950, 1966), Jones *et al.* (1994), Kennedy *et al.* (2000), Kondo *et al.* (1991), MacKinnon & Phillips (1993), Mann (1996), van Marle & Voous (1988), Mayr (1944a), McGregor (1905a, 1909), Mearns (1905, 1909), Medway & Wells (1976), Mees (1966, 2006), Nash & Nash (1988), Noske (1993), Parkes (1971), Rand (1970), Rensch (1929, 1931a, 1931b), Riley (1997), Robson (2000b), Salomonsen (1953b), Sheldon *et al.* (2001), Smythies (1986), Watling (1983), Wells (2007), White & Bruce (1986), Zimmer (1918).

8. Grey-throated Sunbird

Anthreptes griseigularis

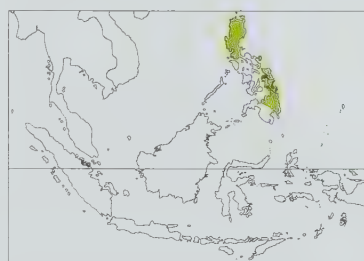
French: Souimanga à gorge grise **German:** Graukehl-Nektarvogel **Spanish:** Suimanga Gorjigris
Other common names: Plain-throated Sunbird

Taxonomy. *Anthothreptes griseigularis* Tweeddale, 1878, Surigao, north-east Mindanao, Philippines.

Forms a superspecies with *A. malacensis* and often treated as conspecific, but the two exhibit constant differences in plumage and measurements, and no indication of hybridization or introgression; close also to *A. rhodolaemus*. Two subspecies recognized.

Subspecies and Distribution.

A. g. birgatae Salomonsen, 1953 – N & C Luzon (including Palaui, off N coast) and Catanduanes, possibly also Polillo Is and Mindoro, in N Philippines.
A. g. griseigularis (Tweeddale, 1878) – Samar, Leyte, Dinagat, Sakujok, Siargao, Bucas Grande and NE Mindanao (Mt Hilong-Hilong S to Mt Mayo), possibly also Bohol, in SE Philippines.



Descriptive notes. 12–13 cm. Male nominate race has forehead to back metallic green, rump and uppertail-coverts metallic purplish-blue; shows much maroon to brick-red on median upperwing-coverts; some metallic violet-blue on carpal-coverts and tips of median coverts; lesser wing-coverts metallic purplish-blue; lores, cheek, ear-coverts, greater wing-coverts and scapulars maroon to brick-red (birds from Samar, Dinagat and Bucas Grande have more red on cheek than do those from Mindanao); flight-feathers dark brown, primaries with pale fringes, secondaries edged maroon; rectrices black, tinged metallic green and violet-blue;

chin and throat grey, violet-tinged metallic green streak from bill along side of neck; breast, flanks, abdomen and undertail-coverts olive-yellow, pectoral tufts bright yellow; underwing-coverts pale yellowish white; iris bright red; bill black; legs greenish-grey. Female has head to upper back, cheek, ear-coverts and lesser wing-coverts dark olive-grey to brown, edged grey, with some feathers slightly tinged green, lower back to uppertail-coverts greyish-green, some feathers of last tinged rusty; primaries dark brown, edged pale rufous, secondaries dark brown, edged dull rusty, greater coverts and scapulars dull rusty, rectrices dark brown, edged dull grey; chin and throat greyish-white, upper breast grey, lower breast to undertail-coverts pale greenish-yellow, underwing-coverts pale yellowish-white; iris dark brown, bill dark brown, lower mandible sometimes lighter brown, legs greenish. Juvenile apparently undescribed, presumably resembles female. Race *birgatae*

is larger, particularly in bill length, than nominate, and male's underparts are duller and darker. Voice. No specific information.

Habitat. Various types of forest, including mangroves, plantations, scrub, swamp, cultivation, coconut groves, secondary growth and gardens, particularly near coast; sea-level to 610 m.

Food and Feeding. Presumably eats invertebrates, fruits and nectar. Information uncertain and requires revision; previously treated as conspecific with *A. malacensis*, and the two not differentiated with regard to details of ecology and biology.

Breeding. No specific information; previously treated as conspecific with *A. malacensis*, and the two not differentiated with regard to details of ecology and biology; revision of data required.

Movements. Nothing recorded.

Status and Conservation. Not globally threatened. Common. On Luzon, present in provinces of Abra, Bataan, Benguet, Laguna and Isabela. Fieldwork required in order to establish whether this species occurs on Polillo Is. Mindoro and Bohol.

Bibliography. Brooks *et al.* (1995), Brown (2003), Cheke & Mann (2001), Delacour & Mayr (1946), Dickinson *et al.* (1991), Dutton *et al.* (1992), Kennedy *et al.* (2000), Manuel (1937), McGregor (1905a, 1909), Mearns (1905), Parkes (1971), Rabor (1938), Rand (1970), Rand & Rabor (1960), Salomonsen (1953b).

9. Red-throated Sunbird

Anthreptes rhodolaemus

French: Souimanga à gorge rouge

Spanish: Suimanga Gorjirrojo

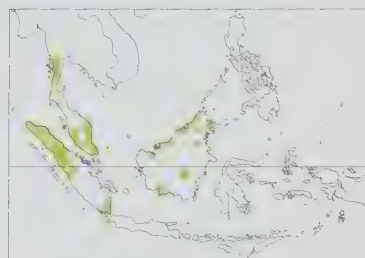
German: Rotkehl-Nektarvogel

Other common names: Shelley's/Red-shouldered/Rufous-throated Sunbird

Taxonomy. *Anthreptes rhodolaema* [sic] Shelley, 1878, Malacca, Peninsular Malaysia.

Close to *A. malacensis* and *A. griseigularis*. Proposed race *aeneus*, described from E Borneo (Labuan Klambu, in Kalimantan), considered indistinguishable from birds in rest of range. Monotypic.

Distribution. Patchily, from extreme S Myanmar (S Tenasserim) and S peninsular Thailand to Peninsular Malaysia, Sumatra and Borneo.



Descriptive notes. 12 cm; male 11–2 g, female 11–6 g. Male has crown to mantle dark metallic green, maroon band across upper back, rest of back, rump and uppertail-coverts violet; upperwing brown, greater wing-coverts edged rufous, remiges edged bright olive; tail blackish-brown, glossed green; side of face maroon, sometimes browner, especially on ear-coverts; stripe from bill along side of neck, also shoulder, glossed violet; throat pale pink, side of throat and narrow band on upper breast dull red, rest of underparts yellowish-olive; iris red; bill black; legs olive. Female has dull olive crown and upperparts, yellow eyering and

stripe behind eye, olive-yellow below, brighter on lower breast and belly. Juvenile is similar to female, but greyer below, with yellow only on centre of throat to belly. Voice. Various chirps and metallic trills: song a high "sit-sit-sit-see" or slurred "sit-sit-sit-swe-er"; "uu-is" or "tsuu-i", upwardly inflected.

Habitat. Various forest types, including peat-swamp-forest, secondary growth, plantations, clearings and coastal vegetation; sea-level to 900 m.

Food and Feeding. Feeds on insects, including caterpillars, also spiders (Araneae); also pollen, nectar and small fruits, including figs (*Ficus*). Usually in canopy, but occasionally in lower storeys. Gleans foliage.

Breeding. Eggs in late Apr and fledglings mid-Aug in Malay Peninsula; in Borneo, birds with active gonads in Jun–Sept and fledgling in Aug in N (Sabah) and nest-building in Jun in S. Nest constructed of matted plant fibres, with dangling "tail", entrance beneath large eave in upper half, lined with dead leaves, exterior decorated with lichen-covered bark, suspended 9–20 m above ground on cord from tree at edge of clearing. Clutch 1 egg, pale lavender-purple, spotted, blotched and lined dark brown; no information on incubation and nestling periods.

Movements. Nothing recorded.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Uncommon in Myanmar and Malay Peninsula; rare in Sumatra; very uncommon in Borneo. Possible occurrence on Palawan, in W Philippines, requires investigation. Destruction of lowland forest puts this species potentially at risk; owing to its ability to utilize secondary and submontane forests and forest edge, however, it is not immediately threatened. Occurs in several protected areas, e.g. Taman Negara National Park, in Peninsular Malaysia, and Danum Valley Conservation Area, in Borneo.

Bibliography. Anon. (2007), Butchart & Stattersfield (2004), Cheke & Mann (2001), Collar *et al.* (2001), David & Gosselin (2002b), Dickinson *et al.* (1991), Holmes (1996), Kleefisch (1975), MacKinnon & Phillips (1993), Mann (2008), Medway & Wells (1976), Nash & Nash (1988), Pfeiffer (1961), duPont (1971b), Riley (1934), Robson (2000b, 2005a, 2007), Sheldon *et al.* (2001), Smythies (1986), Stattersfield & Capper (2000), Wells (2007).

10. Mouse-brown Sunbird

Anthreptes gabonicus

French: Souimanga brun

German: Gabunnektarvogel

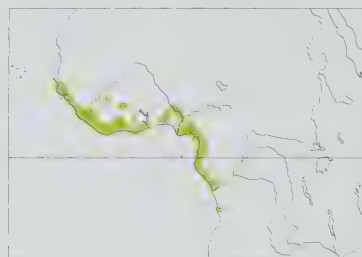
Spanish: Suimanga Pardo

Other common names: Brown/Mouse-coloured/Mangrove Sunbird

Taxonomy. *Nectarinia gabonica* Hartlaub, 1861, Gabon.

Monotypic.

Distribution. Senegambia E. discontinuously, to Nigeria and W Cameroon. S to Angola (Cabinda and mouth of R Kissama).



Descriptive notes. 10 cm. Dull sunbird, lacking metallic colours; bill broad at base, only slightly decurved. Male is mouse-brown above, with narrow white line across forehead, and white extending from lores to above and below eye (where conspicuous); hint of olive-green on outer half of uppertail-coverts and outer webs of flight-feathers, small white carpal patch; tail dark brown, broad white tips and greenish fringe on outer webs of all except central pair of feathers, outer edges of tips of outermost pair white on both surfaces; greyish-white below, white underwing-coverts and axillaries; iris red or brown; bill black; legs

black, toes sometimes paler, more greyish. Distinguished from female of *A. longuemarei* by white around eye and grey underparts; from female of *Cyanomitra cyanoalaema* (which also has white around eye) by shorter and straighter bill. Female is very like male, but has less prominent green on outer webs of remiges and rectrices. Juvenile is also similar, but more olive on wings and upper body, with lemon-yellow tinge below. Voice. Song consists of sequence of twitters, e.g. "tser-tser-tsew-tsi-tsi-tsi-tsi-tsi-tseuuur". Calls are quiet "tserr", "wit-wit-sqee-witter-witter" or "tsurp-tseep-tseep" or just "tseep" or "sqee", occasionally repeated.

Habitat. Coconut plantations, mangroves, farmland and gardens in coastal zones; also strays inland along riverine forest beside large rivers, e.g. reaches Madina-Diassa, in S Mali.

Food and Feeding. Few data. Hunts insects in trees and lianas, often close to water, using behaviour like that of a sylviid warbler. Common visitor to *Hibiscus* flowers in coastal gardens of S Cameroon, but not certain whether nectar or insects were taken.

Breeding. Egg-laying recorded in all months in W Africa, Apr and Jun in Gabon and Sept in DR Congo. Territorial. Nest (without hanging "beard") made of grass, dead leaves and spider webs, lined with feathers, grass and pappus, suspended usually over water at riverside or in mangroves. Clutch 1–2 eggs, grey, faintly washed violet, with dark streaks and spots; incubation by female; no information on duration of incubation and nestling periods.

Movements. Occurrences beside rivers far inland in wet season suggest seasonal movements.

Status and Conservation. Not globally threatened. Sometimes abundant and usually not uncommon in mangroves; rarer inland. Susceptible to destruction of mangrove habitats.

Bibliography. Bannerman (1948), Borrow & Demeijer (2001), Chapin (1954), Cheke (1999), Cheke & Mann (2001), Christy & Clarke (1994), Dowsett & Dowsett-Lemaire (2005a, 2005b), Fry *et al.* (2000), Gatter (1997), Hall & Moreau (1970), Rand *et al.* (1959), Serle (1949, 1957), Sinclair *et al.* (2004), Walsh (1967).

PLATE 9

inches 2
cm 5



11. Western Violet-backed Sunbird

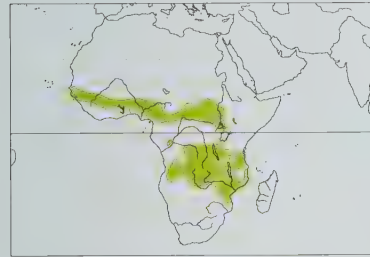
Anthreptes longuemarei

French: Souimanga violet **German:** Violettmantel-Nektarvogel **Spanish:** Suimanga Violeta
Other common names: (African) Violet-backed/Blue/Plum-coloured/Longuemare's Sunbird; Uganda Violet-backed Sunbird (*haussarum*)

Taxonomy. *Cinnyris longuemarei* Lesson, 1833, "Senegambia superior" = Senegal. Forms a superspecies with *A. orientalis*, *A. neglectus* and *A. aurantius*. Race *haussarum* sometimes included within nominate. Four subspecies recognized.

Subspecies and Distribution.

A. l. longuemarei (Lesson, 1833) – Senegal S to Guinea-Bissau and E to N Sierra Leone.
A. l. haussarum Neumann, 1906 – E Guinea E to N Cameroon, Central African Republic, S Sudan, N DR Congo and N & W Uganda.
A. l. angolensis Neumann, 1906 – S PR Congo, SW & SE DR Congo, Angola, Zambia, Malawi W of Rift Valley, and SW Tanzania.
A. l. nyassae Neumann, 1906 – SE Tanzania (S from Dar es Salaam), Malawi E of Rift Valley, N Mozambique and E Zimbabwe.



Descriptive notes. 13–14 cm; 9.8–14 g. Distinctive sunbird with almost straight, stout bill. Male nominate race has metallic violet head, throat and upperparts, bluer on rump; upperwing dark brown, lesser wing-coverts metallic violet with trace of green (sometimes none) at edges; tail blackish, washed metallic violet; underparts white, pectoral tufts yellow; iris dark brown; upper mandible greenish-black, lower mandible greenish-brown; legs dark olive-green. Distinguished from *A. orientalis* mainly by violet (not blue-green) back and rump. Female differs from male in having forehead and upperparts brown apart from metallic

violet uppertail-coverts, distinctive white eyebrow, brown tail washed with metallic violet, yellow belly, no pectoral tufts, white underwing tinged yellow. Juvenile male lacks pectoral tufts, is olive-green above, but uppertail-coverts metallic violet, slight white eyebrow, yellow breast and belly (becoming white on older birds). Race *haussarum* differs from nominate in having metallic green ends of lesser coverts and edges of wing feathers; *angolensis* male has lesser coverts metallic green, breast washed buff, female has chin to breast off-white softly streaked grey, juvenile remiges edged yellow-green; *nyassae* male is more violet above than preceding race, lacking greenish tinge, underparts white, female darker brown above, crown with violet gloss, underparts less yellow than previous. **VOICE.** Song (race *angolensis*) a rapid series of five or six rising and falling chatters before ending with "zit-zit-zit-chit-chit". Call "chip-chip" or "cha-cha-cha" or "t-claa-tee-tee"; alarm call "skee" or sharp "tit".

Habitat. Savanna woodland, including acacia (*Acacia*), miombo and *Uapaca* woodlands, gallery forest in savanna, also gardens, lakeside scrubland and mangroves.

Food and Feeding. Insects, including beetles (Coleoptera), flies (Diptera), lepidopteran larvae and Hymenoptera; spiders (Araneae). Also nectar from mistletoes (Loranthaceae), aloes (*Aloe*), proteas (*Protea*), baobabs (*Adansonia*) and other trees such as *Bauhinia*, *Bombax*, *Brachystegia*, *Erythrina*, *Faurea speciosa*, *Parinari macrophylla*, *Spathodea* and *Syzgium guineense*. Forages in manner of Old World warbler (Sylviidae), but also seeks food in bark; also hawks for insects.

Breeding. Egg-laying in Feb–May and Nov in W Africa, mostly Jan–Mar in E Africa; Feb and Sept–Dec in DR Congo, Feb, Jul, Sept, Oct and Dec in Zambia; Jun, Aug, Sept and Dec in Tanzania (breeding activity also Jan, May, Jun), Sept–Nov in Malawi and Aug–Dec in Zimbabwe. Male strongly territorial. Nest, built by female, an untidy structure with side entrance near top, made of dead leaves, bark, grass and spider webs, lined with vegetable down, attached 4–7.5 m above ground in tree. Clutch 1–2 eggs, greenish-white or blue-white or pale buff, with brown or black scribbles concentrated at wider end; incubation by female alone, but chicks fed by both sexes; no information on duration of incubation and nestling periods; both parents feed young out of nest, both also roost with young side by side.

Movements. In W Africa moves N in Jan–May, to breed in N savanna in dry season. Probably sedentary in Uganda and Zimbabwe apart from local wanderings in dry season and juvenile dispersal. Scarce non-breeding migrant in Kenya; local wanderer in Malawi.

Status and Conservation. Not globally threatened. Uncommon in W Africa; common in S Sudan and savannas of DR Congo; not uncommon in Uganda W of Budongo Forest; scarce in S Africa, uncommon in Malawi and Zambia, less so in miombo woodland of Angola. Occurs in several protected areas, e.g. Maraoué National Park, in Ivory Coast, Bénoué National Park, in Cameroon, and Dzalanyama Reserve and Lilongwe Nature Sanctuary, in Malawi.

Bibliography. Baker & Baker (2007), Bannerman (1948), Barlow *et al.* (1997), Borrow & Demey (2001), Britton (1981), Carroll (1988), Carswell *et al.* (2005), Chapin (1954), Cheke & Mann (2001), Dowsett-Lemaire & Dowsett (2006), Fry *et al.* (2000), Hall & Moreau (1970), Hockey *et al.* (2005), Krienke (1941), Lynes (1938), Medland (1991), Newby-Varty (1945), Pettet (1977), Priest (1938), Serle (1957), Shead (1967), Tree (1997k), Walsh (1966), Walsh *et al.* (1990), Wells (1966), White (1963).

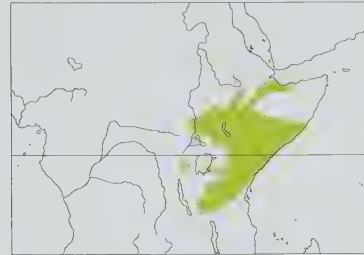
12. Kenya Violet-backed Sunbird

Anthreptes orientalis

French: Souimanga du Kenya **German:** Schwalbennektarvogel **Spanish:** Suimanga Keniata
Other common names: Eastern Violet-backed Sunbird, Kenya Sunbird

Taxonomy. *Anthreptes orientalis* Hartlaub, 1880, Lado, on Bahr-el-Jebel (White Nile), Sudan. Forms a superspecies with *A. longuemarei*, *A. neglectus* and *A. aurantius*. Two proposed races, *neumannii* (described from Afgoi, in S Somalia) and *barbouri* (from Dodoma, in Tanzania), are both considered insufficiently differentiated from birds elsewhere in range. Monotypic.

Distribution. SE Sudan, Ethiopia and NW & S Somalia S to N Uganda, Kenya and NE & WC Tanzania, also Rwanda,



rump; from *A. neglectus* mainly in white (not grey-brown) underparts. Female is greyish-brown above except for whitish supercilium, violet-blue uppertail-coverts and tail, outer web of outermost rectrix brown, dull white below, belly and flanks yellowish, lacks pectoral tufts. Juvenile is similar to female, apart from buff or yellow on middle of belly and brownish crown, mantle and wing-coverts. **VOICE.** Song a brief series of rising and falling twitters, "too-wit-woo-tweu, zeet-zeet"; call 1 or 2 "chwee" notes.

Habitat. Woodland, including junipers (*Juniperus*) in highlands, and dry bush country. Prefers drier country than that inhabited by *A. longuemarei*.

Food and Feeding. Insects and spiders (Araneae); nectar. Searches among foliage and bark in manner of Old World warbler (Sylviidae). Visits *Leonotis* flowers and mistletoes (Loranthaceae). Hawks for insects.

Breeding. Egg-laying in Nov–Mar in Sudan and Apr–Jun Ethiopia; recorded in all months except Mar and Sept in E Africa. Territorial. Nest oval, with short porch above entrance, made of grass, wool, hair and pappus, adorned with old egg capsules of mantises (Mantodea), attached low in bush. Clutch 1–2 eggs, green-grey, speckled with dark grey, brown or black; no information on incubation and nestling periods.

Movements. No data.

Status and Conservation. Not globally threatened. Common in Sudan, Ethiopia, Somalia and Uganda; uncommon in Kenya. Occurs in several protected areas, e.g. Awash National Park, in Ethiopia, and Tarangire National Park, in Tanzania.

Bibliography. Ash & Miskell (1983), Carswell *et al.* (2005), Chapin (1954), Cheke & Mann (2001), Friedmann (1931, 1937), Fry *et al.* (2000), Hall & Moreau (1970), Kahindi & Kageci (1995), Lewis & Pomeroy (1989), Prinzing & Jackel (1986), Prinzing *et al.* (1989), van Someren (1922), Zimmerman *et al.* (1996).

13. Uluguru Violet-backed Sunbird

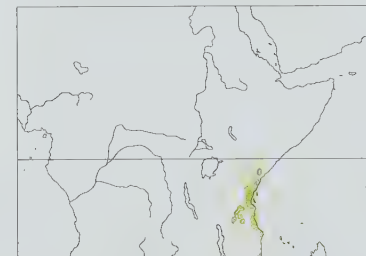
Anthreptes neglectus

French: Souimanga des Uluguru **Spanish:** Suimanga de las Uluguru
German: Ulugurunektarvogel
Other common names: Uluguru Sunbird

Taxonomy. *Anthreptes longuemarei neglectus* Neumann, 1922, Uluguru Mountains, Tanzania.

Forms a superspecies with *A. longuemarei*, *A. orientalis* and *A. aurantius*. Monotypic.

Distribution. SE Kenya, mountains of E Tanzania and NE Mozambique.



Descriptive notes. 12 cm; 12.8–15.5 g. Smallish sunbird with violet back in both sexes. Male has reddish-violet forehead, crown, mantle, back and scapulars, dull black nape, metallic blue-green rump, metallic violet uppertail-coverts; upperwing dark brown, edged greenish-olive to mustard yellow, iridescent green shoulder and median wing-coverts, greater wing-coverts edged green to yellow; uppertail metallic violet (black below), tips of outer feathers white; chin and upper throat metallic reddish-violet, lower throat, underparts and underwing whitish, pectoral tufts yellow or orange, buff wash on belly, flanks and undertail-coverts; iris dark brown; bill black; legs greyish. Distinguishable, with care, from *A. orientalis* and *A. longuemarei* by broader yellow-green edges to remiges and upperwing-coverts, dark brown hindcollar; female and immature dimmer buffy-grey (not white) below than those species. Female is similar to male, but central part of forehead blackish-brown, chin and throat white, and has much yellow on belly, undertail-coverts and thighs, rest of underparts buffy-grey with diffuse darker streaking, and olive streaks at side of belly; probably lacks pectoral tufts (but two examined specimens labelled as females had yellow tufts). Juvenile has distinct white supercilium, dull brown crown, mantle and wing-coverts, occasionally with metallic violet wash but iridescence may be only on uppertail-coverts, tail and bend of wing; remiges edged yellow-green; lemon-yellow on lower belly and vent. **VOICE.** Call "tsssp" or "sweep-sweep-sweep" repeated up to four times, sometimes preceding a melodious trill.

Habitat. Montane and submontane forest at up to 1800 m; gallery forest, thickets and tea plantations at forest edge; moist scrubland, wooded country and forests along Kenyan and Tanzanian coasts.

Food and Feeding. Few data. Visits *Grevillea* and mistletoes (Loranthaceae), and takes insects. Forages in groups of up to 6 birds.

Breeding. Egg-laying in Dec, Jan and Mar in E Africa; Dec–Feb and Sept, and active nests recorded Sept–Dec, in Tanzania. Territorial. Untidy nest with dangling "beard", constructed from grass, lichens and moss, lined with white vegetable down, suspended 8 m up from tree. Eggs evidently undescribed; male feeds fledglings.

Movements. Presumed resident.

Status and Conservation. Not globally threatened. Scarce in most of range; locally common in E Usambaras and Uluguru Mts (Tanzania). Occurs at comparatively few sites: in Kenya found in Shimba Hills, R Tana forest, Buda Forest Reserve and Jadini forest; in Tanzania present in Ulugurus,

Ukagurus and Udzungwas, N Nguu Mts, W Usambaras, and Mt Nilo (in E Usambaras); and in Mozambique occurs at River Lurio and Netia.

Bibliography. Alexander (1995a), Baker & Baker (2007), Borghesio *et al.* (2008), Britton (1981), Butynski (1994), Cheke & Mann (2001), Evans, T.D. (1996), Fjeldså *et al.* (1997), Fry *et al.* (2000), Hall & Moreau (1970), Hipkiss *et al.* (1994), Jensen *et al.* (2005), Keiith (1968), Lewis & Pomeroy (1989), Sclater & Moreau (1933), Seddon *et al.* (1999a, 1999b), Stuart & Jensen (1985), Zimmerman *et al.* (1996).

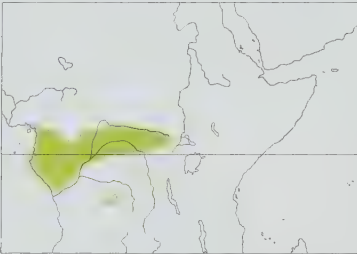
14. Violet-tailed Sunbird

Anthreptes aurantius

French: Souimanga à queue violette **Spanish:** Suimanga Colivioleta
German: Violettschwanz-Nektarvogel

Taxonomy. *Anthreptes aurantium* J. Verreaux and É. Verreaux, 1851, Gabon. Forms a superspecies with *A. longuemarei*, *A. orientalis* and *A. neglectus*. Males from Gabon and lower R Congo have buff breast and more violet on throat than those from E DR Congo (Ituri Mts), and some adult females have white (not yellow) belly, but it is unclear whether recognition of geographical races is warranted. In original description, species name clearly appears to be adjectival, and gender must be corrected. Monotypic.

Distribution. S Cameroon, S Central African Republic, Gabon and PRCongo E to W & N DR Congo (E to Ituri Forest); also NE Angola.



Descriptive notes. 13–14 cm; 12–13 g. Smallish sunbird with long, slightly curved bill. Male has crown to mantle brilliant metallic blue or green (depending on reflections), back greenish, rump and uppertail-coverts blue; remiges brown, secondaries and upperwing-coverts with wide metallic green edges; tail violet or blue, edged green; side of head blackish, slightly glossy, throat metallic green; pectoral tufts orange, underparts and underwing pale buff, belly more grey, sometimes white; iris dark brown; bill black, base of lower mandible grey; legs black, tinged bluish or greyish. Distinguished from *A. longuemarei* by orange (not yellow)

pectoral tufts and green or blue (not violet) upperparts. Female is like male but bluer, less purple, above, with distinct white or dull yellow supercilium, dark line through eye, throat greyish-white, underparts pale yellow, pectoral tufts yellow with slight orange wash. Juvenile is grey-green or greenish-brown above, tail blue with metallic green wash, white wing edges, underside greyish-white with yellow or greenish wash, except on throat. **VOICE.** Little known. High-pitched flight call. **Habitat.** Forest, particularly secondary forest, gallery forest, seasonally flooded forest and swamp-forest, invariably in close proximity to water; also wooded savanna, edges of salt pans and mangroves. **Food and Feeding.** Takes fruits (e.g. of *Macaranga assas*), berries; also insects, such as flying ants (Formicidae), termites (Isoptera), crickets (Orthoptera) and caterpillars; also spiders (Araneae). Female seen to feed small fruits to nestlings. Forages low down, in pairs or in groups of up to four individuals. Probes bases of flowers of *Globimetula* species.

Breeding. Egg-laying in Mar in Cameroon; Apr, Nov and Dec in Gabon; and Apr and Jun (and probably Jul and Sept) in DR Congo; young in nest, Dec, in PRCongo. Territorial. Co-operative breeder, with at least two adults in non-breeding plumage seen helping parents feed young at nest and after fledging. Oval nest with “beard” of dead leaves and short porch, built from dry leaves, fibres, fungi and filaments from spider webs (especially from the social spider *Agelena republicana*), lined with white pappus, and suspended up to 3 m above water from bush or tree; one nest was being built in *Martretia quadricornis* tree. Clutch 1–2 eggs, elongated, blue-grey with brown or purple-black lines, denser at wider end; no information on incubation and nesting periods.

Movements. Presumed resident. **Status and Conservation.** Not globally threatened. Rare or uncommon in most of range. More numerous in Gabon, where one pair every 500 m along rivers. Recently recorded from Korup National Park, in Cameroon.

Bibliography. Bannerman (1948), Borrow & Demeý (2001), Brosset & Éard (1986), Chapin (1954), Cheke & Mann (2001), Dowsett-Lemaire & Dowsett (1991), Fry *et al.* (2000), Hall & Moreau (1970), Lynes (1938), Rand *et al.* (1959), Traylor (1962).

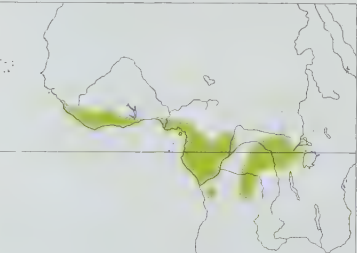
15. Little Green Sunbird

Anthreptes seimundi

French: Souimanga de Seimund **Spanish:** Suimanga de Seimund
German: Stutzschwanz-Nektarvogel
Other common names: Seimund’s Little Green Sunbird, Little Olive Sunbird

Taxonomy. *Cinnyris seimundi* Ogilvie-Grant, 1908, Banterbari, Bioko. Sometimes placed in genus *Nectarinia*; with such treatment, race name *minor* becomes invalid, as preoccupied, and must then be replaced by name *traylora*. Three subspecies recognized.

Subspecies and Distribution. *A. s. kruensis* (Bannerman, 1911) – W Guinea and Sierra Leone E to Togo. *A. s. minor* Bates, 1926 – SE Nigeria, Cameroon, S Central African Republic E to DR Congo, S Sudan, Uganda (Budongo Forest) and extreme NW Tanzania, S to NW & NE Angola. *A. s. seimundi* (Ogilvie-Grant, 1908) – Bioko I (Fernando Pôo).



Descriptive notes. 9.5 cm; male 6.3–11 g, female 5–6.5 g. A very small, green sunbird with short, minimally decurved, fairly thick bill and pale area around eye; lacks gloss and lacks pectoral tufts. Nominata race is olive-green above, with pale yellow crescents above and below eye, faint darker eyestripe; upperwing dark brown, feathers with yellow edges; tail dark brown, edged olive on outer webs; throat dull green-yellow, underparts paler than upperparts, yellower on belly, with all yellow along middle abdomen; undertail-coverts yellow, underwing white with yellow edging; iris dark brown; bill dark brown, paler base of lower

mandible; legs greenish-black. Differs from *Cinnyris batesi* in being paler and straighter-billed, with more yellow underparts, also in more prominent yellow around eye and mainly green (not brown) tail; from *Deleornis fraseri* in smaller size, yellow colour below, and lack of pectoral tufts. Sexes similar, but female smaller than male. Juvenile has dark crown and greyer flanks than adult. Race *kruensis* is duller below than nominate, tinged grey, with chin white, eyering less pronounced; *minor* is smaller than nominate, and greener (less yellow) below, has faint yellow supercilium, male with upper mandible greenish-black, lower mandible brownish-yellow with green-brown tip, female with base of lower mandible yellow. **VOICE.** Squeaky “twip twip twip” rapidly repeated up to eight times (race *kruensis*); “pse-ee” or “pss-upp”, repeated every second (*minor*).

Habitat. Most forest habitats, forest edge, forest–grassland mosaic, undergrowth in clearings and coffee plantations.

Food and Feeding. Takes nectar, small fruits of *Ochthocosmus africanus* and *Urera hypsilodendron*, seeds of figs (*Ficus*); also insects, such as small beetles (Coleoptera) and caterpillars, and small spiders (Araneae). Forages actively in forest trees, at all levels, in groups or in mixed-species flocks with other sunbirds. Visits *Astonia*, *Erythrina*, *Lophira alata*, *Macaranga assas*, *Mitragyna*, *Rauwolfia*, and mistletoes (Loranthaceae).

Breeding. Egg-laying in Feb in Sierra Leone, Jul in Liberia, Apr–May, Jul, Nov and Dec in Cameroon, Nov in Gabon, Oct in PRCongo, Feb and Sept in DR Congo, and Nov–Feb and Aug in Uganda; fledgling in Jul in Ghana. Compact oval nest of fibre and cobwebs or bark and dry leaves, lined with thistle down, hung near end of twig 10 m up in tree, covered above by foliage, or suspended from yam vine (*Dioscorea*). Clutch 2 eggs, unglossed, cream, with brown speckles all over; no information on incubation and nesting periods.

Movements. No data. **Status and Conservation.** Not globally threatened. Not uncommon in Cameroon, N Angola and Uganda, and abundant in Sudan (at Talanga forest); uncommon elsewhere, and rare in Guinea and DR Congo. Occurs in a number of protected areas.

Bibliography. Baker & Baker (2007), Bannerman (1948), Bates (1927), Borrow & Demeý (2001), Brosset & Éard (1986), Chapin (1954), Cheke & Mann (2001), Dowsett-Lemaire (1990), Dowsett-Lemaire & Dowsett (2007), Fry *et al.* (2000), Hall & Moreau (1970), Lachenaud (2006b), Nikolaus (1987), Rand *et al.* (1959), Traylor & Archer (1982), Wolters (1965).

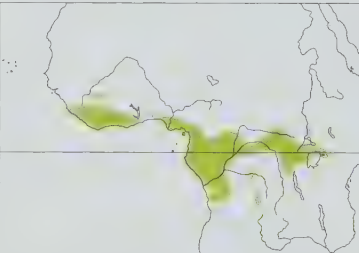
16. Straight-billed Green Sunbird

Anthreptes rectirostris

French: Souimanga à bec droit **German:** Goldband-Nektarvogel **Spanish:** Suimanga Piquirrecto
Other common names: Green Sunbird, Banded(!)/Banded Green/Green-backed/Western Green Sunbird; Yellow-chinned Sunbird (*rectirostris*); Grey-chinned Sunbird (*tephrolaemus*)

Taxonomy. *Certhia rectirostris* Shaw, 1811, no locality = Ashanti, Ghana. Forms a superspecies with *A. rubritorques*. Races sometimes treated as two distinct species. Proposed race *amadoni* (from Rumpi Hills, in W Cameroon) considered insufficiently distinct from *tephrolaemus*, differing from latter only in slightly smaller size; description of *pujoli* (from Guinea) is based on a juvenile specimen of nominate race. Two subspecies recognized.

Subspecies and Distribution. *A. r. rectirostris* (Shaw, 1811) – extreme S Mali, Sierra Leone and E & SE Guinea E to Ghana. *A. r. tephrolaemus* (Jardine & Fraser, 1851) – SE Benin and S Nigeria E, including Bioko I (Fernando Pôo), to S Central African Republic, DR Congo, S Uganda and W Kenya, S to NW Angola and NW Tanzania; also S Sudan (Imatong Mts).



Descriptive notes. 9–10 cm; 7–12 g. Very small sunbird with short, more or less straight bill, similar to that of Old World warbler (Sylviidae). Male nominate race is metallic green with golden tinge above, uppertail-coverts olive (sometimes metallic green); remiges and tail very dark brown with olive edges, upperwing-coverts brown, greater coverts with olive edges, lessers edged metallic green or blue; chin and throat lemon-yellow, bordered metallic green below, lower section of chest-band orange, plumage below this ashy grey, becoming pale yellow on belly and undertail-coverts; pectoral tufts lemon-yellow, under-

wing white, axillaries tipped yellow; iris dark brown or reddish-brown; bill and legs black. Distinguished from *Anthodidea collaris* by smaller size, straighter bill, yellow (not green) throat lacking gloss. Female is olive-green above, yellower on rump and uppertail-coverts, with hint of metallic green on head and back, pale olive-yellow supercilium and eyering, dark lores, dark brown wing and tail feathers edged olive, metallic edges on lesser wing-coverts, pale yellowish below, whiter on chin, brightest on belly. Juvenile is like female but without any iridescent feathering, crown and upperparts olive-brown, yellowish supercilium, underparts tinged yellow; older juvenile male has metallic feathers on crown and mantle and is brighter yellow below, developing yellow on throat before metallic or orange feathering. Race *tephrolaemus* male has chin and upper throat grey (smaller patch than yellow of nominate), larger area of metallic green on throat, and abdomen greyer than nominate, female darker, more brown, above than nominate, and juvenile greyer than that of nominate and tinged yellow. **VOICE.** Song (of race *tephrolaemus*) a series of rising and falling high-pitched phrases, e.g. “tser-tsit-tsee-too, tepu-ti-du-tepu-di-do, chup-chup-chup, churr”, finishing with “tser-tser-tser”. Calls high-pitched “psee-psee” repeated every 1–2 seconds, also a descending “tsi”, also “huit-huit-huit-huit”.

Habitat. Forests, gallery forests, swamp-forest, clearings, also cultivations of cocoa, coffee and oil palms (*Elaeis guineensis*); also inselbergs and mountains. From lowlands to 1100 m; to 1500 m in Uganda and at 700–2150 m in Kenya.

Food and Feeding. Takes termites (Isoptera), moth larvae (Lepidoptera), spiders (Araneae); also small berries, fruits of *Discoglyprena*, *Ochthocosmus africanus*, *Macaranga*, seeds of *Alchornea cordifolia*, and probably nectar. Attracted to flowers of *Turraeanthus* (Meliaceae), but perhaps in search of insects. Forages in pairs or family parties, or in mixed-species flocks, high in canopy, usually above 20 m. Searches for food on and below leaves, along branches and tree trunks, in warbler-like manner; sometimes hawks for insects.

Breeding. Egg-laying in Sept–Dec in Liberia, Dec in Ghana, Jun in Nigeria, Apr–Feb, Jun–Jul and Nov in Cameroon, Feb and Sept–Oct in PRCongo, Jan–Apr, Jul and Sept in DR Congo, and Aug in Uganda and Kenya; breeding in Nov in Tanzania. Territorial, sometimes in groups of 3–7 individuals. Probably co-operative breeder, at least occasionally, as young sometimes fed by adult helpers within group. Nest globular, that of nominate race made of stems and spider webs, adorned with flowers from kola tree (*Cola*), lined with white vegetable silk, suspended 2–40 m up; that of

tephrolaemus composed of fibres, lichens or moss, lined with cottony vegetable down or unidentified brown vegetable matter, with short mossy “beard”, suspended 1.5–10 m above ground. Clutch 2 eggs, grey, tinged violet, with dark grey-green spots and streaks; incubation by female alone, chicks fed by both parents, no information on duration of incubation and nestling periods; young sometimes fed by several adults.

Movements. Little information, but thought to move seasonally. Occurrence of this species mainly in non-breeding season in N Tanzania suggests some movement.

Status and Conservation. Not globally threatened. Common in Liberia, Equatorial Guinea, Gabon, S & W Uganda and W Kenya; not uncommon in Angola; uncommon elsewhere in range. Occurs in several protected areas.

Bibliography. Baker & Baker (2007), Bannerman (1948), Borrow & Demei (2001), Brosset & Éard (1986), Button (1967), Carroll (1988), Carswell *et al.* (2005), Chapin (1954), Cheke & Mann (2001), Christy & Clarke (1994), David & Gosselin (2002b), Dowsett-Lemaire (1996), Eiseentraut (1973), Éard (1979), Fry *et al.* (2000), Hall & Moreau (1970), Lachenaud (2006b), Lewis & Pomeroy (1989), Nikolaus (1987), Pérez del Val (1996), Prigogine (1978b), Quattrill & Quattrill (1998), Rand *et al.* (1959).

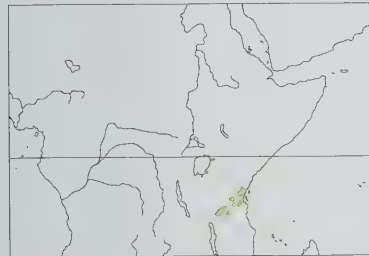
17. Banded Sunbird

Anthreptes rubritorques

French: Souimanga à col rouge **German:** Rotband-Nektarvogel **Spanish:** Suimanga Cuellirrojo
Other common names: Banded Green Sunbird, Usambara Grey-chinned Sunbird

Taxonomy. *Anthreptes rubritorques* Reichenow, 1905, Milalo, Usambara Mountains, Tanzania. Forms a superspecies with *A. rectirostris*. Monotypic.

Distribution. NE & E Tanzania: E Usambaras (Mt Nilo), W Usambaras, Ngurus, Nguus, Udzungwas (including Ndundulu Mts) and Ulugurus.



Descriptive notes. 8–9 cm; 10.5–11.9 g. Very small sunbird with short tail. Male is metallic green above; remiges brown, edged olive-green, scapulars, median and lesser wing-coverts metallic green, greater coverts duller, dull iridescent green; tail green with purplish sheen; grey below, narrow red breastband, yellowish central belly and undertail-coverts, orange-yellow pectoral tufts; underwing white; iris black or brown; bill and legs black. Distinguished from *Anthodiaeta pallidigaster* by green (not blue-green upperparts), grey underside with red breastband, yellow pectoral tufts. Female is duller above than male, with less

green metallic feathering on upperparts and ear-coverts, tail brownish, edged olive, throat whitish instead of grey, no breastband, otherwise olive below, yellowish centrally. Juvenile is blackish with olive tinge above, yellow-olive below. **VOICE.** Song by male Jun–Jan, from high in tree, “chip” or “teuu” repeated every second for up to a minute, sometimes on rising scale. Calls “thk-eeer” and far-carrying “shwerp”.

Habitat. Submontane forest and forest edge, including scrub near maize (*Zea mays*) plantations and junctions with miombo woodland and exotic plantations and gardens. Above 200 m; 1000–1350 m on Mt Nilo, 900–1600 m in Ulugurus.

Food and Feeding. Visits *Erythrina abyssinica*, *Grevillea*, *Macaranga kilimandscharica* and *Rubus* for nectar, small berries, fruits and insects. Forages in canopy of mature trees. Forages in pairs, in small parties or in mixed-species flocks; flocks of 60 individuals reported from both E & W Usambaras.

Breeding. Laying in Jan, Jul and Sept–Nov; active nest in late Dec. Nest built by female, attended by male, an oval structure without dangling “beard”, composed of *Usnea* lichens, cobwebs and vegetable matter, adorned externally with casuarina (*Casuarina*) needles, lined with pappus throughout (including ceiling), hung more than 15 m up in *Newtonia* or *Widdringtonia* tree. Male guards nest from nearby perch, calling often. Eggs evidently undescribed; incubation of eggs and feeding of young by female alone. No other information.

Movements. No data.

Status and Conservation. **VULNERABLE.** Restricted-range species: present in Tanzania–Malawi Mountains EBA. Locally common in Usambaras; uncommon or rare in Udzungwas and elsewhere. Global population estimated at 10,000–19,999 individuals, and decreasing; total range estimated at c. 6700 km². Threatened by deforestation and forest degradation. In Usambaras and Ulugurus, large human population placing ever greater pressure on land, and increasing fragmentation of forest a problem; inaccessible nature of terrain effectively protects main block of montane forest in Ulugurus, although this covers no more than c. 120 km²; conservation projects here are directed at assisting local initiatives and increasing involvement of local communities in forest management. Forests in Nguru Mts, because of comparatively small local human population and precipitous terrain, believed not to be currently at risk. In Usambaras, occurs in area of East Usambara Catchment Forest Project and other reserves, such as Mount Nilo Forest Reserve; in Udzungwas, found in Udzungwa Mountains National Park and West Kilombero Scarp Forest Reserve.

Bibliography. Anon. (2007f), Baker & Baker (2007), Borghesio, John & Cordeiro (2007), Borghesio, John, Mulungu *et al.* (2008), Butchart & Stattersfield (2004), Cheke & Mann (2001), Collar & Stuart (1985), Cordeiro (1998), Evans (1997), Fry *et al.* (2000), Hall & Moreau (1970), Hipkiss *et al.* (1994), Moreau (1944), Moreau & Moreau (1937), Seddon *et al.* (1999a, 1999b), Stattersfield & Capper (2000), Stuart & Hutton (1977).

Genus *ANTHODIAETA* Cabanis, 1851

18. Collared Sunbird

Anthodiaeta collaris

French: Souimanga à collier **German:** Waldnektarvogel **Spanish:** Suimanga Acolorado

Taxonomy. *Cinnyris collaris* Vieillot, 1819, Gamtoos River, Cape Province, South Africa. Genus formerly subsumed in *Anthreptes*; recently, this species and its three congeners were placed in a genus *Hedydipna*, but this name invalid, current genus name having precedence. Has been suggested that races *subcollaris*, *hypodila* and *zambesiana* represent one or more separate species,

on basis of reduced (or lack of) iridescence in plumage of juveniles (whereas metallic colours present even on nestlings of *somereni*); further study required. Other proposed races are *nigeriae* (described from Overri, in SE Nigeria), considered inseparable from *subcollaris*; *ugandae* (from Maraquet, Kenya) and *phillipsi* (R Lofu, in Zambia), both synonymized with *garguensis*; *jubaensis* (Hellesheid, on R Jubba, in S Somalia), merged with *elachior*; *chobiensis* (R Chobe, in N Botswana), subsumed in *zambesiana*; and *patersoniae* (lower R Pungwe, in E Zimbabwe) and *beverleyae* (R Limpopo, in S Zimbabwe), both considered indistinguishable from *zuluensis*. Nine subspecies recognized.

Subspecies and Distribution.

A. c. subcollaris (Hartlaub, 1857) – Senegal and Guinea-Bissau E to coastal Nigeria (E to Niger delta).

A. c. hypodila (Jardine & Fraser, 1851) – Bioko I (Fernando Póo).

A. c. somereri (Chapin, 1949) – SE Nigeria E to S Central African Republic and SW Sudan (W of R Nile), S to NW Angola (Cabinda, S to Cuanza Norte and Cuanza Sul) and N DR Congo.

A. c. djamdjensis (Benson, 1942) – SW Ethiopia (R Algehe and R Sagan area).

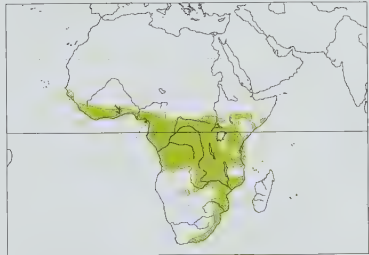
A. c. garguensis (Mearns, 1915) – S Sudan (E of R Nile), E & SE DR Congo, Uganda, W Kenya, Rwanda, Burundi, W Tanzania, W Zambia (S to Ngoma) and CE Angola (Alto Zambesi to Vila Luso and Malanga).

A. c. elachior (Mearns, 1910) – coastal E Africa from S Somalia (S from Jubba S of 4° N) S to Kenya (inland to Kenya Highlands) and NE Tanzania (inland to Moshi and Kilosa, S to Dar es Salaam), also Pemba I, Zanzibar and Mafia I.

A. c. zambesiana Shelley, 1876 – NE Angola (Malanje E to Mexico), S DR Congo and SW Tanzania S to S & E Zambia, Malawi, N Botswana, N Zimbabwe (Zambezi valley, Ngamiland and S Barotseland) and C Mozambique.

A. c. zuluensis Roberts, 1931 – E highlands of Zimbabwe and S Mozambique (S from Gorongosa) S to E Swaziland and NE South Africa (Mpumalanga, NE KwaZulu-Natal).

A. c. collaris (Vieillot, 1819) – SE South Africa from S KwaZulu-Natal S to Eastern Cape and SE Western Cape (Knysna).



Descriptive notes. 10–10.5 cm; male 5.3–11 g, female 5.4–9.7 g. Small sunbird with short, slightly curved bill. Male nominate race is bright metallic golden-green above, also on chin and throat, with upptail-coverts more pure green; upwing dark brown, lesser and median wing-coverts bright metallic green, greater coverts, secondaries and tertials broadly edged green, primaries with narrow olive-green edging; tail blackish, glossed dark green, feathers edged bright metallic green; green of throat bordered below by narrow purple breastband, underparts yellow, pectoral tufts bright yellow, flanks tinged olive; iris dark brown or blackish; bill and legs black. Female is like male but lacks green and purple below, has chin and throat dusky olive, becoming yellower below. Juvenile resembles female. Race *subcollaris* male is brighter green above than others, with less green in wing, brighter orange-yellow below, purple breastband broader than in nominate, female has buff throat with metallic green mottling at side, juvenile distinctive, has olive-tipped grey head feathers, olive forehead with faint metallic green sheen, greyer crown and nape, yellow streak above and below eye, cheek and throat side yellow-olive, back, wing and upptail-coverts bright olive, metallic green patch on shoulder, tail brown with olive edging, throat to upper breast pale grey-white, merging with pale yellow on belly; *hypodila* has brilliant metallic feathering and is duller yellow below than previous; *somereri* has palest and dullest yellow underparts of all races, flanks dark olive, female throat dusky yellow; *zambesiana* male has secondaries edged yellow, wing-coverts with little or no green on margins, underparts deep yellow, almost no olive on flanks; *djamdjensis* male is similar to previous but brighter yellow below, female with this richer yellow colour extending to lower throat; *elachior* is much paler below than last, especially in female; *garguensis* male is deep yellow below, with flanks tinged greener than in *zambesiana*, female has throat to chest olive-grey, flanks dark green; *zuluensis* differs from nominate in having secondaries edged yellow, male wing-coverts with narrower green edges. **VOICE.** Song of race *subcollaris* high-pitched “tsi-tsu-tsu-tsu-tsi-tsu-tsu-tsu-tsi” with single notes interspersed; of *elachior* a “dzer” introductory note before brief series of “tsee-ou” notes, as e.g. “busy-busy-busy...busy”; nominate song deeper “chip-chip-chip...chip”; female, too, sings, sometimes from nest. Varied calls include loud “tsweet-tsweet” or “tserp-tserp”, or “cherreee” or “tsewrew”, and high-pitched “chi-chi” during courtship; repetitions of “tsk-tsk” in flight.

Habitat. Forest, woodland and savanna; particularly common in open areas such as forest edges, clearings, cultivations and gardens. Sea-level to 2600 m.

Food and Feeding. Diet mostly insects, also spiders (Araneae), snails; also seeds and small fruits, e.g. of *Chrysanthemoides*, *Macaranga*, *Ochthocosmus africanus*, *Rauwolfia vomitoria*, *Tetrorchidium didymostemon*, *Trema orientalis*, and berries of *Alchornea cordifolia*. Attracted to sweet liquid exuding from exit holes of fig-wasp *Elisabethiella baijnathi* in fruits of the fig *Ficus burtt-daveyi*, and possibly also nectarivorous. Visits wide range of foodplants, including *Acacia abyssinica*, *Achyrosporum carvalhi*, *Acrocarpus fraxinifolius*, *Berlinia grandiflora*, *Burchellia bubalina*, *Caesalpinia pulcherrima*, *Clematis simensis*, *Clerodendrum johnstonii*, *Combretum paniculatum*, *Dombeya goetzenii*, *Englerina woodfordioides*, *Faurea saligna*, *Grevillea banksii*, *Grewia similis*, *Halleria lucida*, *Helinus mystacinus*, *Leonotis mollissima*, *Leonotis nepetifolia*, *Leucas densiflora*, *Macrorrhiza pubinervis*, *Mimusops caffra*, *Petrea nobilis*, *Ruspolia hypocrateriformis*, *Schotia speciosa*, *Sericostachys*, *Sireltzia nicolai*, *Symphonia globulifera*, *Syzgium guineense*, *Tecoma capensis*, *Tetrorchidium didymostemon*, *Triumfetta macrophylla*, *Xylopia aethiopica* (arils), various unidentified mistletoes (Loranthaceae), and plants of genera *Albizia*, *Aloe*, *Anthocleista*, *Catunaregam*, *Erythrina*, *Eucalyptus*, *Fuchsia*, *Gouania*, *Hibiscus*, *Kalanchoe*, *Lantana*, *Pavetta*, *Rytigynia*, *Salvia*, *Stereospermum*. Drinks from birdbaths. Forages in pairs and family parties; joins mixed-species flocks. Forages actively in manner of Old World warbler (Sylviidae) or tit (Paridae), leaf-gleaning in low bushes and overgrown areas at edge of clearings or plantations, but also in creepers on forest trees at up to 25 m; sometimes hangs upside-down to feed. Hawks for insects; hovers at flowers.

Breeding. Laying Dec in Senegal, breeds all months (peak Oct–Apr) in Liberia, most months in Ghana, Jan, Apr, Jul, Sept–Oct and Dec in Nigeria, Jan–Jun and Oct–Dec in Cameroon, Nov–Apr and Jul in Gabon, Sept–Nov in PR Congo, Jan and Aug–Sept in DR Congo, laying May and Oct in Angola; Jan, Apr and Oct–Nov in extreme S Sudan, Dec in Somalia, Jan–Dec in E Africa (peak Sept–Oct in Tanzania, Apr–Nov on Zanzibar), Jan–May, Jul–Oct and Dec in Malawi, and Jan, Mar–Apr, Aug–Sept and Dec in Zambia; Jun and Oct in Botswana, Sept–Jan and Apr–May in Zimbabwe, Jan, Mar–May and Aug–Dec in Mozambique, and in all months (mainly Sept–Feb) in South Africa. Territorial males chase each other, while clicking wings; polyandrous and polygynous groups also recorded. Female builds nest, taking 1.5–7 days, structure pear-shaped, 82–165 mm

tall, 52–76 mm wide, 64–88 mm deep, sometimes with dangling “beard” of dead leaves and cobwebs (up to 75 mm long), lateral entrance hole 25–45 mm across sited c. 4 cm from top, some having porch above entrance extending c. 3 cm out, composed of grass, fibres, dead leaves, leaf mould, spider webs and twigs, occasionally adorned with lichen, bark, seeds or flowers, lined with feathers, kapok or other vegetable matter, suspended 1.5–8 m above ground from branch. Clutch 1–4 eggs, white to light brown, bluish, green or pinkish, with bold brown, olive or grey markings denser at broad end; incubation by female, male occasionally assisting, period 12–14 days (up to 19 recorded, perhaps because female did not start immediately after egg-laying); chicks brooded by female, which sometimes fed at nest by male, provisioning of chicks by both sexes, nestling period 14–17 days; fledglings dependent on parents for up to 24 days after leaving nest. Nests parasitized by Klaas’s Cuckoo (*Chrysococcyx klaas*). Nestlings sometimes taken by monkeys.

Movements. Mainly sedentary; one ringed individual moved 7 km.
Status and Conservation. Not globally threatened. Common and widespread throughout almost entire range. Occurs in many protected areas, examples being Abuko Nature Reserve, in Gambia, Korup National Park, in Cameroon, Mikumi National Park, in Tanzania, and Lilongwe Nature Sanctuary, in Malawi.

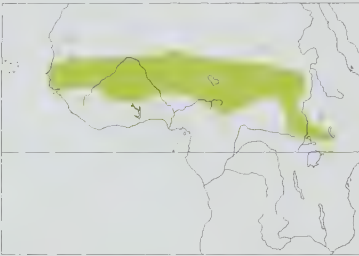
Bibliography. Alexander (1995b), Amadon (1953), Baker & Baker (2007), Bannerman (1921b, 1948), Barlow *et al.* (1997), Blackwell & Wells (1965), Borrow & Demeý (2001), Britton & Britton (1977), Brosset & Erard (1986), Carroll (1988), Chapin (1954), Cheke (1971a), Cheke & Mann (2001), Colston & Curry-Lindahl (1986), Dellinger & Haefner (1991), Dowsett & Dowsett-Lemaire (2005a, 2005b), Dowsett-Lemaire (1990), Dowsett-Lemaire & Dowsett (2006), Eiseentraut (1963), Field (1971), Fry *et al.* (2000), Hall (1960), Hall & Moreau (1970), Hanmer (1981, 1997), Hockey *et al.* (2005), Irwin (1961), Lachenaud (2006a), Lewis & Pomeroy (1989), Nikolaus (1987), Pérez del Val (1996), Prinzinger & Jackel (1986), Prinzinger *et al.* (1989), Rand *et al.* (1959), Ridd (1988), Serle (1943a, 1957), Sevastopulo (1980a, 1980b), Skead (1962, 1967), Sykes (1984), Tree (1997m).

19. Pygmy Sunbird

Anthodiaeta platyura

French: Souimanga pygmée **German:** Grünbrust-Nektarvogel **Spanish:** Suimanga Pigmeo
Other common names: Pygmy Long-tailed/Western Pygmy/Southern Pygmy Sunbird

Taxonomy. *Cimyrus platyrus* Vieillot, 1819, Senegal. Genus formerly subsumed in *Anthreptes*; recently, this species and its three congeners were placed in a genus *Hedydipna*, but this name invalid, current genus name having precedence. Forms a superspecies with *A. metallica*, and formerly treated as conspecific. Monotypic.
Distribution. W & S Mauritania and Senegal E to Sudan and W Ethiopia, S to N Guinea, N Ivory Coast, N Cameroon, NE DR Congo, Uganda and NW Kenya.



Descriptive notes. Male 9–16 cm (including tail), female 8–9 cm; 5.7–7 g. Small sunbird with short decurved bill. Male in breeding plumage has crown and upperparts metallic green with bronzy or coppery red sheen, metallic purplish-blue rump and uppertail-coverts; lesser upwring-coverts and outer margins of inner median and greater coverts metallic green, remiges dark brown; tail black, tinge of steel-blue gloss, central pair of rectrices protruding 55–80 mm beyond the rest and with racquet-shaped widening at tips; chin to upper breast metallic green, tinged bronzy, otherwise bright yellow below, flanks and

undertail-coverts paler, occasionally a thin violet strip below green of lower throat; axillaries black or greyish-black, mixed with yellow, especially on shafts; iris black or dark brown; bill and legs black. Distinguished from *A. metallica* mainly by lacking or having very narrow violet band on upper breast, rather than a broad blue-purple band. Non-breeding male (eclipse plumage) loses elongated central rectrices, resembles female, but metallic green on wing-coverts and black underwing feathers retained, and some green may remain on body, uppertail-coverts and throat, on latter forming bib. Female lacks tail streamers and metallic plumage, is greyish-brown above, washed olive on rump, with wings, wing-coverts and back brown (back paler), rump pale greenish-yellow, tail very dark brown, tinged dark blue; broad buff stripe over eye; pale yellow below, throat paler, flanks greenish, axillaries and inner underwing-coverts pale yellow, others white, iris brownish-black, faint pale eyering. Juvenile male is initially as female, but soon acquires bright yellow on underparts and some metallic green in plumage; immature female has grey throat, otherwise grey-brown below, eyestrype yellowish. Voice: Song 3–4 seconds long, consisting of such phrases as “pseu-pseu-pseu-der-dzer-dzer” or “ti-ti-ti-ti-ti-ti” or “pserr-pserr-pserr” or “pser-eee” and some trilling, repeated every 10 seconds. Male contact call “cheek-cheek”, and similar “cheek” call by nest-building female; other calls include “twee-weet”, “tsuup-tsuup-tsuup” and “tsei”.

Habitat. Dry acacia (*Acacia*) woodland, thorn-scrub, savanna woodland and Sahelian vegetation; also visits gardens.

Food and Feeding. Nectar, pollen, acacia petals; also insects, including ants (Formicidae), and spiders (Araneae). Visits many flowering plants such as aloes (*Aloe*), acacia, neem trees (*Azadirachta*), cotton trees (Bombacaceae), flame trees (e.g. *Delonix regia*) and mistletoes (Loranthaceae). Forages singly, in pairs and in family parties; sometimes associates with mixed-species groups. Hovers at flowers; also hangs upside-down to feed.

Breeding. Nests in dry season, laying Jan–Mar and Aug–Sept in Mauritania, Feb–Mar and Sept in Senegambia, Feb–Mar in Burkina Faso and Togo, Dec in Niger, Dec–Apr in Nigeria, Feb in Cameroon and DR Congo, Feb–May in Sudan, and Oct and Dec in E Africa; occasionally double-brooded. Territorial male displays by bowing to female, cocking tail and drooping wings. Nest, built by female, an oval structure 85–100 mm tall, 45–53 mm wide and up to 62 mm deep, with entrance 30 mm wide and short porch (25 mm), made of grass, leaves and feathers held together with spider webs, lined with vegetable matter, decorated externally with dead leaves, seeds and cocoons (but no dangling “beard”), placed 1.5–4 m above ground in body of thorn bush (e.g. *Acacia*, *Bougainvillea*, *Balanites*, *Dichrostachys*). Clutch 1–2 eggs, glossy white or sky-blue; incubation by female alone, period 14 days; chicks fed by both parents, nestling period 12–15 days; both parents also attend to fledglings.

Movements. Resident or partial migrant in far N of range (e.g. Air, in Niger). In W Africa moves S from the Sahel to breed in savanna areas (Oct–Apr), returning N with beginning of rains (Mar–May); thus only a dry-season visitor in most of S range. Those breeding in DR Congo late Dec to Mar possibly come from Sudan.

Status and Conservation. Not globally threatened. Common and widespread throughout most of range. Occurs in several protected areas, e.g. Comoé National Park, in Ivory Coast, and Waza National Park, in Cameroon.

Bibliography. Bannerman (1948), Bates (1927, 1934), Borrow & Demeý (2001), Carswell *et al.* (2005), Chapin (1954), Cheke & Mann (2001), Cramp & Perrins (1993), Fry *et al.* (2000), Hall & Moreau (1970), Lewis & Pomeroy (1989), Mackworth-Præd & Grant (1945), Nikolaus (1987), Petiet (1977), Serle (1940, 1957), Skinner (1969), Thonnerieux *et al.* (1989), Walsh *et al.* (1990).

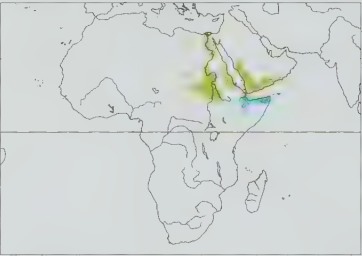
20. Nile Valley Sunbird

Anthodiaeta metallica

French: Souimanga du Nil **German:** Erznektarvogel **Spanish:** Suimanga del Nilo
Other common names: Eastern Pygmy/Northern Pygmy Sunbird, Bronzed Pygmy Sunbird, Metallic Sunbird

Taxonomy. *Nectarinia metallica* M. H. C. Lichtenstein, 1823, Dongola, Sudan. Genus formerly subsumed in *Anthreptes*; recently, this species and its three congeners were placed in a genus *Hedydipna*, but this name invalid, current genus name having priority. Forms a superspecies with *A. platyura*, and formerly treated as conspecific. Birds from NW Ethiopia (Melissai, on Adiabo Plains) with apparently short wing described as race *adiabonensis*, but considered inadequately differentiated from those elsewhere in species’ range. Monotypic.

Distribution. Egypt (R Nile and CE coast), Sudan, Eritrea, W, N & E Ethiopia, Djibouti and S Arabia (Saudi Arabia S of Jeddah, Yemen, SW Oman). Non-breeding visitor to E Ethiopia and N Somalia.



Descriptive notes. Male 17 cm, female 9 cm; 7–7.5 g. Small sunbird with short decurved bill. Male in breeding plumage has head to upper chest and upperparts to back dark metallic green with dark purplish-blue gloss, rump and uppertail-coverts shiny dark bluish-purple; upwring-coverts as back, primary and greater coverts and bastard wing black, greater coverts with metallic blue-green edges; flight-feathers black, tinged brown, tertials black with blue gloss; tail black, tinged dark metallic blue and edged greenish, central pair of feathers extending 50–70 mm beyond rest and with racquet-shaped tips; dark purplish-blue strip

below green on chest, rest of underparts yellow, flanks and undertail-coverts paler; underwing dull black; iris dark brown; bill and legs black. Non-breeding male (eclipse plumage) is similar to female, but flight-feathers and tail brownish-black with blue-green tinge (not brown); in second and subsequent non-breeding dress has black in centre of throat. Female lacks metallic plumage colours and elongated tail feathers, has top and side of head and upperparts grey-brown, faint yellowish-green gloss on forehead and neck, pale cream to whitish-yellow supercilium and light brown eyestrype, dark grey-brown remiges, pale yellow below, brightest in central region. Juvenile is similar to female, but upperparts pale greenish-grey, supercilium duller yellow, remiges brownish-grey. Voice: High-pitched warbling song, as “pruiit-pruiit-ptuiit-tiriririri-tiririri”, and miscellaneous chatters. Contact call “pee”; other calls similar but of 2 notes, second higher-pitched.

Habitat. Arid scrub and gardens near irrigation, from sea-level to 2200 m.

Food and Feeding. Nectar, also insects. Nectar taken from many flowers, e.g. oleander (*Nerium oleander*), mistletoes (Loranthaceae), *Calotropis procera*, *Maurea crassifolia*, *Rhazya stricta*, and species of genera *Acacia*, *Bombax*, *Capparis*, *Hibiscus*, *Jacaranda*, *Parkinsonia*. Usually in pairs, but in non-breeding season congregates in groups of up to 70 individuals; sometimes in mixed-species groups. Takes insects by leaf-gleaning, also by hawking.

Breeding. Laying Apr–May in Egypt, Jan–Nov in Sudan, Dec–May in Saudi Arabia, Mar–Apr in Yemen and May in Oman. Territorial; singing male flicks wings, spreads tail and quivers body. Male has dancing hovering display-flight with whirring wings, also courts female by rocking body to and fro and moving head from side to side; female joins dance before mating. Nest, built by both sexes, an elongated ovoid structure 9–12 cm tall, 5 cm wide, entrance hole 25 mm across, composed variously of grass stems, plant fibres, rootlets, dead leaves, wool, flowers, feathers, seeds, hair, spider egg cases and nylon string, bound with spider web, lined with white down and feathers, attached by rear surface to branch 1.5–10 m up in body of thorn tree or on external branch, or suspended from shrub. Clutch 1–4 eggs, glossy pinkish-white, finely speckled at larger end with rufous on larger grey areas; incubation by female alone; no information on duration of incubation and nestling periods.

Movements. Movement into Cairo area of Egypt in Oct–Mar. Movements in Red Sea hills of Sudan in summer, and flowering acacias attract migrants to coast of Eritrea, Jan–Jun. Influxes recorded in Somalia and Ethiopia in Sept–May, Saudi Arabia in Oct and Oman in Nov–Feb.

Status and Conservation. Not globally threatened. Common; sometimes abundant locally. Occurs in a number of protected areas, such as the Awash National Park, in Ethiopia.

Bibliography. Ash & Miskell (1983), Baha el Din (1992), Cheke & Mann (2001), Cramp & Perrins (1993), Eriksen (1998), Evans (1992), Evans & Dijkstra (1993), Fry *et al.* (2000), Hall & Moreau (1970), Jennings (1995), Mackworth-Præd & Grant (1945), Meininger & Mullic (1981), Nikolaus (1987), Rahmani *et al.* (1994), Zedlitz (1910).

21. Amani Sunbird

Anthodiaeta pallidigaster

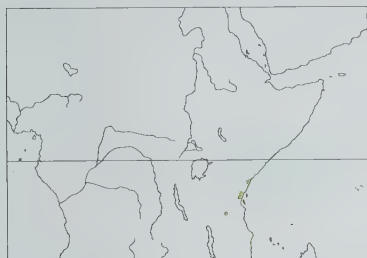
French: Souimanga d’Amani **German:** Amaninektarvogel **Spanish:** Suimanga de Amani
Other common names: Pale-bellied Sunbird

Taxonomy. *Anthreptes pallidigaster* W. L. Sclater and Moreau, 1935, 4 miles [6.4 km] east of Amani, north-east Tanzania.

Genus formerly subsumed in *Anthreptes*; recently, this species and its three congeners were placed in a genus *Hedydipna*, but this name invalid, current genus name having precedence. Males in Ndundulu Mts, in C Tanzania, are brighter metallic blue, less green, than those elsewhere in species’ range, and possibly represent an undescribed geographical race; further study required. Monotypic.

Distribution. Coastal SE Kenya (Sokoke-Arabuko Forest) and NE & C Tanzania (E Usambara Mts and nearby, and Ndundulu Mts).

Descriptive notes. 8–9 cm; 6–8 g. A very small sunbird with short, decurved bill. Male has head to upper back, scapulars and upwring-coverts (except greater) dark iridescent purplish blue-green, blackish lower back and rump, metallic purplish-blue uppertail-coverts and tail; remiges and greater wing-coverts blackish-brown; chin and middle of throat to upper chest metallic dark purple-blue, surrounded by metallic dark green; otherwise grey-white below, pectoral tufts orangey red with



yellow at base; white underwing; iris dark brown; bill and legs black. Female is dark grey above and on side of head, with white supercilium, minimal metallic feathering scattered on head and hindneck, but silver-green metallic feathers on lesser and median upperwing-coverts and uppertail-coverts, dark brown wing, blue-back tail with white tips (both surfaces), white below, including underwing-coverts. Juvenile is as female, but washed pale yellow from lower breast to vent, has white patch from base of bill to above centre of eye, dark blue tail lacks white tips; purple tinge visible on throat of juvenile male. Voice. Com-

plex song consists of a random sequence of high-pitched, ascending and descending "chissick" chirps. Calls include characteristic and loud "seer-seer", followed by twittering; "chip", soft "zee-eeee", and "seeet-seeet".

Habitat. *Brachystegia* (*Brachystegia*) woodland in coastal Kenya, and forest and forest clearings in Tanzania; also gardens and degraded forest. From lowlands to 1550 m.

Food and Feeding. Caterpillars, spiders (Araneae), presumably also nectar. Forages at 5–35 m, alone or in groups of up to 60; joins mixed-species flocks. Feeds at *Allanblackia stuhlmannii*, *Erythrina*, *Grevillea* and mistletoes (Loranthaceae). Sometimes hangs upside-down; also hawks for insects.

Breeding. Laying in Mar, May–Jun and Sept–Dec. Nest-building, by female, takes one week; nest of fine plant fibres, lichen and down, with "beard" of lichen, lined with pappus, outer covering and porch over side entrance of *Usnea* lichens, providing good camouflage, suspended 7–14 m above ground, sometimes in *Brachystegia spiciformis* tree, also in eucalypt (*Eucalyptus*) plantation. Clutch 3 eggs, beige, with heavy brown markings concentrated at wider end; incubation by female only; no information on duration of incubation and nestling periods; both sexes feed fledglings.

Movements. Local short-distance movements in search of flowering plants.

Status and Conservation. **ENDANGERED.** Restricted-range species: present in Tanzania–Malawi Mountains EBA and East African Coastal Forests EBA. Global population estimated to lie in range 10,000–19,999 individuals, and decreasing; estimated total geographical range c. 870 km². Range very small and fragmented: occurs in Arabuko-Sokoke Forest, in Kenya, and in four areas in E Usambara Mts and two areas in Udzungwas, in Tanzania. Most populations threatened by deforestation; competition with *A. collaris* possibly has an additional adverse effect. In Sokoke, 2900–4700 pairs (1 pair/1.5–2.4 ha) estimated in 1970s, and densities of 1.4 birds/km transect in 1999. In Udzungwas, occurs in c. 295 km² of suitable habitat at 1350–1550 m; these populations in isolated areas, away from humans, and therefore better protected. Long-term forest conservation through sustainable management and community participation is underway in Arabuko-Sokoke; in Tanzania, three active conservation projects in E Usambaras, together covering at least 121 km².

Bibliography. Anon. (2007f), Baker & Baker (2007), Borghesio, John & Cordeiro (2007), Borghesio, John, Mulungu *et al.* (2008), Britton & Britton (1978), Britton & Zimmerman (1979), Butchart & Stattersfield (2004), Cheke & Mann (2001), Collar & Stuart (1985), Cordeiro (1998), Davis (2005), Dinesen *et al.* (1993), Fjeldså (1999), Fry *et al.* (2000), Hipkiss *et al.* (1994), Irwin (1996), Oyugi & Kombe (2004), Seddon *et al.* (1999a, 1999b), Stattersfield & Capper (2000), Stuart & Hutton (1977).



Genus *HYPOGRAMMA* Reichenbach, 1853

22. Purple-naped Sunbird

Hypogramma hypogrammicum

French: Souimanga strié **German:** Streifenektarvogel **Spanish:** Suimanga Estriado
Other common names: Blue-naped/Banded Sunbird(!)

Taxonomy. *Nectarinia hypogrammica* S. Müller, 1843, Sumatra and Borneo. No obvious close relatives; tongue morphology unique within family, on which grounds this species may even merit placement in its own subfamily. Five subspecies recognized.

Subspecies and Distribution.

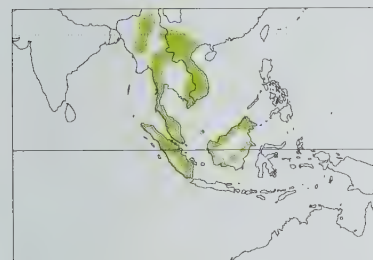
H. h. lisettiae (Delacour, 1926) – N Myanmar, S China (SW Yunnan), N Thailand and N & C Indochina.

H. h. nuchale (Blyth, 1843) – S Myanmar, S Thailand and Peninsular Malaysia.

H. h. mariae (Deignan, 1943) – S Indochina, including E Cambodia.

H. h. natunense (Chasen, 1935) – N Natuna Is.

H. h. hypogrammicum (S. Müller, 1843) – Sumatra and Borneo.



Descriptive notes. 12.7–15 cm; male 7.8–15.2 g, female 9.7–13.5 g. Distinctive large sunbird with streaked underside. Male nominate race is dark olive-green above, with metallic purple-blue nuchal band and lower back to uppertail-coverts, often some white bases showing through on rump; tail all dark olive, outer rectrices with white tips (all except central rectrices narrowly tipped white below); throat greyish-white, becoming olive-yellow downwards, vent dark olive-green, yellow to olive-yellow undertail-coverts; throat, breast and upper belly boldly streaked dark olive; iris red or brown; bill black to brownish-black; legs

brown, brownish-green or olive. Female is smaller than male and lacks metallic coloration. Juvenile apparently undescribed. Racial differences rather subtle: *lisettiae* is longer-billed than nominate, male gloss is distinctly purple, collar on average narrower than nominate, breast and abdomen paler yellow, undertail-coverts brighter yellow, no white in metallic colour of rump, and underside of all except central rectrices tipped yellowish-white; *mariae* male differs from previous in having upper surface of central rectrices black with narrow olive-green edges, remaining rectrices broadly tipped white, underparts less yellow than in other races; *nuchale* male has gloss more purple and less blue than nominate, underside of all rectrices except central pair broadly tipped white; *natunense* differs from last in having larger bill and more finely marked throat. **Voice.** Song a high-pitched, strong “sweet-sweet-sweet, sweet, sweet”. Calls strident “schwerp”, sharp “chwep” and “tsit-tsit”. **Habitat.** Variety of forest types, including peatswamp-forest, secondary growth, plantations, open swamps; occasionally in gardens. Sea-level to at least 1200 m.

Food and Feeding. Insects, spiders (Araneae), also nectar, fruits and seeds. Generally forages low down, below 5 m, but sometimes higher. Raids spider webs for trapped prey.

Breeding. Laying at least Mar and May–Jul in Malay Peninsula, where juveniles recorded Jan–Oct; in Borneo, laying Aug in NW (Sarawak), and birds with active gonads in Jan–Mar, May–Aug, Nov and Dec and nest-building Jan in N (Sabah). Nest pear-shaped or an untidy pendent ball, made of grass, rootlets, bark, lichen, dry moss, leaves and cobwebs, loosely decorated with various materials which may hang up to 15 cm below nest, lined with cotton down, and fixed to underside of plantain (*Musa*) leaf or palm frond 6 m above ground. Clutch 2–3 eggs, whitish with overall uneven suffusion of lilac-grey, with dark grey and black scribbles and irregular blotchings, especially at broad end; no information on incubation and nestling periods; fledglings attended by both parents.

Movements. None recorded.

Status and Conservation. Not globally threatened. Uncommon in Thailand; common in parts of S Laos; common in Peninsular Malaysia; locally common in Sumatra and Borneo. Occurs in several protected areas, including e.g. Cat Tien National Park, in Vietnam, Taman Negara National Park, in Peninsular Malaysia, Way Kambas National Park, in Sumatra, and Danum Valley Conservation Area, in Borneo.

Bibliography. Cheke & Mann (2001), Duckworth *et al.* (1997), Échécopar & Hùe (1983), Evans *et al.* (2000), Ford (1995), Gaither (1994), Jeyarajasingam & Pearson (1999), Lambert (1991), MacKinnon & Philipps (1993), Mann (1996), Medway (1972), Medway & Wells (1976), Mitra & Sheldon (1993), Nash & Nash (1988), Robson (2000b), Sheldon *et al.* (2001), Smythies & Davison (1999), Wells (2007).

Genus *ANABATHMIS* Reichenow, 1905

23. Reichenbach’s Sunbird

Anabathmis reichenbachii

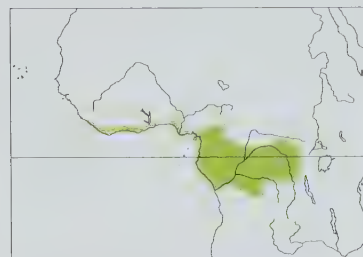
French: Souimanga de Reichenbach **Spanish:** Suimanga de Reichenbach
German: Reichenbachnektarvogel

Taxonomy. *Nectarinia reichenbachii* Hartlaub, 1857, Gabon.

Genus previously merged with *Nectarinia*. Monotypic.

Distribution. S Liberia E to S Nigeria, Cameroon, Central African Republic and DR Congo (E to middle and upper R Congo and Kivu), S to N Angola.

Descriptive notes. 12–14 cm; 7–13 g. Distinctive sunbird with graduated tail. Male has head to chin and throat metallic dark steel-blue with iridescent green and violet sheen; back of head and upperparts olive-green, brown feather centres on mantle and scapulars (creating mottled effect),



rump and uppertail-coverts olive mixed with olive-yellow; upperwing dark brown, edged olive; rectrices blackish-brown, all except central pair with wide pale brownish-white tips; pale grey below, lower belly and vent yellow, pectoral tufts yellow or orange-yellow, underwing white; iris dark brown; bill and legs black. Female is like male but slightly smaller, with duller yellow pectoral tufts. Immature is similar to adult, but has dark olive head, black mottling on crown, yellow supercilium, olive-yellow cheeks and underparts, dark brown barring on throat. **Voice.** Song, from high perch such as top of coconut palm (*Cocos nucifera*),

consists of high-pitched trills and whistles e.g. “tser-pit-too-tu-wee” and “witssooo” and “weee”, and “tser-pert-ta-tee”, sometimes ending in “tsee-too”, the whole lasting for a minute or more. Calls include disyllabic “chirr-up”, and variations on “psi-ou” or “tchu-ih-tchu-ih”.

Habitat. Coastal swamps, scrub, palm groves in sandy zones, mangroves, rice fields, forest clearings, beside watercourses, and in gardens; nearly always near water.

Food and Feeding. Insects and nectar. Forages singly or in pairs, 5–30 m up in trees within 500 m of water. Hawks for insects. Takes nectar from coconut palm, *Psychotria djumensis*, *Sabicea africana*, *Stipularia africana*, and mistletoes such as *Englerina gabonensis* and *Globimetula braunii*. **Breeding.** Egg-laying in May, Jun and Sept–Dec in Cameroon, Sept–Oct and Dec in PR Congo, and Feb and Oct–Nov in Gabon; immature in Liberia in Sept. Nest, built in 5 days, a small pouch-shaped structure, made of grass, dead leaves, fibres and spider webs, unlined, hung 1–5 m above water among papyrus, *Mimosa nigra* and scattered trees. Clutch 1–2 eggs, matt light chocolate-brown or grey-buff with dark speckles, latter denser at wide end; incubation by female alone; no information on duration of incubation and nestling periods.

Movements. No data.

Status and Conservation. Not globally threatened. Common from Cameroon S to PR Congo; elsewhere locally not uncommon (Nigeria, Ivory Coast), but often scarce or rare. Occurs in a few protected areas.

Bibliography. Bannerman (1948), Bartlett & Anderson (1987), Borrow & Demey (2001), Brosset & Énard (1986), Cane & Carter (1988), Chapin (1954), Cheke & Mann (2001), Demey (1986), Dowsett *et al.* (1993), Dowsett-Lemaire & Dowsett (1991), Eccles (1985), Eisentraut (1963), Fry *et al.* (2000), King *et al.* (2004), Kirkup (1998), Lachenaud (2006a), Rand *et al.* (1959).

24. Principe Sunbird

Anabathmis hartlaubii

French: Souimanga de Hartlaub **German:** Hartlaubnektarvogel **Spanish:** Suimanga de Principe
Other common names: Hartlaub’s Sunbird

Taxonomy. *Nectarinia hartlaubii* Hartlaub, 1857, “Angola”; error = Principe, Gulf of Guinea.

Genus previously merged with *Nectarinia*. Monotypic.

Distribution. Principe I, in Gulf of Guinea.



Descriptive notes. 13–14 cm; 10.4 g. Fairly large, dark sunbird with graduated tail. Male is olive above, uppertail-coverts black, edged metallic green; upperwing brown, edged olive; tail feathers dark blue with metallic tinge, all except central pair with buffish-white tips; chin to upper breast metallic dark blue and reflecting violet; lower breast greenish-olive, merging into yellowish on rest of underparts; underwing-coverts and axillaries white; iris chestnut-brown; bill and legs black. Female is as male, but throat olive with dark barring, lacking metallic plumage. Juvenile is like female, but has dark grey-brown throat (blackish-grey on young male) and chest. **Voice.** Noisiest in late afternoon. Song is repetitions of “peek-oo-wee, peek-oo-wee” or “pstes-to-ichou, pstes-to-ichou”, with occasional “twee” whistles, or “tik-e-tik, tik-e-tik, tik-e-tik, ee-tik” or a fast “tiu-tiu-huit-tiu-tiu-huit”. Call very persistent, of 2–3 notes, “dreee” or “too-wee”, or “wee wee”, and variations on “psit-sit”; female utters quiet high-pitched notes.

Habitat. Forest (except montane forest), cultivations, plantations, scrub, gardens; ubiquitous.

Food and Feeding. Insects, including ants (Formicidae) and aphids (Aphidoidea); also nectar. Forages singly, in pairs or in groups of up to ten individuals. Forages at all levels; seeks insects mostly at low levels in trees, or on ground. Takes nectar from flowers of coconut (*Cocos nucifera*), banana (*Musa*) and *Erythrina* trees.

Breeding. Season Oct–Feb/Mar; laying recorded in Feb, and juveniles seen in all months. Nest 17–20 cm tall, with short porch and short “beard”, made of palm bark and dead leaves, lined with plant down and feathers, suspended 1–7 m up from small branch or twigs. Clutch 2 eggs, white, densely covered with reddish spots. No other information.

Movements. Resident.

Status and Conservation. Not globally threatened. Restricted-range species: present in Principe EBA. Common to c. 150 m, except in dense woodland.

Bibliography. Amadon (1953), Bannerman (1948, 1951), Borrow & Demey (2001), Cheke & Mann (2001), Christy & Clarke (1998), Fry *et al.* (2000), Jones & Tye (2006), de Naurois (1994), Sinclair & Ryan (2003).

25. Newton’s Sunbird

Anabathmis newtonii

French: Souimanga de Newton **Spanish:** Suimanga de Newton
German: Gelbburst-Nektarvogel
Other common names: (Newton’s) Yellow-breasted Sunbird, Sao Tome Sunbird(!)

Taxonomy. *Cinnyris newtonii* Bocage, 1887, São Tomé, Gulf of Guinea.
Genus previously merged with *Nectarinia*. Monotypic.
Distribution. São Tomé, in Gulf of Guinea.



Descriptive notes. 10–11 cm; 6–9 g. Male is dark olive above, forecrown paler, uppertail-coverts black, tinged metallic green at tips; upperwing dark brown, edged dark olive; tail black, central feather pair glossy, remainder with broad white tips, outermost pair with as much white as black; chin and throat metallic green with violet reflections, purple on upper breast; yellow below, brightest on breast; underwing white, underwing-coverts at wing margin black with white tips; iris dark chestnut; bill and legs black. Female is slightly smaller than male, lacks metallic coloration on throat and side of neck, which have scaly appearance (owing to dark feather bases); breast and belly pale yellow. Juvenile is similar to female but lacking yellow; immature male has chin and throat dark grey with yellow mottling, breast and belly pale yellow. Voice. Song a 2-minute burst of fast ascending and descending short high-pitched notes of varied sounds such as “tsee”, “ti”, “to”, “wee”, “tzeee” and “tsuuee”. Calls similar to song notes, including “tsee-ee”, “bzueeh”, “jit-jit-jit” and “bink”. Young begging call “bjuit, bjuit, bjui”.

Habitat. Forests, particularly mossy montane primary forest, also woods, savanna woodland, gardens and plantations; to 1800 m.
Food and Feeding. Insects, spiders (Araneae) and nectar. Forages in pairs or small groups, sometimes in larger groups of up to 30 individuals; also joins mixed-species parties. Active feeder in treetops. Attracted particularly to *Canna* flowers.
Breeding. Egg-laying in Aug–Feb. Possibly a co-operative breeder; group of four, including one male, seen to investigate old nest. Singing male stands erect, turns one way and then other, and raises and vibrates wings to display white underwing-coverts; up to five males may sing and display together. Nest, built by female, a pouch-like structure, entrance with porch at side near top, dangling “beard”, made of leaves, moss and other plant material, lined with feathers, plant down and wool, hung from low branch. Clutch 2 eggs, grey-white, densely covered with small violet spots; no information on incubation and nestling periods. Nests parasitized by African Emerald Cuckoo (*Chrysococcyx cupreus*).
Movements. Possibly some altitudinal movement; reportedly absent from gardens at low levels in Apr.
Status and Conservation. Not globally threatened. Restricted-range species: present in São Tomé EBA. Common in all habitats with tall trees. Absent from N savannas.

Bibliography. Amadon (1953), Atkinson, Dutton *et al.* (1994), Atkinson, Peet & Alexander (1991), Bannerman (1948, 1951), Borrow & Demey (2001), Cheke & Mann (2001), Christy & Clarke (1998), Eccles (1988), Fry *et al.* (2000), Jones & Tye (2006), King & Dallimer (2003), de Naurois (1979, 1994), Snow (1950).

Genus *DREPTES* Reichenow, 1914

26. Sao Tome Sunbird

Dreptes thomensis

French: Souimanga de Sao Tomé **German:** Riesennektarvogel **Spanish:** Suimanga Gigante
Other common names: (São Tomé) Giant Sunbird, Dusky São Tomé Sunbird

Taxonomy. *Nectarinia thomensis* Bocage, 1889, São Miguel, São Tomé, Gulf of Guinea.
Genus previously merged with *Nectarinia*. Monotypic.
Distribution. São Tomé, in Gulf of Guinea.



Descriptive notes. Male 20–23 cm, 21–28 g; female 18–19 cm, 18–21 g. Unmistakable; the largest sunbird, with all-blackish plumage, long decurved bill, and long graduated tail (outer rectrix 28–48 mm shorter than central pair). Male has head and upperparts black, feathers edged slightly metallic steel-blue, greayer on rump; uppertail-coverts and lesser and median upperwing-coverts tipped metallic blue; remiges dark brown; tail black, tinged dark blue, outer three feather pairs tipped white; dark brown below, feathers tipped metallic blue, belly to vent with yellow wash; pale grey-buff underwing-coverts and axillaries tipped white; iris dark brown or red; bill and legs black. Female is like male but smaller, wing length 79–84 cm (male 85–94 cm), tail 69–76 cm (male 84–98 cm). Juvenile resembles a small adult. Voice. Song a series of 3 notes each 1 second long, “chee-cheep-eeep” or “tsweet-chut-uu” or “huët-tsip-tsuit”, often followed by “chut, chut, chit chit”. Call a loud “cheep”. Lekking males call “tic-tic-tic-tic-tic-tic”, followed by “tsi-tsu-huee, tsi-tsiu-tsiu” or “huit-huit-rruit-rruit”.

Habitat. Montane forest, including mistforest, also lowland primary forest and plantations; also strays into disturbed habitats up to 1 km from forest. Lowlands to c. 2000 m.
Food and Feeding. Insects; also nectar and fruit pulp. Forages for insects on leaves, and hovers to feed from beneath leaves; probes flowers and bark in canopy.
Breeding. Egg-laying Sept–Jan. Possibly polygynous; females outnumber males by factor of 2 at some localities. Apparent lekking behaviour recorded, several males gathering together to sing. Nest a pouch, with side entrance and small porch, made of moss and other plant material, with long dangling “beard”, suspended 4–10 m above ground from end of long branch. Clutch 2 eggs, elongate, white with small red spots. No other information.
Movements. Resident.
Status and Conservation. VULNERABLE. Restricted-range species: present in São Tomé EBA. Rare to locally common. Global population in range 250–999 individuals, and believed stable; extent of available habitat estimated at 340 km². Threatened by forest clearance. Large areas of lowland and middle-altitude forest already lost to plantations, and number of small farms has increased and tree-cutting accelerated as a result of land privatization. Clearance of forest for cultivation, timber and fuelwood an additional threat; likewise, road-building developments along E & W coasts have allowed increased human access to previously remote areas. Proposals made to designate pri-

mary forests as ecological zones or national parks, but forest currently unprotected; law providing for listing of protected areas and for protection of threatened species has still to be ratified.
Bibliography. Amadon (1953), Anon. (2007f), Atkinson, Dutton *et al.* (1994), Atkinson, Peet & Alexander (1991), Bannerman (1948, 1951), Borrow & Demey (2001), Butchart & Stattersfield (2004), Cheke & Mann (2001), Christy & Clarke (1998), Fry *et al.* (2000), Jones & Tye (1988, 2006), King & Dallimer (2003), de Naurois (1983, 1994), Sargeant (1994), Snow (1950), Stattersfield & Capper (2000).

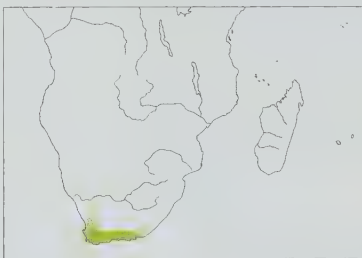
Genus *ANTHOBAPHES* Cabanis, 1851

27. Orange-breasted Sunbird

Anthobaphes violacea

French: Souimanga orangé **German:** Goldbrust-Nektarvogel **Spanish:** Suimanga Pechinaranja
Other common names: Violet-headed/Wedge-tailed Sunbird

Taxonomy. *Certhia violacea* Linnaeus, 1766, Cape of Good Hope, South Africa.
Genus previously subsumed in *Nectarinia*. Monotypic.
Distribution. Western Cape and SW Eastern Cape (E to Port Elizabeth), in SW South Africa.



Descriptive notes. Male 14.5–16.5 cm, 9–11.3 g; female 12.5–13.5 cm, 8.6–9.7 g. Male is iridescent green on head to mantle and chin to upper breast; back yellow-green, lesser upperwing-coverts metallic green, median and greater wing-coverts and flight-feathers brown, edged yellow-green; tail brownish-black, central pair of feathers elongated and darker, outer rectrices paler; violet breastband separating metallic green of throat from reddish-orange of upper breast and belly, yellow lower belly, pectoral tufts bright yellow; axillaries and underwing-coverts grey-brown; iris dark brown; bill and legs black. Female lacks metallic colours and elongated central rectrices, has head grey-olive, upperparts dark yellow-green, paler on rump and uppertail-coverts, tail brown, edged yellow, throat and breast dark yellow-green with some admixed grey, rest of underparts yellowish. Juvenile is like female but darker. Voice. Song a high-pitched warbling of melodious notes, interrupted at varying intervals by descending “tzzurr” or “jeeeu”. Calls include “seep-seep, seep-seep, seep-seep”, or “shraynk”; warning call “eet-eet” or “dzeeu-dzeeu”; males chasing one another give “ke-ke-ke” call.

Habitat. Fynbos; mountain slopes with heaths (Ericaceae) and proteas (*Protea*), also gardens, and occasionally in Karoo biome.

Food and Feeding. Nectar; also insects, including beetles (Coleoptera), flies (Diptera), Hymenoptera, Lepidoptera and Orthoptera; also spiders (Araneae). Known foodplants include 66 species of *Erica*, *Liparia splendens*, *Protea lepidocarpodendron* and *Protea mellifera*. Forages singly, in pairs and in small groups; in non-breeding season forms loose groups of 50–100 individuals. Hawks for insects; feeds also on ground.

Breeding. Egg-laying in all months, with peak May–Aug (breeds in synchrony with flowering of *Erica* species); two or three broods. Territorial display by male, from protea or *Erica* bush, includes wing-stretching to reveal pectoral tufts and tail-jerking. Nest built by female alone, taking 5–18 days, an ovoid structure without porch or “beard”, 85–120 mm high, 64–90 mm wide, 75–100 mm deep, side entrance 2–4 cm wide, made of twigs, roots, *Erica* leaves and grass, held together by cobwebs, lined with down from protea or *Eriocephalus* species, occasionally adorned externally with spider cocoons and feathers, placed low down (76% below 1 m) but sometimes up to 10 m above ground in bush (e.g. protea). Clutch 1–2 eggs, colour variable, usually white, sometimes green-grey, densely spotted and streaked with grey-brown or chocolate-brown, markings concentrated at wider end; incubation by female, period 14–15 days; chicks brooded by female, fed by both sexes, male providing one-third of feeds, nestling period 15–22 days; young at least partly dependent on parents for c. 3 weeks after leaving nest. Nests parasitized by Klaas’s Cuckoo (*Chrysococcyx klaas*). In one study, hatching rate 65% and fledging rate of nestlings 68%.

Movements. During austral summer, moves up to 8 km, and ascends at least 320 m higher, in search of flowering plants. Vagrant recorded once in King William’s Town (S Eastern Cape), outside normal range.

Status and Conservation. Not globally threatened. Restricted-range species: present in Cape Fynbos EBA. Common to locally uncommon. Habitat loss has presumably caused some declines. Habitat disturbance by humans and invasive plants a potential threat in some areas. Occurs in Kirstenbosch Botanical Gardens.

Bibliography. Broekhuysen (1963), Cheke & Mann (2001), Collins (1983b, 1983c), Fraser (1989, 1997c), Fraser & McMahon (1991, 1992), Fraser *et al.* (1989), Fry *et al.* (2000), Hall & Moreau (1970), Hockey *et al.* (2005), Oatley (1997), Siegfried *et al.* (1985), Shead (1967), Spottiswoode (1993), Williams (1993a, 1993b), Winterbottom (1964), Wooler (1982).

Genus *CYANOMITRA* Reichenbach, 1853

28. Green-headed Sunbird

Cyanomitra verticalis

French: Souimanga à tête verte **German:** Grünkopf-Nektarvogel **Spanish:** Suimanga Cabeciverde
Other common names: Green-headed Olive/Olive-backed Sunbird(!)

Taxonomy. *Certhia verticalis* Latham, 1790, Africa = Senegal.
Genus formerly subsumed in *Nectarinia*. Has been thought to form a superspecies with *C. bannermani*, possibly including also *C. oritis* and *C. alinae*. Nominate race and *bohndorffi* intergrade in Cameroon. Proposed race *niassae*, described from Kondeland (N of L Malawi), in SW Tanzania, appears indistinguishable from *viridisplendens*. Four subspecies recognized.

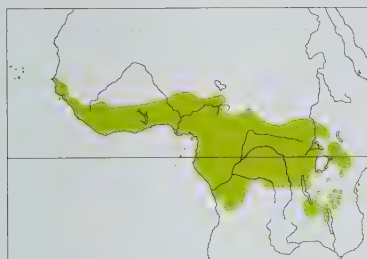
Subspecies and Distribution.

C. v. verticalis (Latham, 1790) – Senegal E to W & N Cameroon.

C. v. bohndorffi (Reichenow, 1887) – C & S Cameroon and Central African Republic S to inland Gabon, middle DRCongo and N Angola.

C. v. cyanocephala (Shaw, 1811) – coasts of mainland Equatorial Guinea and Gabon S to NW Angola (Cabinda) and extreme W DRCongo (mouth of R Congo).

C. v. viridisplendens (Reichenow, 1892) – S Sudan and NE & E DRCongo E to Uganda, Kenya (E to Mt Kenya) and Tanzania, and NE Zambia and N Malawi.



Descriptive notes. 13–14.5 cm; male 9.7–15.5 g, female 10.7–15.5 g. Male nominate race has head, nape, throat and upper breast metallic green with blue reflections, lores black, upperparts behind nape olive with gold tinge; underparts and tail brown edged olive yellow, golden-olive on outer webs of lesser wing-coverts and edges of greater coverts; underparts grey, pectoral tufts creamy with yellow wash, tips of flank feathers green-yellow, axillaries and underwing-coverts grey; iris dark brown; bill and legs greenish-black. Female differs from male in having metallic colour greener and only on forehead, crown, ear-coverts and nape, with

throat grey, no pectoral tufts, and axillaries and underwing-coverts white. Immature male has forehead and crown grey (slightly mottled), chin, throat, lores and malar region blackish-grey, yellow wash on underparts; immature female has paler grey throat. Race *bohndorffi* is bigger than nominate (male wing 64–70 mm; nominate 60–65 mm), with greener, less olive, upperparts and darker grey underside, immature has whole crown dull black and contrasting with olive back; *cyanocephala* is similar to previous in size, but throat and breast more purplish and belly sootier grey, has back darker and greener olive than nominate; *viridisplendens* has head and throat brighter green, less bluish, than other races. **VOICE.** Song a repetition of “tsk” every 1–5 seconds, then a rapid burst of 5–11 “tse” notes. Calls include single “tsk”, also plaintive “chi-u-wee”, “chee”, “tchoue” and “cheerick”; “t’chew-ee, t’chew-ee” used by birds arriving at feeding stations; alarm call “chaa” or “pss-chaa”; aggressive calls include sharp “chep-pee-pee-pee-pee”, sometimes leading into trilling “tee-tee-tee”, and during head-up display “peeeeee-tew” (rising in pitch, dropping on last note). May mimic other species.

Habitat. Primary, secondary and gallery forests and clearings within them, also forest–savanna mosaic and well-wooded savanna and coastal habitats, including mangroves, plantations; also gardens. Occurs at up to 3000 m in Sudan, to 2400 m in E African highlands, 2500 m in Rwanda and 2150 m in Zambia.

Food and Feeding. Nectar and other vegetable matter; arthropods. Nectar taken from variety of tree species and mistletoes (Loranthaceae); small fruits, seeds and sap from oil palms (*Elaeis guineensis*) also eaten. Insect prey includes beetles (Coleoptera), flies (Diptera), homopteran bugs, Hymenoptera and small Orthoptera; spiders (Araneae) also taken. Usually forages high in canopy, sometimes on trunks of trees, but also at lower levels, especially in shaded parts. Gleans leaves; hover-gleans, and chases insects in flight. Groups of up to 30 males forage among fruiting *Xylopia aethiopica* trees, each individual defending a feeding area of 2–4 m around itself by singing and aggressive displays of pectoral tufts.

Breeding. Laying Aug–Sept in Sierra Leone, Jul in Nigeria, Mar–Apr, Jun–Jul and Sept–Oct in Cameroon, Nov–Dec in Gabon, Sept in DRCongo, Feb and probably Mar and Apr in DRCongo, Jan–Nov in E Africa, Dec–May in Zambia, and Dec–Feb and Apr in Malawi; bird in breeding condition in Feb in Angola. Nest an untidy ball with side entrance, made of dried grass, leaves and bark fibres, held together without cobwebs, lined with banana bark and fibres, some with “beard” hanging 0.5 m down from entrance, suspended 1.5–12 m up in vegetation, sometimes over water; territory 0.5–10 ha within forest, one defended by same pair for three seasons. Clutch 2 eggs, matt, slightly pointed at sharp end, pale pink background covered with chocolate-brown dots and lines and grey markings; chicks fed by both parents; no information on duration of incubation and nestling periods. Nests parasitized by Klaas’s Cuckoo (*Chrysococcyx klaas*).

Movements. No data.

Status and Conservation. Not globally threatened. Common over most of its range; uncommon in Gambia and Senegal. Found at densities of 12–20 pairs/km² in Gabon. Occurs in a number of national parks and other protected areas.

Bibliography. Baker & Baker (2007), Bannerman (1948), Blancou (1939), Borrow & Deme (2001), Brosset & Érad (1986), Carroll (1988), Chapin (1954), Cheke (1978), Cheke & Mann (2001), Dowsett-Lemaire (1989a, 1989b, 1990), Eisentraut (1963), Fry *et al.* (2000), Hall & Moreau (1970), Kramer (1975), Kunkel (1964), Lewis & Pomeroy (1989), Louette (1987), Lynes (1938), McCarthy (2006), Ng’weno (1990), Nikolaus (1987), Rand *et al.* (1959), Short & Horne (2003), Zimmerman *et al.* (1996).

29. Bannerman’s Sunbird

Cyanomitra bannermani

French: Souimanga de Bannerman

Spanish: Suimanga de Bannerman

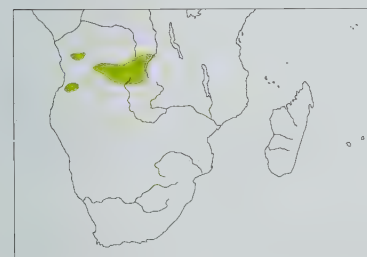
German: Bannermannektarvogel

Other common names: (Bannerman’s) Blue-headed Sunbird

Taxonomy. *Cyanomitra verticalis bannermani* C. H. B. Grant and Mackworth-Praed, 1943, Kayoyo, Katanga, southern DRCongo.

Genus formerly subsumed in *Nectarinia*. Has been thought to form a superspecies with *C. verticalis*, possibly including also *C. oritis* and *C. alinae*. Specific name *sororia*, based on a specimen from Calandula (Malanje), in N Angola, is a synonym of present name. Monotypic.

Distribution. N, W & E Angola, S DRCongo (Katanga) and NW Zambia.



Descriptive notes. 13 cm; 14 g. Male has metallic greenish-blue hood covering head, neck and chin to upper breast, with violet reflections on throat and upper breast; upperparts olive-green, remiges and rectrices dark grey-brown, primary coverts and alula edged olive-green, yellowish edges of primaries and outer webs of all except outermost rectrices; underparts grey, darker on lower breast and upper flanks, pectoral tufts pale yellow, underwing pale grey; iris dark reddish-brown; bill and legs black. Distinguished from *C. verticalis* by duller metallic blue chin and throat with green reflections, paler grey chest and belly, smaller and less promi-

nent pectoral tufts, and shorter, straighter bill. Female has crown dark brown, edged dark grey, sometimes with dull metallic light green edges, particularly on side of crown (appearing mottled), neck and chin to chest smoke-grey, otherwise similar to male but brighter above. Immature male resembles female, but darker grey throat and very little metallic green on forehead, bright olive-green above. **VOICE.** Song a sequence of c. 5 “chuk” notes before “purz-urr-wee” wheeze. Call “chuk”. **Habitat.** Riverine forest and moist evergreen forest, sometimes entering miombo woodland.

Food and Feeding. Few data. Nectar, termites (Isoptera) and spiders (Araneae) recorded as eaten.

Breeding. Egg-laying in Sept in Zambia. Only known nest was big, 18 cm tall (from point of attachment to base), 10 cm wide and 9 cm deep (but extra material made nest up to 19 cm broad), side entrance with porch of thin stems, made of long coarse grass stems, roof of black fibrous stems, lining of fine stems, much material hanging down to 16 cm below base, nest adorned externally with strips of banana bark and large leaves, suspended 1.2 m over water from vine. Clutch 2 eggs, matt pink-brown, densely streaked with dark purple-brown. No other information.

Movements. No data.

Status and Conservation. Not globally threatened. Uncommon in Angola; not uncommon elsewhere in range.

Bibliography. Benson *et al.* (1971), Cheke & Mann (2001), Colebrook-Robjent (1990), Dean (2000), Dowsett *et al.* (2008), Fry *et al.* (2000), Grant & Mackworth-Praed (1943a), Hall & Moreau (1970), Louette (1987), Ripley (1960, 1962), Traylor (1962).

30. Blue-throated Brown Sunbird

Cyanomitra cyanolaema

French: Souimanga à gorge bleue

German: Braunrücken-Nektarvogel

Spanish: Suimanga Gortjazul

Other common names: Blue-headed Brown/Blue-throated Sunbird

Taxonomy. *N.[ectarinia] cyanolaemus* Jardine and Fraser, 1851, Malabo, Bioko.

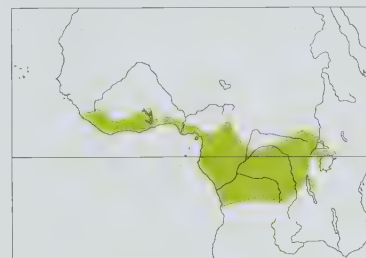
No apparent close relative; shows characters of both present genus and *Chalcomitra*. Three subspecies recognized.

Subspecies and Distribution.

C. c. magnirostrata (Bates, 1930) – Sierra Leone E to Togo.

C. c. octaviae Amadon, 1953 – SW Nigeria, Cameroon and S Central African Republic E to Uganda (Budongo Forest) and W Kenya (Kakamega Forest), and S to N Angola and S DRCongo (Katanga); also NW & W Tanzania.

C. c. cyanolaema (Jardine & Fraser, 1851) – Bioko I (Fernando Póo).



Descriptive notes. 14–15 cm; 11–20 g. Male nominate race has forehead, chin and throat metallic dark steely blue-green, tinged violet; crown, side of head and upperparts brown, flight-feathers and tail also brown, some rectrices tipped pale; underparts mostly brown, belly, flanks and undertail-coverts paler grey-brown, pectoral tufts lemon-yellow or creamy, underwing greyish; iris dark brown; bill and legs black, soles of feet yellowish. Female is dark brown with olive-yellow wash above, white eye-brow and feathers surrounding eye, brown wing and tail feathers edged olive-yellow, edges broadest on secondaries, some tail feathers with

pale tips, chin and throat white or buff, underparts grey-white and variously mottled with pale yellow-green and grey, brightest yellow on vent, white underwing; bare parts as male. Juvenile male lacks pectoral tufts and metallic coloration, has yellowish-olive edges on wing and tail feathers, underparts tinged olive, upper mandible greenish-black, lower mandible yellow with greenish-black tip; juvenile female has grey-brown underparts faintly washed yellow. Race *magnirostrata* has relatively bulky and long bill (24–28 mm), male darker above than nominate; *octaviae* has smaller bill (20–25.5 mm) than previous and male is greyer, less brown, below, female yellow-tinged, less green, above than nominate. **VOICE.** Song an extended series of descending trills and twitters involving “ptisew” and “psit” notes. Calls include “tschuk”, “tsit”, “chip”, and ascending and descending “tsesw”.

Habitat. Forest, open areas (e.g. gardens, cultivations) within forest, and gallery forest in savanna; various habitats along coast. To 1500 m in Liberia, Uganda and Kenya, and to 2000 m in Rwanda.

Food and Feeding. Takes insects, spiders (Araneae), also seeds and small fruits (e.g. of *Alchornea* and *Discoglypemma*). Forages at varying heights, from ground level to 45 m. Joins mixed-species flocks with other sunbirds. Attends flowers of mistletoes (Loranthaceae) and of trees, including *Symphonia glubulifera* and those of genera *Albizia*, *Berlinia*, *Bombax*, *Caesalpinia*, *Combretum*, *Erythrina*, *Maranthes*, *Musanga*, *Spathodea*.

Breeding. Laying in Aug and Nov in Nigeria, Jun and Jul in Cameroon, Dec–Apr in Gabon, Oct in DRCongo, Mar in DRCongo, and Mar–Sept in Uganda; birds in breeding condition in Aug–Sept in N Angola (Cabinda). At start of rains, males gather in leks of 4–45 individuals on dead branches, display by exposing pectoral tufts and hopping from branch to branch opposite each other, singing with puffed-up chest, head thrown back, bill wide open, wings drooping and tail spread. Nest an extraordinary elongated structure up to 1 m from top to bottom, with short porch above entrance hole, built of twigs, dead leaves, *Marasmius* fungus, cobwebs, fibres and moss, with deep inner chamber lined with bark or mammal hairs, including those of gorilla (*Gorilla gorilla*), suspended 1–12 m up on shrub or bush in clearing or over water. Clutch 2 eggs, matt, variously pink-brown, brown, cream, grey-violet or buff, grey around larger end, densely marked with brown or dark purple-grey; incubation by female, period 14 days; no information on nestling period.

Movements. Mostly sedentary; records in gallery forest in savanna lands primarily in wet season, suggesting seasonal dispersal.

Status and Conservation. Not globally threatened. Common in most of W Africa, but rare in Togo; widespread and common in mainland Equatorial Guinea, and locally common in Angola, DRCongo, Uganda and Tanzania. Occurs in several protected areas, e.g. Korup National Park, in Cameroon.

Bibliography. Amadon (1953), Bates (1911, 1927), Borrow & Deme (2001), Brosset (1974), Brosset & Érad (1986), Burger (1987), Carswell *et al.* (2005), Chapin (1954), Cheke & Mann (2001), Dowsett-Lemaire (1990), Fry *et al.* (2000), Hall & Moreau (1970), Lachenaud (2006b), Mariaux & Vaucher (1991), Prigogine (1971, 1972), Rand *et al.* (1959), Traylor & Parelius (1967).

31. Cameroonian Sunbird

Cyanomitra oritis

French: Souimanga à tête bleue

German: Blaukopf-Nektarvogel

Spanish: Suimanga Camerunés

Other common names: (Cameroon) Blue-headed Sunbird(!)

Taxonomy. *Cinnyris oritis* Reichenow, 1892, Buea, 950 m, Mount Cameroon, Cameroon. Genus formerly subsumed in *Nectarinia*. Has been thought to be possibly part of a superspecies formed by *C. verticalis*, *C. bannermani* and *C. alinae*. Three subspecies recognized.

Subspecies and Distribution.

C. o. hansoensis Bannerman, 1922 – SE Nigeria (Obudu Plateau and Mambilla Plateau) and highlands of W Cameroon (except Mt Cameroon).

C. o. oritis (Reichenow, 1892) – Mt Cameroon (SW Cameroon).

C. o. poensis Alexander, 1903 – Bioko I (Fernando Poo).



hansoensis is smaller than others, has shorter bill than nominate, metallic colour of feathers of crown and side of head bright steel-green (instead of dull steel-blue), throat and breast steel-blue (not deep purplish-blue), middle of belly more yellowish; *poensis* is slightly bigger than preceding race, shorter-billed and darker olive than nominate, with gloss on head more greenish and metallic colour extending to hindneck, side of neck and farther down breast. VOICE. Song consists of bursts of metallic notes and a quiet warble interspersed with up to four repeats of "tsi", each burst lasting 2–4 seconds. Calls include repetitive ticking, a "pseep" usually at intervals of half a second, and "tch-tch-tchwee" repeated every 2 seconds; alarm call "jeep".

Habitat. Undergrowth in forest, forest edges, and beside streams. On Mt Cameroon in montane forest at 1200–2100 m and eucalypt (*Eucalyptus*) plantations; strays down to 570–670 m in period Jun–Sept. Primary and secondary forest and clearings at 800–2800 m on Bioko.

Food and Feeding. Insects and nectar. Seen to feed at *Lea guineensis*, *Psychotria manni* and unidentified Rubiaceae. Forages singly or in pairs; sometimes large numbers assemble at flowering trees.

Breeding. Egg-laying in Mar–Apr, Jul and Nov–Dec in Cameroon and Apr on Bioko. Pear-shaped nest, with porch extending 5 cm above entrance, made of loose grass, rootlets and moss, lined with fibre and silk-cotton, with dry grass "beard", attached to fern 1 m up over rocky bank by stream. Clutch 2 eggs, thickly covered in dark brown speckles, darker at broad end. Nests recorded as parasitized by Klaas's Cuckoo (*Chrysococcyx klaas*). No other information.

Movements. Some altitudinal movement; descends to lower levels on Mt Cameroon, Jun–Sept.

Status and Conservation. Not globally threatened. Restricted-range species: present in Cameroon Mountains EBA. Common within its restricted range. Frequent in Gashaka-Gumti National Park (in Mambilla Plateau), in Nigeria. In Cameroon, reasonably common in Bamenda Highlands, Bakossi Mts, Rumpi Hills, Mt Manenguba, Mt Kupé and Mt Cameroon. Common on Bioko.

Bibliography. Bannerman (1948), Borrow & Demey (2001), Boulton & Rand (1952), Cheke & Mann (2001), Eisenraut (1963), Fry *et al.* (2000), Hall & Moreau (1970), Newsome (1986), Pérez del Val (1996), Serle (1965), Smith *et al.* (2000), Stuart & Jensen (1986).

32. Blue-headed Sunbird
Cyanomitra alinae

French: Souimanga d'Aline **German:** Ruwenzorinektarvogel **Spanish:** Suimanga Cabeciazul
Other common names: Rwenzori Blue-headed Sunbird

Taxonomy. *Cyanomitra alinae* F. J. Jackson, 1904, Rwenzori, DR Congo. Genus formerly subsumed in *Nectarinia*. Has been thought to be possibly part of a superspecies formed by *C. verticalis*, *C. bannermani* and *C. oritis*. Proposed race *vulcanorum* (described from W Kivu Volcanoes, in E DR Congo) considered a synonym of *tanganjicae*. Five subspecies recognized.

Subspecies and Distribution.

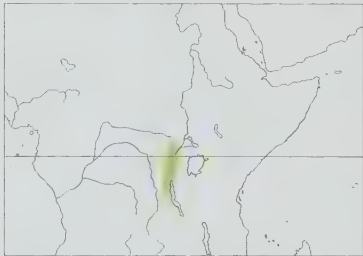
C. a. deroi (Prigogine, 1975) – NE DR Congo in two main populations (one W of L Albert, the other W of L Edward).

C. a. alinae F. J. Jackson, 1904 – NE DR Congo (W Rwenzori Mts, Virunga Volcanoes) and SW Uganda (E Rwenzoris, Bwindi Forest).

C. a. tanganjicae (Reichenow, 1915) – E DR Congo (mountains W of L Kivu, Itombwe Mts, NW of L Tanganyika), Rwanda (Nyungwe forest, SE of L Kivu) and Burundi.

C. a. kaboboensis (Prigogine, 1975) – Mt Kabobo, in E DR Congo.

C. a. marungensis (Prigogine, 1975) – Marungu Mts, in SE DR Congo.



dull olive-green lower flanks and undertail-coverts; underwing greyish-white; iris brown or reddish-brown; bill black; legs black or olive-black. Female is similar to male but has no pectoral tufts, and metallic feathers on crown duller green, without blue sheen. Juvenile male is dull olive-green above, with metallic spots on crown, orange-yellow tinge on mantle, has chin to upper breast dull blackish-grey with dark barring, rest of underparts greyish-olive. Race *deroi* has crown deep green, less blue than nominate, and metallic colour below bluer, less purple, also back darker and redder and breast darker grey than other races; *tanganjicae* has head greener, less blue, than nominate, longer bill than previous; *kaboboensis* differs from preceding two in having deep grey

belly only slightly tinged black (looking paler), also less olive in lower belly and undertail-coverts, no metallic green in wing-coverts, steel-blue neck and throat with greener reflections; *marungensis* is distinguished from last by paler belly and shorter and weaker bill. VOICE. Song a quiet twittering, culminating in a series of loud "chip" notes every 3–4 seconds; advertises territory with far-carrying rising and falling notes in series 3–6 seconds long. High-pitched subsong used in aggressive meetings and courtship. Calls include rising and falling sequence ending with distinctive "tci tci tci yehu", also "tsee" and "chip".

Habitat. Primary, secondary and riverine montane forests above 1400 m and up to 3280 m; 1980–2480 m on Mt Kabobo, and 1660–1710 m in Marungu Mts.

Food and Feeding. Insects and small spiders (Araneae); also nectar. Forages usually at low levels, but sometimes in canopy. Visits flowers of *Balthasarea schliebenii*, a favourite species around which it defends territories; feeds also from *Brillantasia*, *Canaria emini*, *Impatiens niarniamensis*, *Ixora burundensis*, *Lobelia giberroa*, *Phragmanthera usuiensis*, *Pseudosabicea*, *Symphonia*, *Tapinanthus brunneus* and *Tapinanthus constrictiflorus*. Takes nectar from flowers of trees and mistletoes (Loranthaceae) while perched, also while hovering.

Breeding. Egg-laying in Jan–May in DR Congo. Territorial males face each other on treetops, calling, until one flies at the other; occasionally both fall together, gripping each other's feet, before displays repeated. Nest pouch-shaped, entrance with pronounced porch, made of moss, *Usnea* lichens, grass, roots and dry leaves, lined with fine grass or flower heads, suspended 2 m up from bush. Clutch 1–2 eggs, red-brown or red-grey with dark patches, darker at larger end. No other information.

Movements. Presumed sedentary.

Status and Conservation. Not globally threatened. Restricted-range species: present in Albertine Rift Mountains EBA. Common in most of its montane range; scarce in Kivu area of DR Congo.

Bibliography. Bennun (1986), Carswell *et al.* (2005), Chapin (1954), Cheke & Mann (2001), Dehn & Christiansen (2001), Dowsett & Prigogine (1974), Dowsett-Lemaire (1990), Fry *et al.* (2000), Hall & Moreau (1970), McCarthy (2006), Prigogine (1971, 1972, 1975, 1984), Schouteden (1938).

33. Eastern Olive Sunbird
Cyanomitra olivacea

French: Souimanga olivâtre **German:** Olivnektarvogel **Spanish:** Suimanga Oliváceo Oriental
Other common names: Olive/Olive-coloured Sunbird

Taxonomy. *Cinnyris olivaceus* A. Smith, 1840, Kafirland eastward toward Port Natal = Durban, South Africa. Genus formerly subsumed in *Nectarinia*. Probably forms a superspecies with *C. obscura*. Formerly regarded as conspecific, but separated initially on basis that females of latter lack pectoral tufts; although some female *C. obscura* do have pectoral tufts (albeit white, wispy insignificant ones), and conspecificity supported by analyses of mitochondrial DNA, treatment as separate species nevertheless considered justified, as the two differ in vocalizations and in egg patterning, and yellow pectoral tufts extremely rare (if they occur at all) in female *C. obscura*. Recent re-examination of specimens reveals that possibility of sympatry of the two species on Zanzibar is unfounded. Additional proposed races are *chyulu* (described from Chyulu Mts, in S Kenya), which is merged with *neglecta*, *puguensis* (Mafia I, off N Tanzania), synonymized with *changamwensis*, *intercalans* (Fort Jameson, in Eastern Province of Zambia), included in *alfredi*, and *daviesi* (Pondoland, in coastal E South Africa), considered indistinguishable from nominate. Five subspecies recognized.

Subspecies and Distribution.

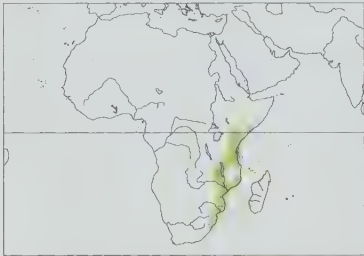
C. o. changamwensis Mearns, 1910 – S Somalia and coastal SE Kenya and E Tanzania (inland to Taita, Usambaras, Pugu Hills and S Pare Mts), Zanzibar and Mafia I.

C. o. neglecta Neumann, 1900 – SC Kenya S to NE Tanzania.

C. o. alfredi Vincent, 1934 – S Tanzania, E Zambia, Malawi and N Mozambique.

C. o. olivacea (W. K. H. Peters, 1881) – coastal areas of SE Tanzania, Mozambique and NE South Africa (NE KwaZulu-Natal).

C. o. olivacea (A. Smith, 1840) – S KwaZulu-Natal S to NE Eastern Cape (Pondoland), in E South Africa.



yellowish-green; iris dark brown; bill and legs black. Sexes alike, but male (wing 61–70 mm, bill 27–29 mm) slightly bigger than female (wing 59–64 mm, bill 27–28 mm). Juvenile is olive-yellow from chin to chest, and brighter olive above than adult, bill grey, legs pale pinkish-grey. Race *alfredi* is greener than nominate, also paler below, and smaller (male wing 55–67 mm, bill 24–27 mm); *neglecta* is duller above, crown darker, and greyer below than previous; *changamwensis* has brighter and greener upperparts and paler underparts than last, greyish belly contrasting with greener upper breast and throat, also smaller (male wing 56–69 mm, bill 22–24 mm); *olivacea* is paler above and below, smaller (male wing 57–63 mm, bill 21–23 mm) than *alfredi* and with smaller and finer bill, lacks orange in pectoral tufts. VOICE. Song of nominate race a minute-long repetition of rising and falling whistling notes, with occasional melodic sequences of "tsee-tsee-tsee-, tseedlee, eedlee-id-id-seedlee, eedlee-ee-ee-ee"; also a slower warble of "see-weetee-wee-tee-to-tip" and "tsee-tsee-tsee..."; rival males may sing from a tree together in a "choir", with ascending and descending notes. Song of *alfredi* consists of falling notes, "dee-dee-dee-di-doo", also a lengthy series of "tschi" notes repeated every 0.5 seconds, mixed with short melodious sections and ending in repeats of "tsk". Calls include scolding "tsk-tsk-tsk" and "tsick" or "tut-tut-tut", a high-pitched "tseeng-tseeng-tseeng-tseeng", and stuttering "ch, ch, ch"; also "choyt", "chwp, chwp, chwp...", "chip.p.p.p.p", an insect-like "phit", "zeet" or "woot, zeet", or "wip-wip-wip-wip..." repeated again and again (sometimes as "mid-day" call); feeding areas defended with "phweep-phweep" call; alarm "tsink-tsink-tsink" or "jet-jet-jet" or harsh "tk".

Habitat. Forest and clearings, also dense woodland, thickets, coastal scrub, plantations and gardens; to 2150 m.

Food and Feeding. Takes insects, spiders (Araneae), berries, fruit and nectar. Feeds from flowers of trees (e.g. *Erythrina*, *Jacaranda*, *igelia africana*), mistletoes (Loranthaceae) and other plants,

such as *Fuchsia*, *Gardenia*, *Hibiscus*, *Leonotis* and *Strelitzia*. Mainly insectivorous, at least in Malawi. Forages singly or in groups of up to 100 individuals, and in mixed-species flocks. Feeds mainly in undergrowth and lower section of forest; sometimes higher, to canopy. Hovers in front of flowers, and searches along leaves. Gleans leaves; hawks for insects, and inspects spider webs.

Breeding. Laying recorded in Jun in Kenya, Dec–Jan in Tanzania, Sept–Apr on Zanzibar, Sept–Feb in Malawi, Nov in Mozambique, and Aug–Apr in South Africa. Probably polygynous. Singing males gather in leks of 10–20 individuals, which compete for highest perches; males conduct fluttering display-flights. Territorial. Nest, sometimes completed within just two days, an untidy pear-shaped bundle, side entrance with porch, dangling “beard” up to 70 cm long, made of dry grass, fibres, twigs, rootlets, lichen, moss and leaves, held together with cobwebs, cup lined with down, feathers and fine grass, suspended from branch 0.5–2 m up. Clutch 1–3 eggs, grey-white with small greyish-brown spots and streaks; incubation 12–15 days; nestlings fed by both sexes, fledging period 13–17 days. Nests sometimes parasitized by African Emerald Cuckoo (*Chrysococcyx cupreus*).

Movements. Mostly sedentary, but strays in search of food; may undertake post-breeding altitudinal movements. Longest ringing recovery at distance of 4 km.

Status and Conservation. Not globally threatened. Common in most of range; locally common in Malawi. In South Africa, recorded density of 5–7 pairs/ha in coastal areas of KwaZulu-Natal, but scarcer in inland areas. Occurs in several protected areas, including e.g. Arusha National Park, in Tanzania, and Lilongwe Nature Sanctuary, in Malawi.

Bibliography. Aspinwall (1971), Bannerman (1948), Bowie *et al.* (2004b), Cheke & Mann (2001), Clancey (1964, 1978a, 1994a), Dowsett-Lemaire (1989b), Dowsett-Lemaire & Dowsett (2006), Frost & Frost (1980), Fry *et al.* (2000), Hall & Moreau (1970), Hockey *et al.* (2005), Irwin (2004), Moreau & Moreau (1940), Sclater & Moreau (1933), Shead (1967), de Swardt (1992d), Swynnerton (1908), Tree (1997h).

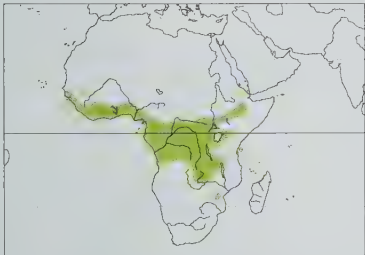
34. Western Olive Sunbird
Cyanomitra obscura

French: Souimanga obscur **Spanish:** Suimanga Oliváceo Occidental
German: Einsiedel-Nektarvogel
Other common names: (Guinea/Guinean) Olive Sunbird

Taxonomy. *N[ectarinia] obscura* Jardine, 1843, Bioko. Genus formerly subsumed in *Nectarinia*. Probably forms a superspecies with *C. olivacea*. Formerly regarded as conspecific, but separated initially on basis that females lack pectoral tufts; although some females do have pectoral tufts (albeit white, wispy insignificant ones), and conspecificity supported by analyses of mitochondrial DNA, treatment as separate species nevertheless considered justified, as the two differ in vocalizations and in egg patterning, and yellow pectoral tufts extremely rare (if they occur at all) in female of present species. Recent re-examination of specimens reveals that possibility of sympatry of the two species on Zanzibar is unfounded. Races *guineensis* and *cephaelis* intergrade in Ghana–Togo region. Proposed races *vincenti* (described from Kapenguria, in W Kenya) and *lowei* (from R Kafuafuta, in W Zambia) considered insufficiently distinct from *ragazzii*. Race name *pembae* is a junior synonym of *granti*. Six subspecies recognized.

Subspecies and Distribution.

C. o. guineensis Bannerman, 1921 – Senegal E to Ghana and Togo.
C. o. cephaelis (Bates, 1930) – Ghana and Togo E to Central African Republic, S to N Angola; also Principe (in Gulf of Guinea); purportedly this race in Burundi.
C. o. obscura (Jardine, 1843) – Bioko I (Fernando Póo).
C. o. ragazzii (Salvadori, 1888) – E & SE DR Congo, extreme S Sudan E to C Ethiopia, Uganda, W Kenya, W Tanzania, Zambia and extreme N Malawi.
C. o. granti Vincent, 1934 – Pemba I, off NE Tanzania.
C. o. sclateri Vincent, 1934 – E Zimbabwe (Melssetter area) and bordering areas of Mozambique.



Descriptive notes. 13–15 cm; male 8–13.8 g, female 7.7–12.2 g. Male nominate race is olive-green above, darker on crown, with faint paler stripe over eye, buff area in front of eye, some white speckling on cheek and ear-coverts; upperwing and tail dark brown with olive-yellow edges; throat whitish, underparts greyish with yellowish tinge, richer yellow on belly, pectoral tufts lemon-yellow; underwing white, but axillaries yellowish; iris dark brown; bill greenish-black, basal half of lower mandible pale; legs brown, toes greenish-black. Female is as male but smaller, pectoral tufts absent or, if present, rudimentary and pale

whitish; bill black with basal half of lower mandible orange or light orange-brown, legs olive, feet yellowish posteriorly. Juvenile is darker olive with brownish crown, has chin and side of throat white, underparts yellowish with grey feather bases (appearing speckled). Race *guineensis* is smaller than nominate and darker below, with base of bill dark except for pale lower edge of upper mandible; *cephaelis* is somewhat longer-winged than previous, also paler, and with pale yellow base of lower mandible; *ragazzii* is similar in colour to nominate, but deeper green above and duller below, with pale yellow base of lower mandible; *granti* has straighter and shorter bill than nominate; *sclateri* is like nominate but paler below, chest with dusky fringes, outer two pairs of rectrices often with pale brownish-olive tips, juvenile has olivaceous throat and breast. **Voice.** Rival males may sing together. Song of nominate race a repeated “hoo-hoo-hoo”; of *guineensis* (in middle of day) a “chip” every 0.5 seconds or alternating high and low notes every second, “weep, wup, weep, wup”; song of *cephaelis* alternately rising and falling, and accelerating and decelerating, “pi, pi, pi, pi, pi-pi-pi, pi”, likened to sound made by squeaky wheel being cranked at different speeds. Calls include a harsh “tschaa-tscha-tscha”, uttered every 5 seconds; a “tic” note, “der-der-der” and “cooeo”.

Habitat. Variety of forest habitats, plantations, clearings, mangroves, coastal thickets, gardens and montane scrub.

Food and Feeding. Insects, spiders (Araneae), nectar, pollen, small berries, seeds, fruits and banana pulp. Visits flowers of various species, including e.g. *Carica papaya*, *Cieba pentandra*, *Oxyanthus troupinii*, *Symphonia globulifera*, *Syzgium congolense*, *Tecoma stans*, *Turraeanthus africanus* and mistletoes (Loranthaceae); seen also to exploit introduced garden plant *Justicia secunda* for nectar. Many trapped individuals have pollen, especially from banana plants, on forehead. Forages usually at low levels; may feed at up to 30 m up in forest canopy.

Breeding. Egg-laying recorded in Feb–Aug in Cameroon, Jan and Nov in Nigeria, Jan on Bioko, Nov–Jan on Principe, all months but mainly Jun–Sept in Gabon, Oct–Mar in Angola (but Aug–

Sept in Cabinda), Feb and Jun–Oct in DR Congo, Jun–Aug in Sudan, all months in E Africa (Feb, Apr–Jun, Aug and Sept in Uganda), and Sept–Mar in Zimbabwe. Males gather at leks of up to eight individuals, which display by singing, jumping, puffing up breast, exposing pectoral tufts, holding head high, with wings drooped and tail held up at 45-degree angle. Nest oval-shaped, side entrance with porch and long “beard” hanging from base of entrance, composed of moss, *Marasmius* fungus and spider webs, covered in grasses, leaves and stems, lined with seed down and soft fibres, suspended up to 5 m above ground from vegetation, sometimes over water. Clutch 1–3 eggs, variously grey or brown-grey, green or brown, heavily mottled with blotches of olive-grey, grey-green, violet-grey, yellow-brown or brown; incubation by female, chicks fed by both sexes; no information on duration of incubation and nestling periods. Nests parasitized by African Emerald Cuckoo (*Chrysococcyx cupreus*) and Klaas’s Cuckoo (*Chrysococcyx klaas*) and, in Gabon, by a honeyguide (of genus *Indicator*).

Movements. Mainly sedentary, but some altitudinal movements during droughts, and dispersal in search of food; immature dispersal suspected in Zimbabwe, where one recovery at 8 km from initial ringing site. In Cameroon, movements of 16 individuals recorded: 15 recaptured within 200 m of first capture, one at more than 300 m.

Status and Conservation. Not globally threatened. Common throughout most of range; locally very common to abundant. Density of 4 birds/ha in primary forest in Gabon. Occurs in several protected areas, e.g. Korup National Park, in Cameroon.

Bibliography. Akinpelu (1989), Bannerman (1948, 1951), Borrow & Demei (2001), Bowie *et al.* (2004b), Brosset & Éard (1986), Carroll (1988), Chabaud (1979), Chadder (2004), Chapin (1954), Cheke (1978), Cheke & Mann (2001), Clancey (1978a, 1978b, 1994a), Dranzoa (1997), Eiseutraut (1963), Fry *et al.* (2000), Hall & Moreau (1970), Hamner (1997, 2001), Irwin (2004), Jones & Tye (2006), Mann (1985), Mariaux & Vaucher (1991), Nikolaus (1987), Pérez del Val (1996), Prigogine (1971, 1972), Rand *et al.* (1959), Sammler (2007), Serle (1957), Tree (1997h), Tye & MacAulay (1993).

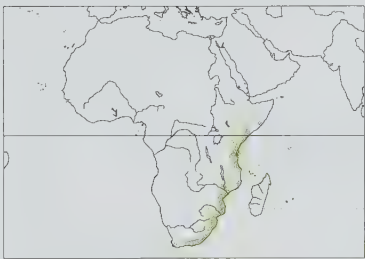
35. Mouse-coloured Sunbird
Cyanomitra veroxii

French: Souimanga murin **German:** Graunektarvogel **Spanish:** Suimanga Ratonil
Other common names: Grey/Verreaux’s Sunbird

Taxonomy. *Cinnyris veroxii* A. Smith, 1831, Cafferland = Eastern Cape Province, South Africa. Genus formerly subsumed in *Nectarinia*. Three subspecies recognized.

Subspecies and Distribution.

C. v. fischeri (Reichenow, 1880) – coastal lowlands from E & SE Somalia S to NE South Africa (NE KwaZulu-Natal), extending inland locally to S Malawi.
C. v. zanzibarica (Grote, 1932) – Zanzibar, off NE Tanzania.
C. v. veroxii (A. Smith, 1831) – coastal areas of E & S South Africa (E KwaZulu-Natal and E Eastern Cape Province; also isolated records from near Cape Town, in Western Cape).



Descriptive notes. 12–14 cm; male 8.5–18.8 g, female 7–16.6 g. Nominative race is dark brown with metallic blue-green sheen on crown and nape; mantle grey, rest of upperparts brownish-grey with metallic blue-green sheen (greener than on crown); side of face grey; remiges and greater upperwing-coverts dark brown with pale brown fringes, secondaries edged pale greenish, median and lesser wing-coverts broadly tipped metallic bluish-green; tail dark greyish-brown with green sheen, edged pale greyish-green, outermost rectrix and tip of adjacent one paler, inner borders of underside of rectrices greyish-white; chin to

breast pale buff or pale grey, rest of underparts greyish-olive or pale pinkish-grey, scarlet pectoral tufts; axillaries and underwing-coverts grey-white; iris dark brown; bill and legs black. Sexes alike, although female occasionally with some yellow in pectoral tufts. Juvenile has olive-green (not grey) mantle, white throat, yellowish-olive underparts brighter on breast than on belly, no pectoral tufts. Race *fischeri* is smaller than nominate (wing 60–63 mm; nominate 62–68 mm), also paler and greyer, less glossy, above, and paler below; *zanzibarica* is smaller (wing 59–61 mm), also paler (whiter) below than others, and greyer without metallic tinge above. **Voice.** Song characteristic, consists of repetitions every 2–5 seconds of 1-second bursts of descending “cherr-chip-chee-churruo” and variants. Subsong a fast series of “tserr-tserr” mixed with short melodious sections. Calls include “chip”, and “chip-chop”, also “tzeep-tjip-cha” and “sit, tsway-sit so”; alarm call various twitters e.g. “skirree, rirree, rirree...” and “tsink, tsink, tsink”.

Habitat. Mostly along coasts in forest, woodland, scrub, mangroves and gardens, straying inland into montane forest near coast. Found in deciduous and semi-evergreen thickets and forest and in riverine forest in Malawi.

Food and Feeding. Insects, spiders (Araneae), spider eggs; also nectar. Nectar taken from aloes (*Aloe*), *Erythrina*, *Halleria lucida*, *Kigelia africana*, *Leonotis leonurus*, *Mimusops caffra*, *Scadoxus punicea*, *Schotia afra*, *Strelitzia nicolai* and mistletoes (Loranthaceae). Forages mainly in higher strata of forest. Probes in flowers and mistletoe bunches. Hovers at spider webs to take prey; also hawks insects in flight.

Breeding. Egg-laying in May–Jul, Sept and Nov–Dec in Kenya, Jan, Apr and Dec in Tanzania, and Sept–Feb in South Africa. Displaying male thrusts head and neck up and fans wings; males display to each other in sessions for 30 minutes or more. Nest a long pouch, with extensive porch above side entrance, and often with hanging “beard”, often made of *Marasmius* fungal hyphae, otherwise rootlets, twigs, leaves, bark, down, moss, lichen or grass used, and (in absence of *Marasmius*) cobwebs used for holding nest together, exterior adornments of bark, web, leaves etc., thickly lined with fine grass on top of leaves, attached 1–6 m up in forest vegetation or in house or hut. Clutch 1–3 eggs, grey-white, buff or dark brown, darker at broader end, occasionally with grey-brown or red-brown spots and streaks; no information on incubation and nestling periods.

Movements. Some seasonal movements from forest to acacia (*Acacia*) woodland; occasional irruptions to W of usual range in South Africa.

Status and Conservation. Not globally threatened. Rare in Somalia; rare in Malawi range except in Lengwe National Park, where common. Scarce in Kenya, Tanzania and Mozambique, but race *zanzibarica* common in coral-rag bush on Zanzibar. Not uncommon in South Africa along coasts of KwaZulu-Natal and Eastern Cape.

Bibliography. Baker & Baker (2007), Britton & Britton (1977), Cheke & Mann (2001), Clancey (1968), Dowsett-Lemaire & Dowsett (2006), Fry *et al.* (2000), Fuggles-Couchman (1984), Hall & Moreau (1970), Hamner (1979, 1981), Hockey *et al.* (2005), Lewis & Pomeroy (1989), Pakenham (1979), Prinzing & Jackel (1986), Prinzing *et al.* (1989), Shead (1967), Tree (1997g), Zimmerman *et al.* (1996).



PLATE 11

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Genus *CHALCOMITRA* Reichenbach, 1853

36. Buff-throated Sunbird

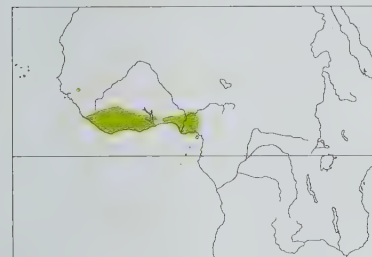
Chalcomitra adelberti

French: Souimanga à gorge rousse **Spanish:** Suimanga Gorjiclaro
German: Fahlkehl-Glanzköpfchen

Taxonomy. *Cinnyris adelberti* Gervais, 1833, Senegal; ?error = Sierra Leone. Genus previously merged with *Nectarinia*. Has sometimes been thought to form a superspecies with *C. rubescens*; alternatively, considered by others possibly closer to *C. senegalensis*. Two subspecies recognized.

Subspecies and Distribution.

C. a. adelberti (Gervais, 1833) – NW Guinea, and Sierra Leone E to Ghana and WC Togo.
C. a. eboensis (Jardine, 1843) – E Benin E to SE Nigeria and W border of Cameroon.



Descriptive notes. 11.5–12 cm; 8.3–11 g. Male nominate race has forehead and crown bright metallic green, back of head and neck blackish-brown, becoming paler on mantle and back; uppertail-coverts and tail blackish-brown; upperwing and wing-coverts dark brown with narrow chestnut edges, except for light chestnut lesser wing-coverts; chin and upper throat black, metallic green malar stripe; lower throat pale buff, forming bib, which is delineated from bright chestnut underparts by black band; underwing chestnut; brown of back and bib subject to bleaching, thus paler with time lapse since previous moult; iris brown; bill and legs

black. Female is olive-brown above, wings and tail darker brown, has throat greyish-white with olive-brown streaks, underparts cream-coloured, tinged and slightly streaked with olive. Immature male is like female, but more olive-brown below. Race *eboensis* male has paler throat and darker chestnut, less rufous, on underparts than nominate, female underparts paler, breast paler yellowish-grey with pale brown markings. **VOICE.** Song of nominate race a complex twittering c. 15 seconds long followed by “pttiooooo” calls every 1–3 seconds for more than a minute, also “tserr-pit-cherr-chooo” lasting 1.5–2 seconds, repeated every 4–6 seconds; song of *eboensis* repetitions of loud “tseep”. Various chirping calls, e.g. “chip”, “tseep”, “pitchew” or “pitchew-tweet”.

Habitat. Lowland forest and forest clearings; often near human habitation, when occurs in plantations and gardens. Below 1000 m.

Food and Feeding. Insects, spiders (Araneae), and nectar. Visits mistletoes (Loranthaceae) and flowers of such trees as *Albizia*, *Bombax*, figs (*Ficus*), *Spathodea campanulata*, *Tabebuia rosea*, *Parkia filicoidea* and *Symphonia*, and garden flowers such as *Hibiscus* and *Convolvulus*. Joins mixed-species groups with other sunbirds. Forages on branches in middle and upper strata of trees. Leaf-gleans, hovers below leaves and arboreal ant (Formicidae) nests; sallies from perches to take insects and spiders.

Breeding. Nests in Oct–Mar dry season. Singing male performs display-flights likened to butterfly flight. Untidy nest made of grass and dry leaves, entrance with short porch, with “beard” of fibres and/or spider webs, lined with white kapok, suspended 2–5 m above ground in mango tree (*Mangifera indica*) or *Raphia* palm. Clutch 1–4 eggs; both parents feed nestlings and remove faecal pellets. No other information.

Movements. Disperses S in search of flowers in dry season in Liberia and Nigeria.

Status and Conservation. Not globally threatened. Generally uncommon or locally common throughout range.

Bibliography. Bannerman (1948), Borrow & Demey (2001), Button (1967), Cheke & Mann (2001), Dellinger & Haeflner (1991), Dowsett-Lemaire & Dowsett (2007), Fry (1965), Fry *et al.* (2000), Gatter (1997), Gray (1972), Hall & Moreau (1970), Kraus (1986a), Lachenaud (2006b), Louette (1982), McCarthy (2006), Prinzing & Jackel (1986), Prinzing *et al.* (1989), Serle (1957), Turner & Forbes-Watson (1979).

37. Carmelite Sunbird

Chalcomitra fuliginosa

French: Souimanga carmelite **German:** Karmelglanzköpfchen **Spanish:** Suimanga Carmelita

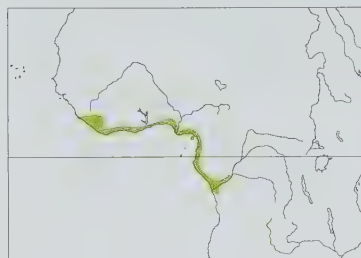
Taxonomy. *C[erthia] fuliginosa* Shaw, 1811, Malembo, Cabinda, Angola.

Genus previously merged with *Nectarinia*. Forms a group with *C. rubescens* and *C. amethystina*; sometimes thought to form a superspecies with those, despite considerable geographical overlap, but all appear to hybridize occasionally in areas where they meet. Proposed races *nigrescens* (described from Brazzaville, in PR Congo), males of which have supposedly darker mantle, is treated as a synonym of nominate, but some authors have recommended its recognition for populations along lower R Congo. Two subspecies recognized.

Subspecies and Distribution.

C. f. aurea (Lesson, 1847) – coasts from Sierra Leone E to Gabon and PR Congo.
C. f. fuliginosa (Shaw, 1811) – NW Angola (including Cabinda) and lower R Congo (inland to Kwamouth, DR Congo).

Descriptive notes. 13–14 cm; 11.6–12.2 g. Male nominate race has body plumage chocolate-brown, darkest on breast, belly and undertail-coverts, except for metallic purplish-blue forehead and metallic violet chin, throat and uppertail-coverts, and small patch of metallic violet on lesser wing-coverts below carpal joint; remiges and rectrices very dark chocolate-brown; lemon-yellow pectoral tufts, dark brown underwing; some bleached individuals have back of head pale brown to grey-white, and light brown mantle; iris dark brown; bill and legs black. Female is earth-brown above, remiges and rectrices dark brown, upperwing-coverts edged and tipped pale buff, white tips on tail; moustachial stripe creamy buff, throat brownish, underparts creamy white with dark feather-centres (looking mottled). Juvenile male resembles female, but has sooty-brown cheeks, chin and throat, no moustachial stripe, and breast with heavy dark brown mottling. Race *aurea* is somewhat



less dark above than nominate, male with less extensive gloss on forehead and throat, female paler especially on neck and upper mantle. **VOICE.** Song a 0.5-second “pttreeeee”, repeated every 2–3 seconds, and a trilling “dree-dree”. Call “tsit”. **Habitat.** Woods, plains, mangroves, swamps, plantations and gardens in coastal regions; reaches savanna in Liberia, extends 50 km inland in Nigeria, and occurs inland on R Congo. **Food and Feeding.** Nectar and insects. Feeds at *Ceiba pentandra*, *Delonix regia*, *Hibiscus*, *Moringa pterygosperma* and plantains (*Musa*). Forages singly and in small groups of up to eight individuals. Perches on and hovers at flowers, also stretches up to them from ground.

Breeding. Laying recorded in Sept–Nov in Cameroon, Jan–Feb, Jul and Dec in Gabon, Sept and Nov in Nigeria and Sept–Dec in PR Congo. Nest a small pouch, with short “beard”, constructed from leaves, moss and fibres, adorned with bark and lined with down, suspended 3 m up from rubber tree, avocado tree, *Anona senegalensis* or other shrub, or from wire on telegraph pole. Clutch 2 eggs, glossy, long and ovate, brown-white ground colour obscured by brown or lilac-grey markings, denser at wide end. No other information.

Movements. Disperses along coasts and strays inland.

Status and Conservation. Not globally threatened. Rare to locally common throughout range. Faces some threat, at least locally, from mangrove destruction.

Bibliography. Bannerman (1948, 1951), Borrow & Demey (2001), Bouet (1942), Chapin (1954), Cheke & Mann (2001), Dowsett-Lemaire & Dowsett (1991), Fry *et al.* (2000), Hall & Moreau (1970), Louette (1989), McCarthy (2006), Rand *et al.* (1959).

38. Green-throated Sunbird

Chalcomitra rubescens

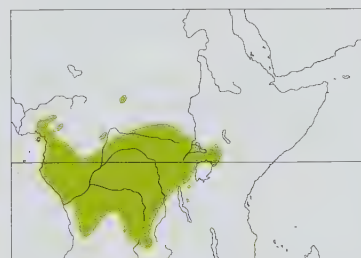
French: Souimanga à gorge verte **Spanish:** Suimanga Gorjiverde
German: Grünkehl-Glanzköpfchen

Taxonomy. *Cinnyris rubescens* Vieillot, 1819, “Kingdom of Congo and Cacongo” = Cabinda area of north-west Angola.

Genus previously merged with *Nectarinia*. Forms a group with *C. fuliginosa* and *C. amethystina*; sometimes thought to form a superspecies with those, despite considerable geographical overlap, but all appear to hybridize occasionally in areas where they meet. Alternatively, may form a superspecies with *C. adelberti*. Three subspecies recognized.

Subspecies and Distribution.

C. r. crossensis Serle, 1963 – extreme SE Nigeria and SW Cameroon (Mamfe and to W of Bamenda).
C. r. stangerii (Jardine, 1842) – Bioko I (Fernando Póo).
C. r. rubescens (Vieillot, 1819) – C & S Cameroon, SW, SE & N Central African Republic and S borders of Sudan S to N Angola, NW Zambia, S & E DR Congo, Uganda, W Kenya and NW Tanzania.



Descriptive notes. 12–13 cm; male 8–14 g, female 6.5–11 g. Male nominate race has narrow black band on front of forehead, merging into metallic green crown with blue reflections, this interrupted by 3-mm stripe of metallic violet reflections towards hindcrown; throat iridescent green with bright purple fringe below, iridescent bluish-green malar streak separated from throat patch by brown streak (1 mm wide); rest of plumage very dark brown with golden-bronze tinge; iris dark brown; bill and legs black. Female is earth-brown above, darkest on forehead, with yellowish supercilium, brown lores and ear-coverts, dark brown wings

and tail darker than back, remiges edged pale, rectrices narrowly tipped white; throat greyish-white or streaked brown (sometimes black), yellowish-white breast prominently streaked olive-brown, belly yellower and less markedly streaked, pale yellow undertail-coverts dark in middle, pale yellow axillaries and underwing-coverts mottled with greyish-brown and tipped white. Juvenile resembles female, but tinged olive above and yellower below, throat and breast mottled dusky brown, markings especially dense on throat, which may appear solidly dusky and bordered by yellowish moustachial stripe. Race *crossensis* male lacks metallic colours on throat, female like that of nominate; *stangerii* male has emerald-green metallic plumage not so golden-green as nominate and iridescent purple band on hindcrown narrower, female is more whitish below than nominate, with chin and throat densely barred black-brown. **VOICE.** Male song, from vantage point such as dead tree, protracted (up to 4 minutes long) and complex, initiated by rapid burst of “chip” notes (6–7 per second), followed by melodious twittering, a 4-second burst of very fast “chi” notes (11–12 per second), more twitters, bursts of “chip, chip, chip”, a trill gradually declining in volume, yet more twitters, then repetitions of 20 or more “chip” notes sometimes speeding up, the later ones preceded by 1–9 “choueee” notes. Call “chip”, typical of family.

Habitat. Forest, clearings within or at edge of forest, plantations, farms, villages, thick bush and gardens; montane grassland and heaths, to 1500 m.

Food and Feeding. Insects, small spiders (Araneae), pollen, small fruits and nectar. Feeds at *Carica papaya*, *Dalbergia*, *Erythrina abyssinica*, *Leonotis nepetifolia*, *Musa*, *Spathodea campanulata* and mistletoes (Loranthaceae). Forages 5–30 m up in trees, sometimes feeding upside-down in manner of tit (Paridae) or hovering in front of flowers. Also hawks for insects, by sallies 2–3 m from perch.

Breeding. Laying recorded in Apr, Jul–Aug and Oct in Cameroon, Mar and Nov in DR Congo, Sept–Oct in Sudan, and May–Aug and Oct–Dec in E Africa. Nest an oval pouch usually with “beard”, porch overhanging side entrance, composed of *Usnea* and other lichens, cobwebs, leaves, moss roots, fibres from *Cyathea* tree-ferns, and silk material from milkweeds (Asclepiadaceae), lined with pappus, sometimes adorned with bark, lichens, and caterpillar faeces, attached to a

Macaranga bush or 7 m up in roadside tree. Clutch 2 eggs, glossy, brown or creamy white with numerous lavender-grey, dark brown or grey-brown stripes, these parallel to long axis of egg but denser at wider end. No other information.

Movements. Probably sedentary, but all records in Zambia in Sept–Oct.
Status and Conservation. Not globally threatened. Common in most of range; uncommon in Sudan, and rare in Nigeria, Tanzania and Zambia.

Bibliography. Amadon (1953), Bannerman (1948), Benson *et al.* (1971), Borrow & Deme (2001), Brosset & Frard (1986), Carroll (1988), Carswell *et al.* (2005), Chapin (1954), Cheke (2001), Cheke & Mann (2001), Deme & Njabo (2001), Friedmann & Williams (1971), Fry *et al.* (2000), Green (1990), Hall & Moreau (1970), Hopkins *et al.* (1999), Louette (1982), McCarthy (2006), Moore (1995), Nikolaus (1987), Prigogine (1971), Rand *et al.* (1959), Serle (1957, 1963), Zimmerman *et al.* (1996).

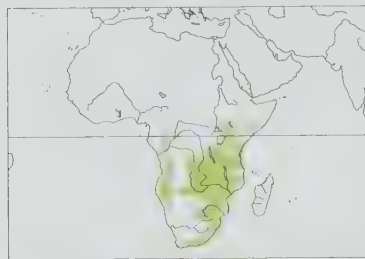
39. Amethyst Sunbird
Chalcomitra amethystina

French: Souimanga améthyste **German:** Amethystglanzköpfchen **Spanish:** Suimanga Amatista
Other common names: Black/Amethyst-throated Sunbird

Taxonomy. *Certhia amethystina* Shaw, 1811, Cape of Good Hope, South Africa. Genus previously merged with *Nectarinia*. Forms a group with *C. fuliginosa* and *C. rubescens*; sometimes thought to form a superspecies with those, despite considerable geographical overlap, but all appear to hybridize occasionally in areas where they meet. Other proposed races are *adjuncta* from E Swaziland (described from Stegi, in Lebombo Mts), which is synonymized with nominate, and *doggetti* (Ravine, in W Kenya) and *kalkkreuthi* (Mombasa, in SE Kenya), both merged with *kirkii*. Three subspecies recognized.

Subspecies and Distribution.
C. a. deminuta Cabanis, 1880 – SE Gabon, S PR Congo, W & SE DR Congo, Angola, Namibia, N & W Zambia and N Botswana.
C. a. kirkii (Shelley, 1876) – SE Sudan, SE Ethiopia (sight records), Somalia (Jubba Valley), NE Uganda, Kenya, Tanzania, Burundi, E & S Zambia, Malawi, Mozambique (S to Coguna) and Zimbabwe.

C. a. amethystina (Shaw, 1811) – E Botswana, S Mozambique (S of R Limpopo), Swaziland and E & S South Africa (Limpopo, Mpumalanga and KwaZulu-Natal S to S coastal Western Cape).



Descriptive notes. 13–15 cm; male 9.2–18.5 g, female 8.3–16.9 g. Male nominate race has iridescent green patch on forehead (sometimes appears silvery light green or gold), pinkish-violet on chin and throat, and coppery-violet on carpal; rest of plumage blackish-brown except for purplish-violet upperpart-coverts and dull black upperwing, primary and greater wing-coverts and tail; some have rudimentary yellow pectoral tufts; iris dark brown; bill and legs black. Female is olive-tinged grey-brown above, slight white supercilium, upperpart-coverts dark brown, tail blackish-brown with greyish-white tips, remiges and greater wing-coverts

dark greyish-brown, primaries and secondaries edged buff, paler on primaries, and lesser and median wing-coverts olive-grey; white moustachial stripe, pale grey-brown with heavy mottling below (except on belly), throat often so densely mottled as to appear black (pale moustache then especially obvious), underwing-coverts and axillaries brownish. Juvenile is similar to female but with throat blacker, and underparts more spotted and yellowish, looking barred (not streaked); immature male with iridescent rosy-purple patch on throat. Race *deminuta* male has shorter bill (24–28 mm) than nominate (25–32 mm), but upperpart-coverts also purplish-violet, female has throat paler, less dusky-looking (feathers lack blackish bases), underparts with variable amounts of yellow and plainer than in nominate, some with hardly any streaking; *kirkii* is similar to previous (smaller than nominate), but male upperpart-coverts blackish-brown or dull black, lacking metallic purplish-violet. A morph with red instead of violet on throat has been described from South Africa, and a xanthochromic individual with butter-yellow underparts from throat to undertail-coverts from Zimbabwe. **VOICE.** Complex song consists of ascending and descending rapid twittering, including sequences of “chip-chip-chip-choo” or “der-chip-cher-chu”; female also warbles and pair-members perform duets. Common call note a single “chip” or “tschick”, other calls include “chup” (but not the “choop” of *C. senegalensis*), also “zit-zit” and “zeebe-zeebu”, “tzwit-tzwit-zit” and similar, also both “chip” and “chop, chip-chop, cher-chip” or “cher-chop” or “chip-chip” or “ptcher-chiitzzz” ending with wheeze; “chee, chee, chee, chee” or “ssweek-ssweek-ssweek” during courtship chases; alarm calls include “t.t.t.t.t.t.t.” or “jit-jit-jit-jit...” or “choy, tit-choy, tit-choy”. Makes sounds also by clicking mandibles.

Habitat. Savanna woodlands, forest edge, gardens and hillsides with many flowering aloes (*Aloe*) and proteas (*Protea*).

Food and Feeding. Insects, including emergent termites (Isoptera); also spiders (Araneae), and nectar. A multitude of known foodplants, including species of genera *Acacia*, *Aloe*, *Abutilon*, *Baikiaea*, *Bauhinia*, *Burchellia*, *Bombax*, *Caesalpinia*, *Cassia*, *Combretum*, *Disa*, *Diospyros*, *Erythrina*, *Euclea*, *Euphorbia*, *Grevillea*, *Hibiscus*, *Kniphofia*, *Leonotis*, *Protea*, *Prunus*, *Salvia*, *Strelitzia*, *Syzygium* and *Tecoma*, and mistletoes (Loranthaceae). Hawks insects in manner of a flycatcher (Muscicapidae); also hovers in front of flowers. Gleans leaves for aphids (Aphidoidea) and takes spiders from webs. Also probes fallen fruit, and drinks oozing coconut sap.

Breeding. Laying recorded in May, Oct and Dec in Angola, Feb and Sept–Nov in DR Congo, Aug in Somalia, throughout year in E Africa (Sept–Mar and Jun–Jul in Tanzania), Sept–Feb and Apr in Malawi, Aug–Mar in Zambia, Jul–Apr in Zimbabwe, Oct, Nov, Jan and Mar in Botswana, Jan in Mozambique, and all months in South Africa; often double-brooded. Courting male chases female, continuously harasses her, and courtship dance involves hopping, drooping each wing in turn, then both simultaneously, and then fluttering each one; female hangs head down and remains motionless; cloaca-pecking recorded. Nest built by female alone, pear-shaped and sometimes “bearded”, side entrance with marked porch, constructed from fine grass, fibres, wool, hair, bark and cobwebs, adorned externally with leaves, bark, bits of wood and lichen, lined with white plant material, feathers or flower petals, suspended 2–6 m above ground from tree, clothes line, electric flex or bare wire. Clutch 1–4 eggs, usually 2, whitish to greenish or light grey, densely covered with spots, mottles, streaks and lines of dark brown, olive-brown or grey, usually denser at wider end; incubation by female alone, period 13–18 days; chicks fed by both sexes, nestling period up to 17 days; both parents feed newly fledged young. Nests parasitized by Klaas’s Cuckoo (*Chrysococcyx klaas*), African Emerald Cuckoo (*Chrysococcyx cupreus*) and Eastern Green-backed Honeyguide (*Prodotiscus zambesiae*).

Movements. Primarily resident. Partial migrant locally: influx from W in Zimbabwe in May–Aug, and visible migration to E in Botswana, where scarcer Jun–Sept. Ringing recoveries of up to 120 km in S Africa. Influxes in Tanzania (Iringa and Songea) in Apr–Oct.

Status and Conservation. Not globally threatened. Has only very small and limited ranges in Somalia, Sudan and Uganda. Common in most of rest of range. Status uncertain in SE Ethiopia; only three sight records, all in need of corroboration. Occurs in several protected areas, e.g. Arusha and Mikumi National Parks, in Tanzania, and Dzalanyama Reserve and Lilongwe Nature Sanctuary, in Malawi.

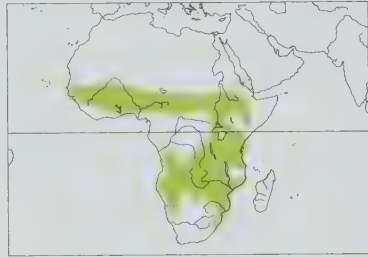
Bibliography. Baker & Baker (2007), Barnicoat (1984), Borello (1992), Borrow & Deme (2001), Brieschke (1990), Capanna & Geralico (1982), Chapin (1954), Cheke & Mann (2001), Clancey (1975), Cowles (1936), Craig & Simon (1991), Fry *et al.* (2000), Hall & Moreau (1970), Hammer (1997, 2002), Herremans (1992), Hockey *et al.* (2005), Johnson & Brown (2004), Keast (1968d), Louette (1989), Lynes (1938), McCarthy (2006), Oatley (1997), Oatley & Best (1997), Oxlee (1988), Prinzing & Jackel (1986), Prinzing *et al.* (1989), Rand *et al.* (1959), Selater & Moreau (1933), Serle (1943a), Skead (1953, 1967), de Swardt & Schoeman (1997), Tree (1991, 1997j), Tyler, D. (1992), Zimmerman *et al.* (1996).

40. Scarlet-chested Sunbird
Chalcomitra senegalensis

French: Souimanga à poitrine rouge **German:** Rotbrust-Glanzköpfchen **Spanish:** Suimanga Pechiescarlata
Other common names: Scarlet-breasted/Scarlet-throated Sunbird

Taxonomy. *Certhia senegalensis* Linnaeus, 1766, Senegal. Genus previously merged with *Nectarinia*. May form a superspecies with *C. hunteri*; sometimes regarded as conspecific, but the two are ecologically segregated in area of marginal overlap in E Kenya. Several additional races proposed: *adamauae* (described from Adamaoua, in NC Cameroon), considered inseparable from *acic*; *saturator* (from Malanje, in Angola) and *inaestimator* (Dar es Salaam, in E Tanzania), both synonymized with *gutturialis*; and *aequatorialis* (Bukoba, in NW Tanzania) and *erythrinae* (Trans Nzoia District, in Kenya), both merged with *lamperti*. Five subspecies recognized.

Subspecies and Distribution.
C. s. senegalensis (Linnaeus, 1766) – S Mauritania and Senegal E to Nigeria.
C. s. acic (Hartmann, 1866) – N Cameroon, S Chad, W & SW Sudan, N Central African Republic, NE DR Congo and NE Uganda.
C. s. proteus (Rüppell, 1840) – SE Sudan (Boma Hills), Ethiopia, Eritrea and N Kenya.
C. s. lamperti (Reichenow, 1897) – S Sudan (E of White Nile: Imatong Mts, Leboni Forest), E DR Congo (L Albert S to N L Tanganyika), W, C & S Uganda and C Kenya S to W Tanzania.
C. s. gutturalis (Linnaeus, 1766) – Angola and S DR Congo E to SE Kenya, Pemba I and Zanzibar, S to C Namibia, N Botswana, Mozambique, and E South Africa (Limpopo Province S to KwaZulu-Natal and N Eastern Cape).



Descriptive notes. 13–15 cm; male 7.5–17.2 g, female 6.8–15.3 g. Male nominate race has metallic emerald crown with golden sheen, otherwise very dark brown above, upperpart-coverts brown with darker brown edges; newly moulted wing and tail feathers brown (fading to cinnamon-brown when older), lesser wing-coverts and scapulars blackish-brown; chin and upper throat and malar stripe metallic green, lower throat and breast bright vermillion with narrow metallic purplish-blue or bluish-green subterminal bars on each feather; rest of underparts very dark brown; iris dark brown; bill and legs greenish-black. Female is brown

above, including upperwing and wing-coverts, white edges on primary coverts and alula and on inner lesser coverts, tail brown, darker near tip, narrowly edged white, chin and throat narrowly barred light brown on dark brown ground (looking mottled), underparts pale yellow, strongly marked with dark brown (particularly on belly), undertail-coverts dark brown with yellowish-white tips. Immature male is like female on upperparts but, below, has metallic green on chin and upper neck, blackish throat and breast, yellow belly with heavy dark mottling and barring, also red on chest and some metallic plumage colours on head. Race *acic* male has red on chest lighter, lacking gloss and with less marked metallic blue barring, and green malar stripe smaller than that of nominate; *lamperti* resembles previous, but male has heavier and longer bill (28–31 mm; *acic* 22–26 mm), female underparts paler and less heavily marked; *proteus* male has small metallic violet spot on lesser wing-coverts, black chin and upper throat bordered with green moustachial stripe, upperwing paler than that of previous two races and contrasting more with black, female lacks white edges on primary coverts and alula, and has belly paler yellow; *gutturialis* male has metallic violet spot on lesser wing-coverts (absent in other races except preceding one) and female has yellower underparts, male takes two years to gain breeding plumage and some have eclipse plumage (combination of fresh female-like plumage and old breeding plumage). **VOICE.** Song involves variations (four or five syllables) of “chip-choop-chip-choo-choo” lasting 1–2 seconds, before repeats of “chip” at rate of five times per second and faster series of “chi” or twittering, which may be whistling “weetodu-weetodu” among a series of “chip” (race *gutturialis*) or “weet” or “weetu” (nominate). Singing sessions, sometimes including immature males, can last for more than an hour. Common call “choop” or “tjoyp”; also variations involving “chip-chip” and “tsee-tsee”.

Habitat. Wooded savannas, e.g. *Acacia* (*Acacia*) savanna, miombo, mopane. Also semi-arid thornscrub, gallery forest in dry savanna, coastal scrub, rocky outcrops, parks, gardens, plantations, farmland, dry baobab (*Adansonia*) woodland and among proteas (*Protea*).

Food and Feeding. Nectar, insects, and spiders (Araneae). Nestling diet small insects. Many known foodplants, including species of genera *Acacia*, *Albizia*, *Aloe*, *Baikiaea*, *Bauhinia*, *Bombax*, *Bougainvillea*, *Caesalpinia*, *Callistemon*, *Canna*, *Carica*, *Cassia*, *Celaena*, *Citrus*, *Combretum*, *Crotalaria*, *Dalbergia*, *Delonix*, *Erianthemum*, *Erythrina*, *Euphorbia*, *Gmelina*, *Grevillea*, *Halleria*, *Hibiscus*, *Kigelia*, *Kniphofia*, *Leonotis*, *Manihot*, *Musa*, *Parkia*, *Protea*, *Prunus*, *Spathodea*, *Symphonia*, *Syzygium*, *Tapinanthus*, *Tecoma*, *Thevetia* and *Vitex*. Forages singly and in pairs or, often, in groups. Male defends feeding territories against other males and conspecific females; also deters other sunbirds, such as *Anthreptes longuemare*. Sometimes hovers in front of flowers, grasses or leaves; takes insects on the wing in manner of a flycatcher (Muscicapidae). Also hovers at spider webs and seizes prey trapped in them.

Breeding. Laying recorded in Jun and Dec in Gambia, May and Jul–Sept in Ghana, Jul in Niger, Feb–Oct in Nigeria, May and Jul in Cameroon, Apr and Jul–Sept in Sudan, Jul–Aug in Ethiopia and Eritrea, Apr in Angola, Mar, May, Jun, Aug–Oct and Dec in DR Congo, Mar–Jul, Aug and Oct

in Uganda, Jan–Feb and Aug in Kenya, all months (peaks in Feb–Mar and Nov–Dec) in Tanzania, Jan–Mar and Jun–Oct on Zanzibar, Jul–Mar in Zambia, Feb–May and Jul–Dec in Malawi, Nov–Apr in Namibia, Aug–Dec in Botswana, Jul–Apr and Jun in Zimbabwe, Sept–Mar in Mozambique, and Aug–Jan in South Africa; double-brooded or triple-brooded in some areas. Territorial. Male makes side-to-side movement of body in courtship displays to female. Nest built by female, sometimes in just 3–6 days, a bulky dome, side entrance with porch of dead grass heads overhanging for 4 cm, made of spider web, bark, leaves and grass, adorned with leaf skeletons, feathers, wool, string, paper and insect faeces, lined with plant down, hair and feathers, short “beard” of grass, leaves and bark hanging down to 5 cm below base, suspended 1.5–15 m above ground in tree, from creepers, but also recorded near house (e.g. on electric-light flex); sometimes protected by close association with nests of polistine wasps (*Ropalidia*); same nest sometimes used for up to three broods, or new one built for each attempt. Clutch 1–3 eggs, variable, with background of dirty white or pinkish-white to purple, blue-green or light green, with brown, green or grey streaks, mottles, lines, spots and blotches, denser at broad end; incubation by female, period c. 2 weeks; chicks fed by both parents, nestling period up to 23 days; fledglings roost in nest for at least 4 nights after fledging, but can take nectar independently 9 days after abandoning nest. Nests parasitized by Klaas’s Cuckoo (*Chrysococcyx klaas*), African Emerald Cuckoo (*Chrysococcyx cupreus*) and Greater Honeyguide (*Indicator indicator*); pair seen to chase away Brown-backed Honeyguide (*Prodotiscus regulus*), but nest parasitism by this species unconfirmed.

Movements. Sedentary, but in many populations nomadic and migratory movements occur. Dry-season influxes reported in Zimbabwe (Mar–Jul) and Kenya (Feb–Apr and Sept–Nov). Wet-season visitor to Namibia in Nov–Apr, and in Tanzania ascends to higher altitudes to breed. In W Africa, probably moves N with rains; in Mauritania most records in Jun–Nov wet season. For race *gutturialis*, ringing recoveries of up to 153 km (males) and up to 360 km (females).

Status and Conservation. Not globally threatened. Abundant and widespread in savanna woodland throughout most of range; rare in Mauritania and on Pemba I. Occurs in many protected areas, e.g. Abuko Nature Reserve, in Gambia, Comoé National Park, in Ivory Coast, Bénoué National Park, in Cameroon, Murchison Falls National Park, in Uganda, Arusha and Mikumi National Parks, in Tanzania, Lilongwe Nature Sanctuary, in Malawi, Etosha National Park, in Namibia, and Mkuze Game Reserve, in South Africa.

Bibliography. Anon. (2007p), Baker & Baker (2007), Bannerman (1948), Barry (2002), Borrow & Demey (2001), Chapin (1954), Chaskda & Mwansat (2006), Cheke & Mann (2001), Clancey (1994b), Edwards (1988), Elgood *et al.* (1994), Fry *et al.* (2000), Hall & Moreau (1970), Hanmer (1981, 1989), Hockey *et al.* (2005), Lees (1999), Lynes (1938), McCarthy (2006), Molokwu *et al.* (2006), Moreau (1942), Murray (1968), Nikolaus (1987), Oatley (1995, 1996, 1997), Pettet (1977), Prinzing & Jackel (1986), Prinzing *et al.* (1989), Skead (1967), Steinheimer (2006, 2008a), Thonnerieux *et al.* (1989), Traylor (1962), Tree (1991, 1997i), Wertz (1994), Zimmerman *et al.* (1996).

41. Hunter’s Sunbird

Chalcomitra hunteri

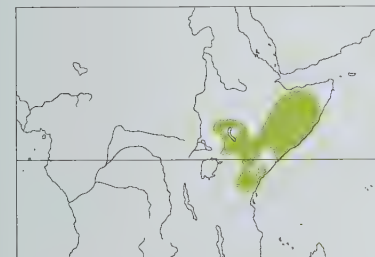
French: Souimanga de Hunter **German:** Purpurbürzel-Glanzköpfchen **Spanish:** Suimanga de Hunter

Taxonomy. *Cinnyris hunteri* Shelley, 1889, Useri River, Kenya–Tanzania border. Genus previously merged with *Nectarinia*. May form a superspecies with *C. senegalensis*; sometimes regarded as conspecific, but the two are ecologically segregated in area of marginal overlap in E Kenya. Two subspecies recognized.

Subspecies and Distribution.

C. h. siccata (Clancey, 1986) – extreme SE Sudan, SSW Ethiopia (near Mega), NW Kenya (including NW shore of L Turkana), and plateau regions of Somalia.

C. h. hunteri (Shelley, 1889) – S & EC Ethiopia, Kenya (except NW) and extreme NE Tanzania.



tail darker but outer tail feathers paler than rest, with outer two pairs tipped white, primaries edged white, tertials and greater wing-coverts edged buff, median and lesser wing-coverts tipped greyish-brown; ear-coverts and cheeks greyish-brown, narrow moustachial stripe very pale brown; chin and throat darker greyish-brown with pale brown bars, underparts pale brownish-white, heavily mottled greyish-brown on breast and flanks; axillaries buff, underwing-coverts greyish-brown with paler tips; bare parts as male. Juvenile is like female, but more heavily barred and mottled on underparts, and lacks moustachial stripe; immature male similar, but moustachial stripe green, chin and throat black, and has scarlet gorget with blue bars. Race *siccata* differs from nominate in black of adult male being more brownish-tinged (not jet-black), breast more orange than scarlet and with buffish subterminal barring on lower part. **VOICE.** Complex song of rising and falling notes, a whistle and a trill, preceding “chip, chip-choo” and “chip” repeated every 1–2 seconds.

Descriptive notes. 13–14 cm; 10–14 g. Male nominate race has forehead and crown iridescent green, face, neck and upperparts black, uppertail-coverts and base of rump iridescent purple; upperwing and tail blackish-brown, metallic purple patch on lesser wing-coverts; black chin and upper throat bordered by green moustachial stripes; scarlet lower throat and breast, feathers with faint iridescent blue and green bands near tips reflecting yellow or violet (most noticeable on lower throat and side of breast), rest of underparts and underwing black; iris brown; bill and legs black. Female is greyish-brown above, uppertail-coverts and

Call “chip” or “tew” repeated up to four times in quick succession, and “choo-choo-choo” or “tchi-tchi-tchi-tch...”.

Habitat. Scrub, open woodland and semi-arid grasslands, to 1500 m.

Food and Feeding. Insects, also fruit pulp and nectar. Takes fruit pulp from *Commiphora* species; feeds at flowers of acacias (*Acacia*), *Acrocarpus fraxinifolius*, aloes (*Aloe*), *Delonix elata*, *Erythrina*, *Kigelia africana*. Perches on or hovers in front of flowers to take nectar. Leaf-gleans for insects, and catches latter also in mid-air.

Breeding. Egg-laying recorded in May and Jul in Somalia, Feb, Jun, Oct and Dec in Kenya and Dec in Tanzania. Nest built by female, ellipsoid and domed, made from grass, leaves, bark, feathers, rootlets and paper held together by spider webs, adorned with lichen, thickly lined with feathers, including those of Vulturine Guineafowl (*Acryllium vulturinum*), with 20-cm “beard”, female continues to line nest after beginning to incubate; generally suspended up to 2 m up in tree, sometimes in or on house or house fitting. Clutch 1–2 eggs, white, pale green-grey or olive-grey with numerous brown streaks and other markings and dark grey speckles, concentrated at wider end; incubation by female, no information on duration of incubation and nestling periods.

Movements. No data.

Status and Conservation. Not globally threatened. Fairly common and widespread throughout Somalia, except in NE and extreme W; fairly common in dry habitats, except grassland, in Kenya. Uncommon in Ethiopia and S Sudan. Reports of presence in Uganda require corroboration.

Bibliography. Archer & Godman (1961), Baker & Baker (2007), Carswell *et al.* (2005), Cheke & Mann (2001), Clancey (1986), Friedmann (1937), Fry *et al.* (2000), Hall & Moreau (1970), Lack (1976, 1985), Lewis & Pomeroy (1989), McCarthy (2006), Nikolaus (1987), Serle (1943a), Zimmerman *et al.* (1996).

42. Socotra Sunbird

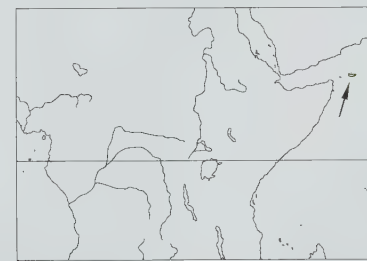
Chalcomitra balfouri

French: Souimanga de Socotra **German:** Sokotranektarvogel **Spanish:** Suimanga de Socotora
Other common names: Socotra Island Sunbird

Taxonomy. *Cinnyris balfouri* P. L. Sclater and Hartlaub, 1881, Socotra.

Genus previously merged with *Nectarinia*. Relationships uncertain. Possibly closest to *C. hunteri*, *C. amethystina* or *C. rubescens*, but differs from all congeners in lacking pronounced sexual dichromatism (both sexes looking like females of other members of genus); has been thought perhaps to be closest to *Cinnyris dussumieri*, another island species but currently placed in a different genus. Further research required. Monotypic.

Distribution. Socotra.



Descriptive notes. Male 12.5–14 cm, female 11.5–12 cm; unsexed 8–15 g. Male is dull brown above, with pale streaking on crown, and fewer similar streaks on nape and mantle; sooty-black lores and area around eye, narrow buffy grey supercilium extending back beyond ear-coverts; tail blackish with slight bluish gloss, white outer webs of outer rectrices, and white tips on all rectrices (diminishing in size from outer to inner); primaries dark brown with greyish-white and olive edging (forming pale panel), upperwing-coverts dull brown with greyish edging; narrow dull black moustachial stripe, white submoustachial stripe broadening towards cheek, black malar stripe; chin and throat dark greyish-brown with darker mottling; feathers of breast dark brown, broadly tipped grey (giving scaled effect), belly pale grey, slightly scaled on upper belly and at side, flanks become pale greyish-brown towards rear, vent to undertail-coverts white; pectoral tufts bright yellow, underwing-coverts pale greyish-white; iris red or reddish-brown; bill and legs blackish. Female is very similar to male but smaller, has barred submoustachial stripe, less clearly patterned chin to lower breast, and lacks pectoral tufts. Juvenile differs from adult in having brown iris, pale yellowish lower mandible, and dark grey feet with yellowish soles. **VOICE.** Song loud and varied, a series of short or long bursts of quick jangling notes; also mimics other species, including Socotra Warbler (*Incana incana*). Shrill hoarse alarm calls, squeaky, strident “zii”; alarm or aggressive call harsh and grating “tcheep-up” or “tchee”.

Habitat. All vegetated areas, and more numerous where vegetation is more substantial; sea-level to 1370 m.

Food and Feeding. Insects, including small cicadas (Cicadidae), also spiders (Araneae); also small fruits (e.g. of *Euphorbia*), seeds and presumably nectar. Forages singly and in pairs. Very active; catches insects in flight or on the ground. Seen to probe flowers, including those of *Calotropis procera*, *Croton* species and *Trichocalyx obovatus*.

Breeding. Laying probably in Jan–May; nestlings found in Mar and May, fledglings in Feb, and juveniles early Feb to late Mar. Nest dome-shaped, with large oval entrance, made of loosely woven fine grasses and cobwebs, lined with white plant wool and possibly goat hair, concealed among branches 2.5 m above ground in *Euphorbia arbuscula* tree or suspended in thick bush and creepers. Clutch 1–3 eggs. No other information.

Movements. None recorded.

Status and Conservation. Not globally threatened. Restricted-range species: present in Socotra EBA. Common. Total population estimated at approximately 11,000 pairs; densities 6–12 birds/km². Overgrazing could reduce numbers of this island-restricted species.

Bibliography. Cheke & Mann (2001), Forbes (1903), Fry *et al.* (2000), Hall & Moreau (1970), Martins *et al.* (1993), Ogilvie-Grant & Forbes (1903), Porter & Martins (1993), Ripley & Bond (1966), Showler & Davidson (1996).



PLATE 12

inches 2
cm 5

Genus *LEPTOCOMA* Cabanis, 1851

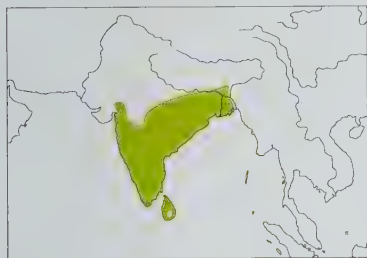
43. Purple-rumped Sunbird

Leptocoma zeylonica

French: Souimanga à croupion pourpre **German:** Ceylonnektarvogel **Spanish:** Suimanga Cingalés
Other common names: Indian Purple-rumped Sunbird

Taxonomy. *Certhia zeylonica* Linnaeus, 1766, Sri Lanka. Genus often subsumed in *Nectarinia*. Genus names *Leptocoma* and *Chalcostetha* described simultaneously, on consecutive pages of same publication; former has been selected by First Reviser as having precedence (see page 48). Present species probably closest to *L. minima*. Geographical variation minimal. Other proposed races, both from peninsular India, are *whistleri* (described from Muddur, in Karnataka) and *sola* (from Pondicherry, in Tamil Nadu), both considered unsustainable and included in *flaviventris*. Two subspecies recognized.

Subspecies and Distribution.
L. z. flaviventris (Hermann, 1804) – peninsular India (E to W Meghalaya) and Bangladesh.
L. z. zeylonica (Linnaeus, 1766) – Sri Lanka.



Descriptive notes. 10 cm; male 7–11 g, female 7–9 g. Male nominate race has metallic green crown and shoulder patch, deep chestnut-maroon side of head, nape and back, and metallic purple rump and uppertail-coverts; upwings and tail black, remiges edged brown; metallic purple throat bordered below by deep chestnut-maroon; breast and centre of belly lemon-yellow, flanks greyish-white, vent and undertail-coverts yellowish-white, large pale grey terminal spots on outer rectrices; iris orange-brown to reddish-brown; bill brownish-black; legs brownish or black. Female is brown with olive tinge above, narrow whitish supercilium,

blackish eyestripe, rufous edging on remiges, large pale grey terminal spots on outer rectrices; throat and flanks greyish-white, throat sometimes with buffy or slightly yellowish wash, breast and centre of belly lemon-yellow. Juvenile is as female, but throat and whole underparts very pale lemon-yellow. Race *flaviventris* is larger than nominate, and male is more reddish-purple, less bluish-purple, on throat. **VOICE.** Song a sharp twittering “tityou, tityou, tityou, tr-r-r-tit, tityou...”, also a feeble “sisiswee, sisiswee...”; described also as a high, thin, even-tempo series of upstrokes, pitch descending after every few notes, e.g. “sit-sit, tset-tset-tset-tset, tsut-tsut-tsut”. Call an almost constant “sweet-sweet, sweet-sweet-sweet”; short high-pitched metallic “tzip”.

Habitat. Various types of forest and jungle, including secondary forest, at forest edge, in farmland, dry cultivation, hedges, isolated trees, and gardens. Lowlands to 1050 m, occasionally 2100 m, in India; to 1400 m in Sri Lanka.

Food and Feeding. Insects, including caterpillars, also spiders (Araneae); also nectar and grapes, and fruits of mistletoes (Loranthaceae) probably eaten. Takes nectar from flowers having large corollas. Forages singly and in pairs. Very active.

Breeding. Laying recorded in all months in India, peaks Mar–May in West Bengal, Dec–Apr and Jul–Sept (after monsoon) in S, and Jun–Sept (during rains) in W (at Pune); in all months also in Sri Lanka, with peak Feb–Jun and second brood Aug–Nov. Unusually in family, male helps female in nest construction, one nest completed in 6 days; a pear-shaped or oval purse, usually with porch, constructed from grass, fibres and oddments, decorated externally with lichen, bark, moss, caterpillar frass, broken leaves and variety of other rubbish, lined with soft vegetable down, and suspended from tip of tree branch 2–15 m above ground, sometimes outside or inside dwelling, attached to creepers, trellis or wire, and even to pendent electric light bulb; new nest constructed for each clutch. Clutch 2 or 3 eggs, plain greyish-white, or grey with greenish or buff tinge, with greyish-brown flecks and speckles, particularly at broader end; incubation by female, guarded at nest by male, period 15–16 days; chicks fed by both sexes, both also remove faecal sacs, nestling period 11–14 days. Nests parasitized by Plaintive Cuckoo (*Cacomantis merulinus*).

Movements. Resident. In Sri Lanka ascends to highest altitudes during NE monsoon.
Status and Conservation. Not globally threatened. Common in India, Bangladesh and Sri Lanka. Possible occurrence in W Myanmar requires corroboration. An important propagator of mistletoes, but considered a pest in parts of India because of its fondness for grapes. Occurs in several protected areas, e.g. Rajiv Gandhi (Nagarhole) National Park, in SW India (Karnataka).

Bibliography. Ali (1969), Ali & Ripley (1974), Bharucha (1982), Chattopadhyay (1980), Cheke & Mann (2001), Choudhury (1990), Ganguly (1986), Kumar *et al.* (1984), Lamba (1978), Leandri (1950), Oates (1890a, 1890b), Parasharya & Vyas (2002), Raju (1998, 2001), Raju & Reddi (1989), Rasmussen & Anderton (2005b), Robson (2000b), Wait (1931), Wesley (2004).

44. Crimson-backed Sunbird

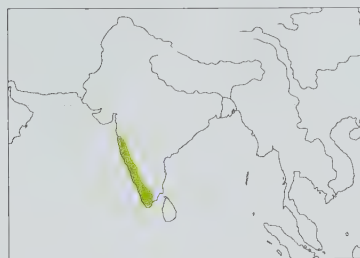
Leptocoma minima

French: Souimanga menu **German:** Däumlingsnektarvogel **Spanish:** Suimanga Mínimo
Other common names: Small Sunbird

Taxonomy. *Cinnyris minima* Sykes, 1832, Western Ghats, Deccan, west India. Genus often subsumed in *Nectarinia*. Genus names *Leptocoma* and *Chalcostetha* described simultaneously, on consecutive pages of same publication; former has been selected by First Reviser as having precedence (see page 48). Present species probably closest to *L. zeylonica*. Monotypic.

Distribution. Western Ghats (from N of Mumbai, S to hills of S Kerala), in W India.

Descriptive notes. 8 cm; male 4–6 g, female 4–5 g. Very small. Male breeding has crown iridescent green, side of face blackish, upwings and tail blackish-brown with lilac gloss, back and shoulder deep red, and rump metallic purple or lilac; purple throat, crimson upper breast bordered with blackish band below, dull yellow belly, bright lemon pectoral tufts, greyish-white flanks; iris dark brown; bill and legs blackish. Male in non-breeding plumage (Apr/May–Aug) is similar to



female, but brighter olive on head, with back and shoulders metallic red, rump and uppertail-coverts metallic purple; lesser upperwing-coverts metallic red, forming with adjacent part of back a broad band. Female is olive above, with lower rump and uppertail-coverts deep maroon-crimson, remiges edged brown and olive, dull yellow below; iris dark brown, bill and legs blackish but paler than male, particularly at base of lower mandible. Juvenile resembles female but greyer, with duller red rump, more yellow below. **VOICE.** Squeaky song “see-see-whi-see-see-siwee...” lasting 5–10 seconds, frequently repeated; also described

as high, thin, tinkly, irregular warble, “tseet-tsut-tseet”, notes in pairs or triplets, alternating in pitch. Call a continuous metallic “chik” during foraging; also various high-pitched, metallic ticking and chattering calls.

Habitat. Evergreen forest, sholas, plantation shade trees, secondary growth and gardens; 300–2100 m, chiefly in foothills.

Food and Feeding. Insects, spiders (Araneae) and nectar. Forages singly, in pairs or in small groups. Active and acrobatic; clings upside-down to plants, also hovers. Defends flowering trees against conspecifics, also against flowerpeckers (Dicaeidae).

Breeding. Laying recorded in Feb–Mar, May and Dec in Mumbai area, Sept–Apr in Kerala but May–Oct in Nilgiris. Nest a neat, rounded, hanging pouch of fibres, moss and cobwebs, suspended from tip of twig within 2 m of ground in bush or sapling, commonly on *Strobilanthes* plant, on edge of path or clearing. Clutch 2 eggs; white with dense ring of reddish spots, and speckled reddish. No other information.

Movements. Local movement; absent from most of Nilgiris Oct–Mar.

Status and Conservation. Not globally threatened. Restricted-range species: present in Western Ghats EBA. Locally common. Claimed occurrence in Sri Lanka (and reports of breeding in Mar–Apr) in early 20th century believed to be erroneous.

Bibliography. Ali & Ripley (1974), Cheke & Mann (2001), Davidar (1985b), Grimmett *et al.* (1998), Henry (1971), Khan (1977), Oates (1890a, 1890b), Rasmussen & Anderton (2005b), Ripley (1961a), Santharam (1996b), Wait (1931).

45. Purple-throated Sunbird

Leptocoma sperata

French: Souimanga de Hasselt **German:** Purpurkehl-Nektarvogel **Spanish:** Suimanga Gorjipúrpura
Other common names: (van) Hasselt’s Sunbird (*sperata*); Philippine/Luzon/Henke’s Sunbird (*henkei*); Mindanao Sunbird (*juliae*)

Taxonomy. *Certhia sperata* Linnaeus, 1766, Manila, Luzon, Philippines. Genus often subsumed in *Nectarinia*. Genus names *Leptocoma* and *Chalcostetha* described simultaneously, on consecutive pages of same publication; former has been selected by First Reviser as having precedence (see page 48); type of genus *Leptocoma* is *hasseltii* (= *brasiliانا*). Present species possibly forms a superspecies with *L. sericea*. Geographical plumage variation considerable; races form two groups, “nominate group” (containing Philippine races) and “*brasiliانا* group” (containing other races), and has been suggested that these may be better treated as two distinct species. Races *mecynorhyncha* and *oenopa* perhaps not tenable, and could perhaps be merged with *brasiliانا*. Nominate race intergrades and hybridizes with *henkei* (hybrids described as race *theresae*) and with *juliae* (hybrids described as race *davaoensis*); an apparently stable hybrid population exists on Sibuyan (NC Philippines). Other proposed races in Philippines are *manueli* (from Karlagan, in Polillo Is), synonymized with nominate; *minima* (Mati Municipality, in Davao Province of Mindanao) synonymized with *trochilus*; and *whiteheadi* (N Luzon), subsumed in *henkei*. Elsewhere, proposed races *phayrei* (Myanmar), *oenopa* (Nias I, off W Sumatra) and *hypolampis* (South Pagai I, off W Sumatra) all included in *brasiliانا*; also, *hasseltii* (Java) is a synonym of *brasiliانا*. Birds of this species recorded recently in N Vietnam probably belong to race *emmae*. Described form *minduquensis* is based on misidentification of female of *Aethopyga siparaja* (of race *magnifica*). Nine subspecies recognized.

Subspecies and Distribution.

L. s. brasiliانا (J. F. Gmelin, 1788) – NE India (Assam, Tripura, Manipur), Bangladesh hills and W & SW Myanmar S to S Thailand, Peninsular Malaysia and Sumatra (and islands off W coast except Simeulue), and W Java and Borneo.

L. s. emmae Delacour & Jabouille, 1928 – Cambodia, S Laos and S Vietnam (probably also this race in Tonkin).

L. s. mecnorhyncha (Oberholser, 1912) – Simeulue I (off W Sumatra).

L. s. eumecis (Oberholser, 1917) – Anamba Is, off E Peninsular Malaysia.

L. s. axantha (Oberholser, 1932) – N Natuna Is.

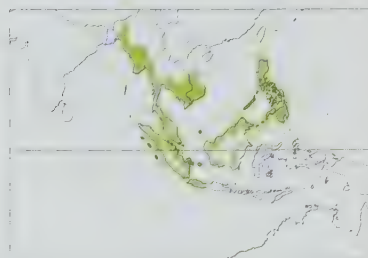
L. s. henkei (A. B. Meyer, 1884) – Calayan, Babuyan Claro, Fuga and Camiguin Norte, and mountains of N & C Luzon, in N Philippine Is.

L. s. sperata (Linnaeus, 1766) – N Philippines (C & S Luzon, Polillo, Marinduque and Cantanduanes).

L. s. trochilus (Salomonsen, 1953) – W, C & S Philippines (Lubang, Mindoro, Busuanga, Culion, Tablas, Romblon, Sibuyan, Masbate, Ticao, Palawan, Dadagican, Ursula, Balabac, Panay, Guimaras, Biliran, Leyte, Samar, Basiao, Calicoan, Negros, Cebu, Bohol, Siquijor, Camiguin Sur, Dinagat, Nipa, Siargao, Bucas Grande, E Mindanao, Talicud, Pujada, Balut); also Maratua Is, off E Borneo.

L. s. juliae (Tweeddale, 1877) – W & C Mindanao and Sulu Archipelago (Malanipa, Malamaui, Basilan, Tonquil, Jolo, Siasi, Tawi-Tawi, Sanga Sanga, Bongao, Simunul, Sibutu), in S Philippines.

Descriptive notes. 9–10 cm; 5.2–7.5 g. Male nominate race has crown iridescent coppery green or golden-green, side of neck, mantle and scapulars maroon, lower back, rump and uppertail-coverts metallic green, tail black glossed blue; upwings black, remiges with orange-red edgings; lores, side of face to ear-coverts and malar area blackish; chin and throat iridescent purple or violet-purple, breast to upper belly scarlet to orange, belly and undertail-coverts yellowish-olive, yellowish-green or yellow (belly greyer in C Luzon); iris brown to dark brown; bill and legs black. Female is mostly olive-green, with wing edging brownish, brighter below, becoming more yellow and whitish from lower breast to vent; all except central rectrices narrowly tipped greyish. Juvenile is similar to female, but greyer below, later becoming browner above and whitish below. Races differ



mainly in plumage coloration and pattern; *henkei* male differs from nominate in having black mantle and duller wings; *irochilus* differs from nominate in having iridescent bronze-green crown, with pectoral spot, lower back, rump and undertail-coverts iridescent blue-green, tail dark purple, and lower belly to undertail-coverts dark olive to olive-grey; *juliae* male differs from nominate in having variable amounts of mauve-red gloss and green on crown, dark crimson (instead of red-brown) mantle, red or brownish-red edging on remiges, tail more purple-blue, breast bright orange-yellow with variable amounts of scarlet, belly

to vent yellow-green; *brasiliiana* male differs from nominate in having mantle black, rump and shoulder patch metallic purple-blue, breast and upper belly deep maroon-crimson, and rest of underparts sooty brown, female olive above with black tail, yellow below, brighter on belly; *emmae* male differs from previous in having more bluish (rather than greenish) gloss on back; *meenynorhyncha* has much longer bill than *brasiliiana*, male usually darker on lower underparts, female more greenish above and darker and duller below; *eumecis* is larger and has longer bill than *brasiliiana*, female is lighter above and paler and more greenish below; *axantha* is similar to last but larger, female brighter and more yellowish above, darker and more olivaceous below. **Voice.** Song "psweet, psweet, psweet, psweet, psweet, psweet...psit-it, psitit, psweet, psweet...". Calls include weak "chip chip", sharp "si-si-si", also "wheep"; double whistle, first note rising and second falling; high-pitched "tiswit...titwitwit"; flight call "chit chit chit chit"; also described for India are a piercing, thin, strongly upslurred "pswécéé", more subdued, staccato, quick, disyllabic "fut-chit", and short, high trills.

Habitat. Found in many forest types, including peat-swamp-forest, heath forest, montane forest and mangroves; also heavily disturbed forest, closed-canopy secondary forest, plantations, coconut groves, coastal scrub, and gardens. Mostly not far from coast, but up to 110 km inland in Peninsular Malaysia; generally sea-level to 200 m, but to 1220 m in Peninsular Malaysia, and 1000 m in N Borneo (Sabah).

Food and Feeding. Insects, including caterpillars and aphids (Aphidoidea); also nectar, fruit and seeds. Forages singly, in pairs or in small groups; sometimes in flocks of up to c. 30 individuals. Usually forages high, and hovers to take insects or water from leaves and nectar from flowers; also hangs from flowers to take nectar, and removes insects from spider webs.

Breeding. Laying recorded in Feb–May in Bangladesh, Apr–May and Jul in Thailand, probably late Jan to May and Jul (nest-building seen late Feb, Apr, May, early Aug) in Malay Peninsula, and Jan and Mar–Jun in Java; fledglings early Jun in Singapore; in Borneo, laying recorded Sept and birds with active gonads Jan–Feb, Apr and Jun in N (Sabah), and juveniles in Aug in S; in Philippines, nest with eggs in Apr in N (Camiguin Norte), laying in Dec on Palawan, Jan on Negros, Feb on Siquijor and Apr on Samar, and bird with active gonads in Apr on Marinduque. Nest globular, with side entrance near top, with or without "tail", made from grass stems, epiphyte rootlets, fibres, leaves and cobwebs, lined with fibrous material, camouflaged with dry leaves, bark and small twigs, and screened by leaves, attached to branch or tip of palm frond 1.5 to 10 m above ground. Clutch 2 eggs, brown. No other information.

Movements. Some seasonal movements recorded in India and Bangladesh and in Borneo. Apparently regularly crosses water to and from Singapore.

Status and Conservation. Not globally threatened. Generally local or rare in India; common in E Bangladesh (Sylhet), mainly Oct to mid-Jan. Locally common in Thailand; but uncommon in S; common and widespread on coast of Peninsular Malaysia, but local inland; generally uncommon in Greater Sunda; common in Philippines. Reports of presence in extreme NE India (NE Arunachal Pradesh) are unsubstantiated. Occurs in several protected areas, e.g. Khao Pra Bang Wildlife Sanctuary, in Thailand, Cat Tien National Park, in Vietnam, and St Paul Subterranean River National Park and Rajah Sikatuna National Park, in Philippines; rare in Danum Valley Conservation Area, in Borneo.

Bibliography. Ali & Ripley (1974), Allen *et al.* (2006), Birand & Pawar (2004), Cheke & Mann (2001), Curio (1994), Dickinson *et al.* (1991), Edgar (1947), Gill (1969), Gilliard (1950a), Grimmer *et al.* (1998), Hellebrekers & Hoogerwerf (1967), Hill (2000), Hoogerwerf (1949), Kennedy *et al.* (2000), MacKinnon & Phillips (1993), Mann (2002), McGregor (1909), Medway & Wells (1976), Nash & Nash (1988), Oates (1890b), Ogilvie-Grant (1894), Plettler (1961), duPont (1971b), Rahor (1977), Rajathurai (1996), Rand & Rahor (1960), Rasmussen & Anderton (2005b), Reed (1971), Ripley & Rahor (1958), Robson (2000b), Salomonsen (1952, 1953b), Sheldon *et al.* (2001), Smythies & Davison (1999), Wells (2007).

46. Black Sunbird

Leptocoma sericea

French: Souimanga satiné **German:** Seidenmektarvogel **Spanish:** Suimanga Negro

Taxonomy. *Cinnyris sericeus* Lesson, 1827, near Dorey, New Guinea.

Genus often subsumed in *Nectarinia*. Genus names *Leptocoma* and *Chalcostetha* described simultaneously, on consecutive pages of same publication; former has been selected by First Reviser as having precedence (see page 48). If present genus is merged into *Nectarinia*, species name *sericea* becomes preoccupied, and must be replaced by next junior synonym, *aspasia*. Possibly forms a superspecies with *L. sperata*. Considerable geographical variation chiefly in gloss colour of males, but in *L. w-cline* in some characters apparent in C parts of range (involving races *auriceps*, *aspasioides*, *mariae* and *cochrani*). Races *corinna* and *vicina* not particularly well marked, and could perhaps be included in nominate. Other proposed races are *tonkeana* (from I: Sulawesi), included in *porphyrolaema*; *morotensis* (Morotai, off N Halmahera), merged with *auriceps*; *olympia* (Misool, in West Papuan Is.), in *cochrani*; *bergmanni* (Adi I, off S Bomberai Peninsula, in W New Guinea), included in nominate; and *chlorocephala* (Wokam, in Aru Is.), synonymized with *aspasioides*. Proposed name *johiensis* (Yapen I, in Geelvink Bay), is older than *salvadorii*, but appears to have been based on specimens of nominate *sericeus*, and may in any case have to be considered a *nomen oblitum*; material for *salvadorii* may have come not from Yapen but from nearby Mios Num; further study required. Junior synonym *theresia* was formerly used as new name for *chlorolaema*, which was erroneously believed preoccupied. Twenty-three subspecies recognized.

Subspecies and Distribution.

L. s. grayi (Wallace, 1865) – N Sulawesi, including small islands of Manado, Bangka and Lembah. *L. s. porphyrolaema* (Wallace, 1865) – Sulawesi (except N), including Togian Is, Muna, Butung and Labuan Blanda.

L. s. sangirensis (A. B. Meyer, 1874) – islands of Sangihe, Siau and Ruang (N of Sulawesi).

L. s. talautensis (A. B. Meyer & Wilesworth, 1894) – Talaut Is (NE of Sulawesi).

L. s. auriceps (G. R. Gray, 1861) – Tifore, Morotai, Halmahera, Ternate, Mare, Makian, Bacan, Obi, Damar, Muor and, Gebe; also archipelagos of Banggai and Sula (off E Sulawesi).

L. s. auricapilla (Mees, 1965) – Kayoa I (off W Halmahera).

L. s. cochrani (Stresemann & Paludan, 1932) – West Papuan Is (Waigeo, Misool).

L. s. mariae (Ripley, 1959) – Kofiau I (N of Misool).

L. s. proserpina (Wallace, 1863) – Buru I.

L. s. aspasioides (G. R. Gray, 1861) – Seram, Ambon, Nusa Laut, Watubela Is and Aru Is.

L. s. chlorolaema (Salvadori, 1874) – Kai Is.

L. s. sericea (Lesson, 1827) – New Guinea (including islands of Manam, Karkar, Adi, Gag), except SE.

L. s. maforensis (A. B. Meyer, 1874) – Numfor I (in Geelvink Bay), in NW New Guinea.

L. s. mysorensis (A. B. Meyer, 1874) – Biak I (in Geelvink Bay) and Schouten Is (off NC New Guinea).

L. s. nigriscapularis (Salvadori, 1876) – Meos Num and Rani I (in Geelvink Bay).

L. s. salvadorii (Shelley, 1877) – Yapen I (in Geelvink Bay).

L. s. veronica (Mees, 1965) – Liki I, off NW New Guinea.

L. s. cornelia (Salvadori, 1878) – Tarawai I, off CN New Guinea.

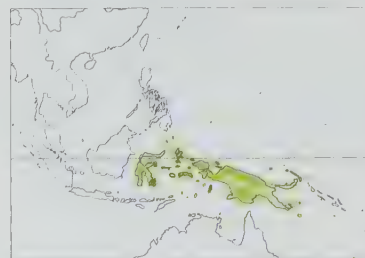
L. s. corinna (Salvadori, 1878) – N Bismarck Archipelago (except Feni Is).

L. s. eichhorni (Rothschild & E. J. O. Hartert, 1926) – Feni I, E of New Ireland.

L. s. caeruleogula (Mees, 1965) – Umbi I and New Britain.

L. s. vicina (Mayr, 1936) – SE New Guinea.

L. s. christinae (Tristram, 1889) – Trobriand Is, D'Entrecasteaux Archipelago, Marshall Bennett Group, Woodlark I and Louisiade Archipelago, off SE New Guinea.



Descriptive notes. 11–11.5 cm; mean 8 g. Male nominate race is chiefly black, with head glossy bluish-green, greenish-blue gloss on rump, uppertail-coverts and tail, and median and lesser upwringing-coverts, rump feathers sometimes with purple edging; throat and breast with reddish-purple and purplish-blue or blue gloss; iris brown; bill and legs blackish. Female is much smaller than male, lacks gloss in plumage, has head grey, paler on throat, wings and mantle olive-grey or olive-green, white tips of tail feathers, belly pale yellow. Juvenile resembles female, but is greener on crown, more yellow on throat and

greyer, less yellow, below; immature male at later stages shows some adult plumage features. Races vary considerably, especially in gloss colour of males: male *maforensis* has green back and golden crown, green of wing-coverts and rump slightly duller and more bluish than nominate; *cornelia* is larger than nominate, male has crown, back and rump glossed blue-green, throat glossed purple-violet; *mysorensis* is longer-billed than previous, male differing in usually having blackish, unglossed underparts, occasionally some violet gloss on throat, and is more bluish-green above than nominate; *nigriscapularis* male differs from nominate in having second and third rows of scapulars black, and velvet-black primaries; *salvadorii* is much larger than last, male has rump and edges of rectrices bluish (less greenish), and more greenish crown than nominate; *veronica* is larger than nominate, male has slightly more bluish-tinged green crown, wing-coverts and rump, underparts steel-blue; *corinna* is longer-winged but shorter-billed than nominate, male having green or blue-green gloss on crown, throat glossed purple or purple-blue, wing-coverts and rump slightly more bluish-green than nominate; *eichhorni* male has throat glossed bluish-purple, crown greyish or graphite-green, wing-coverts and rump bluer than previous; *caeruleogula* is similar to *corinna*, but much smaller wing; *vicina* male is similar to *cornelia* but throat bluish-purple (not purple), female more yellow below than nominate, immature (both sexes) has dull greyish-green (not citrine) back and pale greyish-yellow (not bright sulphur-yellow) abdomen; *christinae* is large and long-billed, male having dark green crown, throat glossed blue, female more yellow below than nominate; *porphyrolaema* male has greenish-blue confined to lesser wing-coverts and rump, with crown green or golden or slightly bronze-green, second and third rows of scapulars black, throat rich purple and laterally bordered with greenish-blue, and back and chest sooty; *grayi* male is similar to previous, but upper back and lower breast dull brownish-red (rather than sooty), purple and blue throat, and small shoulder patch blue, as is rump; *sangirensis* male also is similar, but throat bronzy with purple border, blue laterally only on chin, green crown tinged golden, wing-coverts and rump bluish, second and third rows of scapulars black, female probably has orange throat (like immature male) and pale green underparts, juvenile bright yellow underparts; *talautensis* male differs from last in having crown glossed golden-green, wing-coverts glossed blue with violet tinge, throat bronze with violet and blue border, female and immature male have brown crown, nape, back and shoulders, orange throat and upper breast more pronounced than previous, rest of underparts buffy and white; *auriceps* male is more green to golden-green on crown than nominate, darker than preceding race, with wing-coverts, rump and throat glossed blue; *auricapilla* male is similar to last, but crown very golden-green, wing-coverts and rump violet or purplish-blue; *cochrani* is slightly smaller than nominate, male having bright blue throat as *caeruleogula*, from which differs in having wing-coverts and rump bright green or blue-green with yellow suffusion, finer bill; *mariae* male resembles previous, but has throat glossed pansy-violet (not steel-blue), cap greener (but less yellow-green) than *auriceps*, wing-coverts and rump yellowish blue-green, female brighter yellow below than previous and closer in this respect to nominate; *proserpina* male has black wing-coverts, metallic greenish-blue scapulars and rump, crown green or bluish-green, throat purple or purplish-blue; *aspasioides* has longer bill than all others except *christinae*, male differs from nominate in having greenish crown, more bluish-green wing-coverts and rump, dark blue or purple-blue throat, female in having olive-grey underparts; *chlorolaema* male differs from nominate in having dark green or grass-green throat, green crown, blue-green shoulder to lower back, rump, uppertail-coverts and sides of tail. **Voice.** Song a rapid, sweet, tinkling cadence 1.5–4 seconds in duration. Calls include single, or series of, high-pitched sibilant notes; rapid series of upslurred notes followed by slow trill at lower pitch; rapid series of double notes, one higher than other; clear hollow peep; rapid, slurred, shrill "zi-zi-zi-zi-zi"; series of various single, upslurred notes; various single harsh notes; high-pitched downslurred "sweet" during foraging; flight call "pit-pit-pit".

Habitat. Various forest types, avoiding interior, including mangroves, at forest edge, in woodland, secondary growth, scrub, coconut plantations and other cultivation, also disturbed habitats and gardens. Generally in lowlands, but to 1400 m in some areas.

Food and Feeding. Various arthropods, fruit and nectar. Forages singly, in pairs and in small family groups, occasionally in larger flocks; sometimes joins mixed-species flocks. Very active. Obtains food items mostly by gleanings and hover-gleaning.

Breeding. Laying recorded in Aug and Sept in Sulawesi, Mar and May–Jan on islands of Papua New Guinea, and May on New Ireland; occupied nests late Aug to Sept and Nov in Moluccas, and juveniles Aug to early Sept on Sangihe, Talaut and Siau; in Papua New Guinea, nest-building Aug and Sept and birds with active gonads late Aug to Nov. Nest drop-shaped, c. 16–22 × 5 cm, en-

trance hole 4 × 2 cm with pronounced protecting porch on side of upper half, neatly made of fibres, bark and bast, lined with bark, fastened 3–9 m above ground to end of bough, vine, bamboo or palm frond. Clutch 2 or 3 eggs, creamy white, brown spots all over but concentrated as brown ring at broad end, or pale brownish with darker brown speckles. No other information.

Movements. None recorded.

Status and Conservation. Not globally threatened. Generally common throughout large range. For example, noted as being common on Togian Is, in C Sulawesi.

Bibliography. Beehler *et al.* (1986), van Bemmelen (1948), van Bemmelen & Voous (1951, 1953), Bishop (1992), Bowler & Taylor (1989a), Cheke & Mann (2001), Coates (1990), Coates & Bishop (1997), Eck (1976), Hartert (1926a, 1926b, 1926c), Holmes & Wood (1980), Indrawan *et al.* (2006), Jepson (1993a), Mayr (1936), Mayr & Diamond (2001), Mees (1965c), Rand (1942a), Riley (1997), Ripley (1959a, 1959b), Robson (1992), Watling (1983), White & Bruce (1986).

47. Copper-throated Sunbird

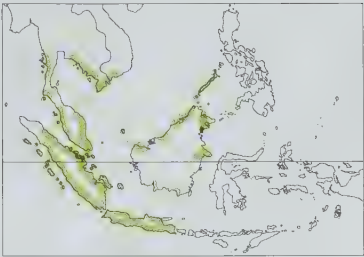
Leptocoma calcostetha

French: Souimanga de Macklot **Spanish:** Suimanga de Macklot
German: Kupferkehl-Nektarvogel
Other common names: Macklot's Sunbird

Taxonomy. *Nectarinia calcostetha* Jardine, 1843, Java. Genus often subsumed in *Nectarinia*. Genus names *Leptocoma* and *Chalcostetha* described simultaneously, on consecutive pages of same publication; former has been selected by First Reviser as having precedence (see page 48); present species is type of genus *Chalcostetha*. No obvious close relatives. Several races have been proposed from various islands off Sumatra, Borneo and Natunas, but none considered adequately differentiated. Monotypic.

Distribution. Extreme S Myanmar (S Tenasserim), S Thailand, S Cambodia, Cochinchina, and Peninsular Malaysia S on coasts and islands to Sumatra and satellites; W Philippines (Palawan and Balabac), Natuna Is, coasts of Borneo and islands off NE (including Maratua), and also coasts of Java.

Descriptive notes. 12.2–13 cm. Male has top of head metallic green, sides of head, hindneck, upper back, upperwing and graduated tail black, lower back, rump and upperwing-coverts metallic green; chin and throat metallic coppery red, bordered metallic purplish-blue, breast metallic purplish-blue, pectoral tufts yellow, belly and undertail-coverts black; iris brown; bill and legs black. Female has top of head grey-brown, upperparts olive-yellow, broken white eyering, throat greyish-



white, underparts greyish olive-green, more yellow on belly (extent variable), undertail-coverts white, large whitish spots on tips of rectrices becoming smaller towards centre. Juvenile is similar to female, but throat yellow, some dark scaling on throat and upper breast. **Voice.** Utters both a high trill, and a deep melodious trill; also, a disyllabic call resembling that of *Anthreptes malacensis*.

Habitat. Inhabits mangroves, heath forest, alluvial forest, secondary forest, coastal vegetation, plantations, coconut groves, cultivation and gardens close to shore; chiefly found in coastal areas, but occurs up to 915 m.

Food and Feeding. Nectar and small arthropods. Feeds on nectar of *Bruguiera* mangroves. Forages in lower and middle storeys. Very active.

Breeding. Laying calculated as Jan–Jul in Malay Peninsula, and eggs Mar–Jun, Aug–Sept and Nov in Java; occupied nest in May on Nias I (off W Sumatra); in Borneo, laying Mar–May and enlarged testes in Jun in N (Sabah) and nestlings in Jul in NW (Sarawak). Co-operative nest-building observed, and some nests may be “decoys”. Nest a pear-shaped bag, loosely woven but solid at base, with or without “tail”, with oval entrance with eave in top half, made of fine grass, fibre, kapok and hairs, camouflaged with bark, leaves and bryophytes, decorated with plant fragments, occasionally felted with spider webs or lined with egret (Ardeidae) feathers; suspended 0.7–3.5 m above ground from mangrove branch, bush, *Casuarina* branch or nipa (*Nypa*) frond, occasionally over water, total length 12.5 cm. Clutch 2 eggs, glossy, greyish-clay to warm brown, fine dark brown spots forming cap, or pale green with heavy olive-brown suffusion and variable number of dark brown spots. No other information.

Movements. None recorded.

Status and Conservation. Not globally threatened. Scarce in Myanmar; common to uncommon in Malay Peninsula; not uncommon in Sumatra and Borneo; uncommon in Java; common in Philippines. Destruction of mangroves has depleted populations in some areas. Occurs in some protected areas, e.g. St Paul Subterranean River National Park, in Philippines.

Bibliography. Cheke & Mann (2001), Dymond (1994), Hellebrekers & Hoogerwerf (1967), Holmes (1996), Hoogerwerf (1949), Kennedy *et al.* (2000), King *et al.* (1975), MacKenzie (1981), MacKinnon & Phillips (1993), Mann (2008), McClure (1998), McGregor (1909), Medway & Wells (1976), Mees (1986), Noske (1993), duPont (1971b), Rajathurai (1996), Robson (2000b), Sheldon *et al.* (2001), Smythies (1960, 1986), Smythies & Cranbrook (1981), Smythies & Davison (1999), Wells (2007).



Genus *NECTARINIA* Illiger, 1811

48. Bocage's Sunbird

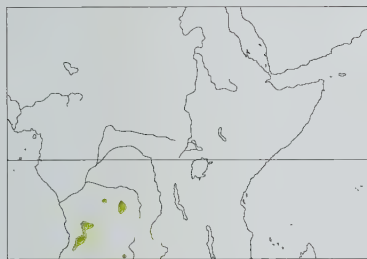
Nectarinia bocagii

French: Souimanga de Bocage **German:** Bocagenektarvogel **Spanish:** Suimanga de Bocage

Taxonomy. *Nectarinia bocagii* Shelley, 1879, Caconda, Angola.

Possibly forms a superspecies with *N. purpureiventris* and *N. tacaze*. Monotypic.

Distribution. S DR Congo (S Kasai Occidental) and Angola (highlands from Malanje, N Bié and W Lunda Sul S to Benguela and N Huila; NE Lunda Norte; Ninda, in Mexico).



Descriptive notes. Male 19 cm, 14.5–15 g; female 14 cm. Male breeding is dark iridescent violet, reflecting blue-green, above; graduated tail black, edged violet, elongated central rectrices protruding 32–35 mm beyond others; remiges black, edged dark violet, lesser upwing-coverts violet; black below, chin to upper breast dark iridescent violet, reflecting blue-green; underside of wing black; iris dark brown; bill and legs black. Non-breeding (eclipse) male in DR Congo resembles female, but retains elongated central rectrices (no eclipse plumage recorded in Angola). Female is pale olive above, more greenish on rump,

flight-feathers dark greyish-brown, edged pale olive, rest of upwing feathers fringed pale green-brown; graduated tail blackish-brown, central feathers extending up to 6 mm beyond others, underside of tail with inner webs edged pale olive, outermost rectrix with outer web all pale brown, adjacent rectrix with pale outer tip; face dark olive-brown, chin and throat olivaceous yellow, underparts olive-yellow with dark brown streaking; underwing greyish-brown on remiges, axillaries green-yellow, underwing-coverts grey with yellow tips; iris black or very dark brown, bill and legs black. Juvenile resembles female, but chin to breast grey, chin feathers tipped pale, belly pale yellow with grey patches, primaries with wider pale edging, underwing grey; immature male drab olive above with a few patches of metallic dark violet, black below with light yellow-olive patches, some violet on throat. **VOICE.** Loud “wiep-wiep” call, and “tsiek-tsiek” uttered by quarrelling males. **Habitat.** Woodlands, such as *Baikiaea plurijuga* woodland, fringes of miombo woodland and montane forest, and beside dambos. Marshy areas with flowering shrubs.

Food and Feeding. Nectar, probably also insects. Feeds from mistletoes (Loranthaceae), *Erythrina* and *Sabicea africana*. Forages singly and in pairs; sometimes in larger groups in dry season.

Breeding. Laying in Feb in Angola and Jan and Oct in DR Congo. Male courts female in fast zigzagging flights. Large nest composed of fibres, lined with soft woolly material from raffia palm (*Raphia*) trunks, constructed in small raffia palm in drier part of marshland. Clutch 2 eggs, whitish, heavily stippled with brown-grey spots, mostly at wider end. No other information.

Movements. No data.

Status and Conservation. Not globally threatened. Uncommon to locally common.

Bibliography. Benson & Irwin (1967), Benson *et al.* (1971), Cheke & Mann (2001), Dean (2000), Fry *et al.* (2000), Hall (1960), Hall & Moreau (1970), Lippens & Wille (1976), Ripley & Heinrich (1966), Schouteden (1959), Wille (1964).

49. Purple-breasted Sunbird

Nectarinia purpureiventris

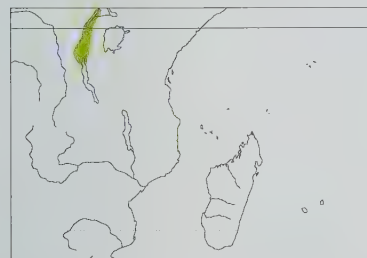
French: Souimanga à ventre pourpre **Spanish:** Suimanga Pechipúrpura
German: Purpurbauch-Nektarvogel

Other common names: Rainbow Bird

Taxonomy. *Cinnyris purpureiventris* Reichenow, 1893, Migere, western Mpororo = south-western Uganda.

Possibly forms a superspecies with *N. bocagii* and *N. tacaze*. Monotypic.

Distribution. Albertine Rift mountains in E DR Congo, SW Uganda, Rwanda and Burundi.



Descriptive notes. Male 22 cm, 10–13.5 g; female 14 cm, 10–12.5 g. Male breeding has crown and side of head iridescent black, reflecting purple, hindneck and mantle iridescent green, uppertail-coverts copper-green, otherwise a mixture of iridescent black, purple, copper and green above; upperwing black, tertials and greater wing-coverts with copper-green edges, lesser coverts iridescent purple with blue sheen; graduated tail black with green edges, central feathers protruding 70–115 mm beyond others; chin and throat black, reflecting blue-green, breast purplish or coppery green, iridescent blue band on lower breast; iridescent

purple with blue sheen on belly and flanks, vent black, undertail-coverts purple, underwing black; iris dark brown; bill and legs black. Male eclipse plumage (acquired by some males periodically) lacks much of the metallic feathering on head and body, looks very like young male (from which separable in hand by speckled, opaque, skull); new olive or grey feathers then sprout on head, back and side of breast, and wing and tail feathers are moulted, looking like female but with metallic feathers on mantle. Female has crown and neck pale brown-grey, barred black, otherwise dull olivaceous green above apart from slightly yellower uppertail-coverts, wing grey-brown with olive-green edges, median and lesser wing-coverts all olive-green, and graduated tail dark grey-brown, feathers edged olive-green, outer pairs with paler grey tips, central rectrices protruding c. 5 mm;

side of head greyish-brown; pale grey with dark barring below, washed olive-yellow, especially on breast, underwing-coverts grey, edged olive-green, axillaries more greenish; iris dark brown, bill and legs black. Juvenile male is like adult female but with dark spots on foreneck, some iridescent feathering may appear within 4 months of fledging. **VOICE.** Song an explosive and rapid series of wheezy notes, squeaks and twitters. Calls include “tsi-tsi-tsi-tsi”, “zay-zay-zit-zit-zit-zit” and “ts-wick”.

Habitat. Forest edge, clearings and roadsides in montane forest and gallery forest, above 1750 m; to 2700 m in Uganda. Descends seasonally from 2350–2500 m to 1750–2000 m in response to timing of flowering at different altitudes.

Food and Feeding. Insects and nectar. Foodplants include *Albizia gummifera*, *Erythrina*, *Lobelia giberroa*, *Symphonia gabonensis* and vines; favours flowers particularly of *Symphonia globulifera*, around which it defends feeding territories. Forages singly or in small groups; also in mixed-specied flocks. Energetic forager at flowers; also catches insects in flight.

Breeding. Laying recorded in Apr–Aug and Nov in DR Congo, Sept–Nov in Uganda, and Jan–Feb in Rwanda. Territorial male sings from perch, holding head raised, wings drooping and fanned tail nearly vertical. Nest a compact oval, sometimes with “beard” of lichens 17 cm long, made of mosses, lichens, grass-heads and flower stalks, adorned with lichens and grass-heads, lined with down from *Gynura vitellina* and a few feathers, suspended from bush or tree branch 2–4 m up. Clutch 1–2 eggs, grey with grey-olive speckles, denser and forming band near wider end; no information on incubation and nestling periods.

Movements. Seasonal movements in response to flowering patterns at different altitudes.

Status and Conservation. Not globally threatened. Restricted-range species: present in Albertine Rift Mountains EBA. Locally common.

Bibliography. Carswell *et al.* (2005), Chapin (1954, 1959), Cheke & Mann (2001), Dowsett-Lemaire (1990), Fry *et al.* (2000), Hall & Moreau (1970), Kunkel (1966), Prigogine (1971, 1972).

50. Tacaze Sunbird

Nectarinia tacaze

French: Souimanga tacaze **German:** Tacazenektarvogel **Spanish:** Suimanga de Tacazzé

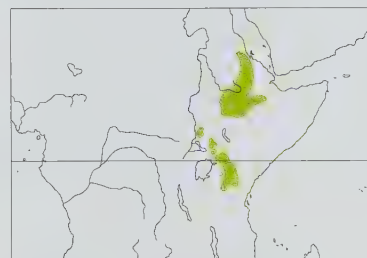
Taxonomy. *Certhia tacaze* Stanley, 1814, Abyssinia = probably Tacaze River, north Ethiopia.

Possibly forms a superspecies with *N. bocagii* and *N. purpureiventris*. Two subspecies recognized.

Subspecies and Distribution.

N. t. tacaze (Stanley, 1814) – highlands of Eritrea and Ethiopia.

N. t. jacksoni Neumann, 1899 – highlands of SE Sudan, N & E Uganda, W, C & S Kenya and N Tanzania.



Descriptive notes. Male 22 cm, 12–18.3 g; female 15 cm, 12–16.2 g. Male nominate race breeding has crown, neck and mantle iridescent green, tinged with purple and bronze reflections, other upperparts more purple; upperwing black, purple iridescence on median and lesser wing-coverts; long graduated tail black with iridescent purplish sheen, central feathers protruding 35–46 mm beyond others; bronzy green below, more purple below breast, becoming black on vent; underwing-coverts and axillaries black; iris brown; bill and legs black. Male non-breeding is like female, but retains wings and tail of adult male breeding.

Female has greyish olive-brown crown and upperparts, brownish-white supercilium and pale greyish-white malar stripe, lores and ear-coverts darker than upperparts, upperwings dark brown with olive edgings; dark brown tail graduated, appearing pointed as central feathers protrude c. 5 mm, outermost rectrix brownish-white on outer edges, others with broad (T5) or narrow (T3 and T4) white tips; throat grey-brown, breast and flanks olive-grey with light blackish mottling, belly and undertail-coverts olive-yellow; bare parts as male. Juvenile is like female but centre of throat black, upperparts greyer, underparts more yellow. Race *jacksoni* male has iridescent purple plumage more pinkish, metallic colour on breast broader and extending farther down, central rectrices 48–62 mm longer than next pair, also has non-breeding plumage similar to adult female but black flight-feathers and tail (with elongated central feathers) retained, as are metallic colours on wing and uppertail-coverts and, occasionally, on tips of body feathers. **VOICE.** Song consists of a long twittering, “sweet-siuswittter tseu seet-swirsittit, tsit-tsit-tsit-chitichitichiti...” or “tew tew tew tew tew”. Calls “chup, chup, chup, seee chup chup, seee chup” and harsh chatters.

Habitat. Forest patches and clearings, grassy areas, bamboo, heathland, gardens and cultivations in highlands. Seldom below 1800 m in Ethiopia; up to 4000 m on Mt Kenya and 1800–4200 m on Mt Elgon, in Uganda; recorded down to 1650 m in S Kenya (Nairobi).

Food and Feeding. Nectar, insects, spiders (Araneae) and mites (Acarina). Food taken mostly from flowers; also catches insects in flight. Associates with giant lobelias (*Lobelia*) and *Kniphofia*; other preferred foodplants include aloes (*Aloe*), mistletoes (Loranthaceae), *Impatiens elegantissima*, *Kigelia africana*, *Leonotis mollissima* and proteas (*Protea*). Forages singly and in pairs; sometimes in large flocks outside breeding season.

Breeding. Laying recorded in May and Jul–Nov in Ethiopia and Apr, Jul and Sept in Kenya, and breeding activity Dec–Feb and Jul in Tanzania; occasionally double-brooded. Male territorial. Nest built by female, taking 3–8 days, a pear-shaped structure with side entrance near top, occasionally with short “beard” of lichen, made with dead leaves, cobwebs, lichen and dry grass, lined with feathers and woolly material, suspended usually 1.5–10 m up from thin branch or in rose bush or creepers on wall; one nest consisted of dead leaves, bark and cobwebs, lined with fluff, chicken feathers and horsehair, another was made of dead giant heath (*Erica*) strands wrapped in thick felt of pale *Usnea* lichen and adorned with light brown flaky bark, seed down, feathers, plant fibres, rootlets and grass stems, and suspended in giant heath. Clutch 1–2 eggs, green-blue with dark brown marks and indistinct pink spots; incubation by female only, period 14–17 days; chicks fed in nest by both parents, for c. 19 days; fledglings return to nest to roost for at least 6 nights. Nests parasitized by Klaas’s Cuckoo (*Chrysococcyx klaas*).

Movements. Resident at high altitudes; altitudinal migrant on lower slopes. Non-breeding visitor to lower parts of Mt Elgon during cool wet season, Jun–Aug. Very common at 2800 m in Dec, but

absent there in Jul. Leaves mountains in S Sudan when *Lobelia* species stop flowering. A few hundred (80% males) in eucalypts (*Eucalyptus*) at Kaptagat, W Kenya, on 30 May, but only a few remaining 6 days later.

Status and Conservation. Not globally threatened. Common in all parts of range; locally abundant. **Bibliography.** Baker & Baker (2007), Cheke (1971a, 1971b, 1972, 1978), Cheke & Mann (2001), Friedmann (1937), Fry *et al.* (2000), Hall & Moreau (1970), Kirchner (1981), Lewis & Pomeroy (1989), Mackworth-Præd & Grant (1945), Prinzing & Jackel (1986), Prinzing *et al.* (1989), Sheppard (1958), Zimmerman *et al.* (1996).

51. Bronze Sunbird

Nectarinia kilimensis

French: Souimanga bronzé **German:** Bronzenektarvogel **Spanish:** Suimanga Bronceado
Other common names: Bronzy Sunbird; Gadow's Sunbird (*gadowi*)

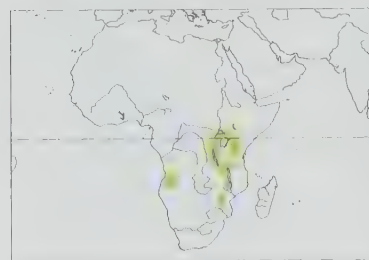
Taxonomy. *Nectarinia kilimensis* Shelley, 1885, Kilimanjaro, Tanzania. Three subspecies recognized.

Subspecies and Distribution.

N. k. gadowi Bocage, 1892 – highlands of WC Angola.

N. k. kilimensis Shelley, 1885 – highlands in E DR Congo, S Uganda, W & C Kenya, Rwanda, Burundi & N Tanzania.

N. k. arturi P. L. Sclater, 1906 – S & SE Tanzania, Malawi W of Rift Valley, E Zambia, E highlands of Zimbabwe and adjoining Mozambique.



Descriptive notes. Male 22 cm, 13.5–19.9 g; female 12 cm, 11.7–16.7 g. Male nominate race has head, neck and upperparts golden-green, copper reflections on back to uppertail-coverts; upperwing dark brown, lesser and median wing-coverts iridescent coppery green; tail blackish-brown, central pair of feathers elongated; breast to belly, flanks and undertail-coverts very dark brown or black; iris dark brown; bill dull black; legs blackish. Female is grey-olive above, with pale buff to buffish-white supercilium and malar stripe, dark brown uppertail-coverts, blackish-brown tail edged white on outer 2–3 pairs of rectrices; throat

whitish with dark streaks, underparts dark yellowish with brown streaks, undertail-coverts yellow. Juvenile is similar to female, but upperparts more olive, throat mottled grey and whitish, with yellowish at side of throat, chest with olive wash, pale yellow with few or no streaks below; immature male has some metallic feathering. Race *arturi* male has head and neck to throat coppery green, upperparts and breast iridescent green with reflections of brighter green, gold, purplish-bronze or red; *gadowi* male is deeper green on head and throat and less golden on upperparts and breast than other races, female greyer above. **VOICE.** Song variations on “jer-jooey, jer-jooey-jooey, jer-jooey-jooey, tik-tik, jer-jooey”, followed by “tyup, tyup-tyup-tyeek-tyeek”; female sometimes duets in territorial song consisting of repetitions every second of “chee-wit”. Calls include repeats of “pea-view” and “choo-ee, choo-choo” or “jer-jooey” or “dzu-wee”; alarm “chee-wit” and continuous “peep”.

Habitat. Forest edges, woodland, scrub, cultivations and gardens, preferably with trees, at 1000–2350 m.

Food and Feeding. Nectar and arthropods. Feeds on variety of plants, including mistletoes (Loranthaceae), giant lobelias (*Lobelia*), aloes (*Aloe*), *Faurea speciosa*, *Grevillea banksii*, *Halleria lucida*, *Impatiens gomphophylla*, *Kigelia africana*, *Symphonia globulifera*, and species of genera *Balthasaria*, *Canna*, *Crotalaria*, *Erythrina*, *Fuchsia*, *Kniphofia*, *Leonotis*, *Musa*, *Protea*, *Prunus*, *Spathodea*, *Syzygium* and *Tecoma*. Forages in pairs. Nectar taken from flowers by perching and by hovering; insects captured by hawking and gleaning, and spiders taken sometimes from webs.

Breeding. Laying in Feb and Mar in Angola, in all months in DR Congo, Feb, Apr–Aug and Oct–Nov in Uganda, Nov–Aug in Kenya, Jan and Mar–Oct in Tanzania, Dec in Zambia, Feb–Mar, Jun–Jul and Dec in Malawi, and Sept–May in Zimbabwe; may nest 4–5 times yearly in equatorial regions (e.g. DR Congo), taking 40–50 days for each cycle. Defends territory from any intruding sunbirds and other bird species, e.g. weavers (Ploceidae) and monarch-flycatchers (Monarchidae). Large nest of dried grass, leaves, bark, down and lichen, woven with spider webs, usually with distinct porch of fibres and grass-heads and with slight “beard” below, lined with grass inflorescences or down, suspended from branch 0.8–1.3 m up; one unusual nest of race *arturi*, suspended at 2.5 m from horizontal branch of pine tree (*Pinus*), was made entirely of dry pine needles and lined with plant down; nest sometimes reused for subsequent breeding attempts. Clutch 1–2 eggs, whitish with grey-brown or lilac spots and blotches; incubation by female only, period 14–16 days; chick or chicks brooded by female, fed by both sexes but mainly by female, nestling period 14–22 days; young roost in nest for 5–6 days after fledging, still fed by female after new nest begun, but independent after 3–4 weeks. Nests parasitized by Klaas's Cuckoo (*Chrysococcyx klaas*) and Diederik Cuckoo (*Chrysococcyx caprius*).

Movements. Apparently nomadic in relation to food supplies.

Status and Conservation. Not globally threatened. Common throughout most of range.

Bibliography. Anon. (1980b), Antikainen (1990), Baker & Baker (2007), Beesley (1972), Chapin (1954, 1978), Cheke & Mann (2001), Cunningham-van Someren (1996), Dowsett-Lemaire (1989a, 1989b, 1990), Friedmann (1937), Fry *et al.* (2000), Gardiner & Meikle (1985), Hall & Moreau (1970), Hamner (1997, 2001), Hockey *et al.* (2005), Jackson (1970), Kramer (1975), Lewis & Pomeroy (1989), Löhl (1979), Lott (1991), Lott & Lott (1991), Mees (1970b), Prinzing & Jackel (1986), Skead (1967), Swynnerton (1908), Tree (1990, 1997a), Zimmerman *et al.* (1996).

52. Malachite Sunbird

Nectarinia famosa

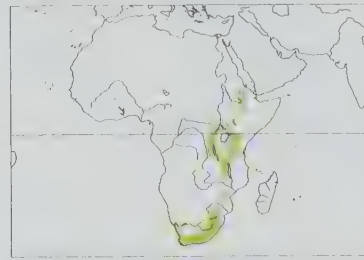
French: Souimanga malachite **German:** Malachitnektarvogel **Spanish:** Suimanga Malaquita
Other common names: Yellow-tufted Malachite/Common Malachite/Long-tailed Emerald Sunbird, Green Sugarbird

Taxonomy. *Certhia famosa* Linnaeus, 1766, Cape of Good Hope, South Africa. Possibly forms a superspecies with *N. johnstoni*. Proposed races *subfamosa* (described from Antotto, in C Ethiopia), *centralis* (Lusasa, in S Uganda) and *aneigularis* (Sotik, in SW Kenya) all considered indistinguishable from *cupreontiens*; *major* (described from Weenen, in KwaZulu-Natal) synonymized with nominate. Two subspecies recognized.

Subspecies and Distribution.

N. f. cupreontiens Shelley, 1876 – Eritrea, Ethiopia, S Sudan (Imatong Mts), E DR Congo, Uganda, Kenya, Tanzania, NE Zambia, N Malawi & N Mozambique.

N. f. famosa (Linnaeus, 1776) – E Zimbabwe and adjacent Mozambique, and S Namibia, South Africa, Lesotho and W Swaziland.



Descriptive notes. Male 24–27 cm, 12–22.5 g; female 13–15 cm, 9.1–17.5 g. Male nominate race breeding has most of body plumage bright metallic malachite-green, but rump and uppertail-coverts brighter golden-green, tertials and greater coverts edged bright green, remiges sooty black edged glossy blue; tail brownish-black, edged dark green on outer webs (except on outer rectrices), central pair of feathers protruding up to 80 mm; iris dark brown; bill and legs black.

Male non-breeding (eclipse) has metallic green

on wing-coverts, rump and uppertail-coverts, but long central tail feathers lost. Female is brown above, with grey-olive wash from neck to uppertail-coverts, tail olive-black, outer rectrices tipped and edged white, adjacent pair with white edges on outer webs, upperwing brown with yellow-olive edges on outer webs; whitish supercilium, pale yellow malar stripe; lacks pectoral tufts, has throat and breast pale yellow with brown blotches and yellow-olive wash, belly similar but less blotched and occasionally bright yellow or green-yellow; flanks olive, undertail-coverts greyish-white. Juvenile is like female, but greener upperparts and yellower underparts and malar stripe; some males have black in centre of throat. Race *cupreontiens* male has bill shorter (26–31 mm) than nominate (30–36 mm), is more golden-green above, blue colour from chest to undertail-coverts darker, less green, central tail feathers also shorter (94–120 mm) than nominate (110–151 mm), non-breeding dress similar to female but retains black remiges and tail, including elongated central rectrices (in contrast to nominate), metallic gloss on wing and uppertail-coverts and, sometimes, a few metallic tips on body feathers. **VOICE.** Song involves whistling “tseuu, tseuu” notes followed by “pesui pesui pesui” or “tik, tik, tik, tik, tik, tik, tik-heezy, heezy, heezy, heezy”; also a fast warble, sometimes interspersed with “chip” calls. Contact calls “tseuu, tseuu” or “tsi-tseer”; other calls include “ssseep” or “sseeem” or “sweenk” and “chip”; alarm a repetitive “trreecce” or slower “tjoep, tjoep, tjoep”.

Habitat. Open habitats, scrubby moorland, forest edge, *Protea* moorland and bamboo at high elevations in Kenya, Malawi and Zambia; also found in restionaceous fynbos, alpine grassland, scrub and gardens. Seldom below 2400 m in Ethiopia; to 3000 m in Tanzania; sea-level to 2800 m in South Africa, but mostly in upland fynbos.

Food and Feeding. Nectar and insects; also two small lizards recorded as prey. Food taken from plants such as giant lobelias (*Lobelia*), aloes (*Aloe*) and red-hot pokers (*Kniphofia*). Other plants visited include mistletoes (Loranthaceae), *Hagenia abyssinica*, and those of genera *Acacia*, *Buddleja*, *Digitalis*, *Erica*, *Erythrina*, *Grevillea*, *Halleria*, *Hypericum*, *Impatiens*, *Jacaranda*, *Kigelia*, *Leonotis*, *Leucospermum*, *Nicotiana* and *Protea*. Forages solitarily, in pairs and in loose groups of 30–40 individuals; also large assemblies (up to 1350 birds/ha in *Leonotis leonurus* patch) at feeding stations. Perches on specialized “rat-tail” of the South African Cape endemic rat’s-tail plant (*Babiana ringens*) to reach inflorescences and effect pollination; feeds also from *Babiana thunbergii*. Pollinaria attached to reach involved in pollination of the orchids *Disa chrysostachya* and *Disa satyriopsis*.

Breeding. Laying recorded in Jul–Sept in Ethiopia, Aug and Dec in Kenya, Mar, May and Jul–Aug in Tanzania, Jun in Zambia, Jan–Feb, Jun and Aug in Malawi, Aug–Mar in Zimbabwe, May–Feb in South Africa, Nov–Jan in Lesotho and Apr in Namibia; double-brooded, often triple-brooded. Territorial, but extra-pair copulations and cloaca-pecking occur. Male courtship involves calling, flicking of drooped wings, fast warbling and wing-flapping, sometimes with tail cocked at sharp angle and waved up and down or from side to side, and exposed pectoral tufts; male then flies vertically before hovering above female and descending to copulate; receptive female utters “pseep-pseep” calls. Male accompanies nest-building female on forays for material, nest may be completed in just 3 days but usually takes 7–30 days; nest oval, usually with porch, sometimes with “beard”, made of grass, fibres, leaves, twigs, rootlets and cobwebs, adorned with lichen or white cocoons, lined with grass, hair, feathers, down, wool and cotton, often placed (not suspended) within bush and with entrance facing inwards, but can be from near ground to 20 m up in tree or bush, often overhanging water; nest sometimes reused for further brood. Clutch 1–3 eggs, often 1 near equator, creamy or grey to brown or green-brown or green-white, freckled olive, grey or brown, dots densest at wider end; incubation by female, period 13 days; chicks fed by female, sometimes also by male, both sexes remove faecal sacs, nestling period 14–21 days; both parents feed fledglings, which return to roost in nest for up to 14 nights. Nests parasitized by Red-chested Cuckoo (*Cuculus solitarius*) and Klaas's Cuckoo (*Chrysococcyx klaas*).

Movements. Nomadic in search of flowers; recoveries up to 161 km from ringing site in South Africa. Moves altitudinally in Kenya, coming down to 1400 m; moves to higher elevations to feed on aloes during droughts in Zimbabwe, where may be nomadic after breeding. Possibly only a non-breeding visitor in S Sudan (Imatong Mts).

Status and Conservation. Not globally threatened. Common in South Africa; locally common in highlands of Kenya, Tanzania and DR Congo (1200–2800 m); uncommon in Ethiopia and Sudan.

Bibliography. Anderson *et al.* (2005), Baker & Baker (2007), Chapin (1954), Cheke (1971a, 1971b, 1978), Cheke & Mann (2001), Craig & Simon (1991), Downs & Brown (2002), Dowsett-Lemaire (1988, 1989a, 1989b), Fraser (1989, 1997b), Fraser *et al.* (1989), Fry *et al.* (2000), Hall & Moreau (1970), Hamner (2001), Hockey *et al.* (2005), Johnson & Brown (2004), Lloyd (1989), Mackworth-Præd & Grant (1945), Manning (2000), Moffet (1990), Nikolaus (1987), Oatley (1995), Porter (1956), Scammell (1963), Siegfried (1985a), Skead (1967), de Swardt (1995, 2001b, 2002, 2003), de Swardt *et al.* (2004), Symes, Downs & McLean (2001), Taylor (1946), Tree (1990), Underhill & Fraser (1989), Uys (1981b), Ward & Underhill (2006), Wolf (1975b), Wolf & Wolf (1976), van Wyk (1984), Zimmerman *et al.* (1996).

53. Red-tufted Sunbird

Nectarinia johnstoni

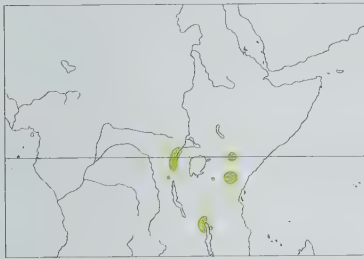
French: Souimanga de Johnston **German:** Lobeliennektarvogel **Spanish:** Suimanga de Johnston
Other common names: Red-tufted Malachite Sunbird, Scarlet-tufted (Malachite) Sunbird, Long-tailed Sunbird

Taxonomy. *Nectarinia johnstoni* Shelley, 1885, Kilimanjaro, Tanzania.

Possibly forms a superspecies with *N. famosa*. Race *nyikensis* formerly known as *salvadorii*, but latter name invalid, as preoccupied. Proposed race *idia* (described from Mt Kenya) treated as synonym of nominate. Four subspecies recognized.

Subspecies and Distribution.

N. j. dartmouthi Ogilvie-Grant, 1906 – E DR Congo, SW Uganda and W Rwanda.
N. j. itombwensis Prigogine, 1977 – Itombwe Mts (at 2350–3100 m), in E DR Congo.
N. j. johnstoni Shelley, 1885 – highlands of C Kenya and N Tanzania.
N. j. nyikensis Delacour, 1944 – highlands in S Tanzania, NE Zambia and N Malawi.



Descriptive notes. Male 27 cm, 14–17 g; female 14 cm. Male nominate race breeding has iridescent green crown, side of head and neck on otherwise black head, metallic green upperparts, bluish tinge on uppertail-coverts; black tail with green edges, elongated narrow central feathers protruding up to 135 mm; upperwing black, median and lesser wing-coverts iridescent green, greater coverts and alula edged iridescent bluish-green; iridescent green below, scarlet pectoral tufts, bluish-green on belly and flanks, black on thighs and undertail-coverts; underwing black; iris brown; bill and legs black. Male non-breeding (eclipse plumage) has crown and face, mantle and chin to chest dusky olive, breast and flanks brighter olive. Female has head and upperparts brownish-grey, dark brown tail has slight blue tinge, outer rectrices buff on tips and distal edges, wings blackish-brown above and below, with pale edges; throat greyish-brown with pale barring, underparts brownish-olive with dark mottling, middle of abdomen dusky white, occasionally washed with yellow, pectoral tufts one quarter the size of those of male and generally more orange (less red); bare parts as male. Juvenile is like female, but without pectoral tufts. Race *nyikensis* male has shorter wing (72–78 mm) and shorter bill (24–27 mm) than nominate (80–86 mm and 29–32 mm, respectively), female similar to nominate but slightly paler and greyer on malar, throat and middle of abdomen; *dartmouthi* male has bluish tinge in metallic green colours, bluer rump than nominate, uppertail-coverts violet-blue, shorter central rectrices (protruding up to 115 mm), violet-blue on upper belly and flanks, female more sooty above, throat markings less prominent, off-white with brownish-black mottling below, flanks dark brown, yellow wash from breast to flanks; *itombwensis* male has deeper more purple-green metallic colouring than nominate, also bluer (particularly on rump and uppertail-coverts) than previous, female paler and greyer than those two, with undertail-coverts off-white (not dull brown), middle of belly dusky brownish-white. **VOICE.** Song of nominate race begins with weak warble, followed by higher-pitched “tsk tee, tsk tee, tk tk tk”, and even higher drawn-out trill of repeated “s-s”; that of *nyikensis* starts with “tse” notes before a series of repeated “tserrep” notes. Calls include metallic “tspk”, fast “tsp-tk tsp-tk”, repeats of “tiki”, and “cha-cha” and “chk-k”. High-pitched “psurr-psurr-psurr” calls by displaying male.

Habitat. Mostly in Afro-alpine moorland; common where giant lobelias (*Lobelia*), giant groundsels (*Senecio*) and proteas (*Protea*) are present, but occurs also in *Protea* grassland and *Kotschyia-Erica* heathland, *Hagenia-Hypericum* forest, *Hypericum* scrub and bamboo. Confined to high elevations, 1900–4400 m; race *itombwensis* restricted to 2350–3100 m in Itombwe Mts (E DR Congo). **Food and Feeding.** Nectar, pollen, insects (particularly bibionid flies and chironomids) and spiders (Araneae). Food taken from giant lobelias, red-hot pokers (*Kniphofia*), aloes (*Aloe*), proteas, groundsels, heaths (*Erica*), *Hypericum* species and *Tecoma capensis*. Forages singly, in pairs and in mixed groups with other sunbirds. Active through most of day, even in adverse weather; tame. Perches freely on flowers. Catches insects in air by flycatching from bushstop. **Breeding.** Laying recorded in Dec in DR Congo, Nov–Jan in Uganda, Jan, Feb, May, Jul–Oct and Dec in Kenya, Jan in Tanzania, and Jan, Oct and Dec in Malawi. Territorial. In display, male raises bill, fluffs out feathers, raises tail over back, keeps wings partly open, and makes high-pitched calls while turning body clockwise. Oval nest composed of *Usnea* lichens or white plant material, animal hair and brown fibres, lined with pappus, placed from below 1 m to up to 15 m above ground within *Erica* bush, in *Hagenia* tree, in top of grass tussock, in *Lobelia telekii* inflorescences, or among dead leaves below terminal rosettes of *Senecio keniodendrum*; territory 1700–3300 m², size varying according to altitude. Clutch usually 1 egg, but in high-quality territory 2 (4% of nests), white with streaks of pinkish-brown, denser at wider end; incubation by female alone, precise period apparently undocumented despite reports to contrary; chicks brooded by female, usually fed by female alone but sometimes by both sexes at rate of 5–12 visits per hour, nestling period 22 days; fledglings tended by female for c. 14 days. **Movements.** Descends to lower altitudes seasonally in Kenya and N Tanzania. Migrant in Malawi, where absent from Nyika plateau in May–Jun.

Status and Conservation. Not globally threatened. Common to very common throughout range; locally abundant. **Bibliography.** Baker & Baker (2007), Burd (1995), Chapin (1954), Cheke & Mann (2001), Coe (1961, 1967), Dowsett-Lemaire (1988, 1989a, 1989b), Evans, M.R. (1991, 1996, 2003), Evans, M.R. & Barnard (1995), Evans, M.R. & Hatchwell (1992a, 1992b), Evans, M.R. & Thomas (1992), Fry *et al.* (2000), Hall & Moreau (1970), Prigogine (1977), Williams (1951b), Young (1982), Young & Evans (1993), Zimmerman *et al.* (1996).

Genus *DREPANORHYNCHUS*

Fischer & Reichenow, 1884

54. Golden-winged Sunbird

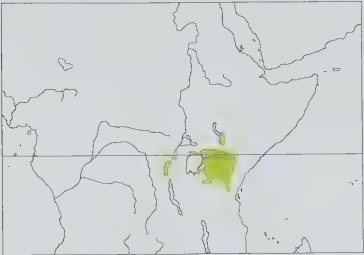
Drepanorhynchus reichenowi

French: Souimanga à ailes dorées **Spanish:** Suimanga Alidorado
German: Goldschwingen-Nektarvogel

Taxonomy. *Drepanorhynchus reichenowi* G. A. Fischer, 1884, Lake Naivasha, Kenya. Genus often subsumed in *Nectarinia*. Birds from Mt Elgon, on Kenya–Uganda border, described as race *alinderi*, but considered inseparable from nominate. Three subspecies recognized.

Subspecies and Distribution.

D. r. lathburyi (J. G. Williams, 1956) – N Kenya.
D. r. reichenowi G. A. Fischer, 1884 – W & S Uganda E to W & C Kenya, and N Tanzania.
D. r. shellyae (Prigogine, 1952) – E DR Congo.



Descriptive notes. Male 16–24 cm, 12.8–17.5 g; females 14–15 cm, 11–15.9 g. Distinctive, rather large sunbird with markedly decurved bill, large golden patches on wing and tail; both sexes have unfeathered V-shaped area on forecrown forming groove, which accumulates pollen as the bird probes in flowers, groove sometimes indistinct but increases in size with wear (becoming up to 9.5 mm long and 3.2 mm wide at its broadest point, near bill). Male nominate race breeding is black above, with bronzy-gold sheen on crown, mantle and back, duller on rump and uppertail-coverts; very long, graduated tail black, central feathers edged golden-yellow and

extending 70 mm beyond rest, which have golden only on outer webs; upperwing black, remiges broadly edged bright golden-yellow (appear all golden), median and lesser wing-coverts copper-coloured, greater coverts, primary coverts and alula edged golden-olive; black below, copper and golden sheen on chin and breast, underwing black; iris dark brown; bill and legs black. Male non-breeding (eclipse plumage) has dull black in place of glossy bronze on head, foreneck and back, a few metallic feathers on lower foreneck and back. Female is olive-green with brown mottling above, but crown, lores and ear-coverts dark brown, dark brown tail edged golden-yellow and graduated, central rectrices extending up to 10 mm beyond others, wing brown with yellow edges (looking all yellow when folded); chin and throat pale yellow, underparts dark olive-yellow, heavy dark brown mottling on centre of abdomen; bare parts as male. Juvenile is like adult female, but underparts olive with extensive black barring, has black face, chin and throat, and less bright yellow edges on remiges and rectrices. Race *lathburyi* is smaller (wing 75–80 mm) than nominate (79–86 mm), with bill more curved; *shellyae* has bill less curved than nominate, female crown grey. **Voice.** Chattering song includes bursts of twitters mixed with high “chi-chi-chi” notes. Calls include quiet “jwee” and “tweep” notes, fast repetition of “cha” and rapid “chuk-chi-chi-chek, cher-cher-cher”.

Habitat. High-lying areas with grassland, montane forest and bamboo clearings, also gardens and agricultural areas; at 1170–3300 m.

Food and Feeding. Insects, including beetles (Coleoptera), Hymenoptera and flies (Diptera), and nectar. Forages singly, in pairs and in groups, sometimes in very large flocks. Takes insects and nectar from plants such as aloes (*Aloe*), *Erythrina abyssinica*, *Fuchsia* species, *Ipomoea batatas*, *Jacaranda mimosifolia*, *Leonotis* species and mistletoes (Loranthaceae). Catches alate ants in flight. Adopts feeding territories in *Leonotis nepetifolia*. Acquires yellow coating of pollen on crown when feeding on lion’s claw flower (*Crotalaria agatiflora*).

Breeding. Egg-laying recorded in May in DR Congo, Jan and Oct in Kenya and Feb and Apr in Tanzania. Globular nest, some with porch and others without, constructed variously with grass, flower stalks. *Usnea* lichens and gossamer, lined with plant down, placed 1 m or more up in *Leonotis* plant, on top of thistle or in shrub. Clutch 1 egg, whitish, heavily mottled with grey-brown, spots denser at wider end; no information on incubation and nestling periods.

Movements. Seasonal altitudinal movements of up to 1000 m or more in response to flowering regimes; one female recovered 101 km from ringing site.

Status and Conservation. Not globally threatened. Common throughout range.

Bibliography. Backhurst (1973, 1977), Baker & Baker (2007), Chapin (1954), Cheke & Mann (2001), Friedmann (1937), Friedmann & Stager (1969), Fry *et al.* (2000), Gill & Wolf (1975a, 1975b, 1977, 1978, 1979), Hall & Moreau (1970), Lewis & Pomeroy (1989), Lott (1991), Prigogine (1952, 1971), Pyke (1979), Sheppard (1958), Travis (1982), Williams (1956), Wolf (1975a), Zimmerman *et al.* (1996).

Genus *CINNYRIS* Cuvier, 1816

55. Olive-bellied Sunbird

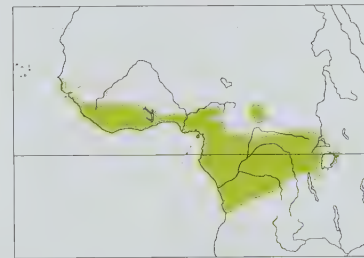
Cinnyris chloropygius

French: Souimanga à ventre olive **Spanish:** Suimanga Ventríoliva
German: Olivbauch-Nektarvogel

Taxonomy. *Nectarinia chloropygia* Jardine, 1842, Aboh, Nigeria. Genus often subsumed in *Nectarinia*. Race *bineschensis* poorly differentiated from, and sometimes synonymized with, *orphogaster*; moreover, it is isolated from other races of present species, and has been suggested also as being possibly misidentified *C. reichenowi*. Proposed races *luhderi* (described from Bipindi, in Cameroon) and *insularis* (Bioko) synonymized with nominate; *uelliensis* (Koloka, Angu and Amadi, on R Uelle, in DR Congo) merged with *orphogaster*. Females in Cameroon and DR Congo having light yellow pectoral tufts and red breastband but no metallic plumage described as race *ogilviegranti*, but shown to be aberrantly plumaged females of nominate race. Four subspecies recognized.

Subspecies and Distribution.

C. c. kempi Ogilvie-Grant, 1910 – Senegal E to SW Nigeria.
C. c. chloropygius (Jardine, 1842) – Bioko I (Fernando Póo) and SE Nigeria E to S Chad and Central African Republic, S to NW Angola and W DR Congo.
C. c. orphogaster Reichenow, 1899 – C & E DR Congo and S Sudan S to NE Angola, Rwanda, Burundi, Uganda, W Kenya and W Tanzania.
C. c. bineschensis Neumann, 1903 – SW Ethiopia.



Descriptive notes. 10.5–11 cm; male 4.7–8 g, female 5–7.5 g. Male nominate race is metallic green on head and throat and from crown to uppertail-coverts; upperwing brown, secondaries narrowly edged olive, tail black with dark blue sheen; blue band below throat merges into scarlet breastband (10 mm wide), otherwise olive below, pectoral tufts bright yellow; underwing off-white, washed yellow or grey; iris brown; bill and legs black. Female is olive above, with pale supercilium, dark stripe through eye, brown flight-feathers and wing-coverts edged green-olive, tail black with dark blue sheen; chin off-white, throat pale olive,

underparts olive-tinged yellow; bare parts as male. Immature male resembles female, but more brown above; some subadult males retain white underwing-coverts from immature plumage, even when iridescent feathers present, and thus confusable with *C. minullus*. Race *kempi* male is lighter, more olive, below and has narrower, more orange breastband than nominate; *orphogaster* male has darker abdomen than nominate; *bineschenis* is like previous, but male abdomen is darker, more sooty-coloured. **Voice.** Short song 3–4 seconds, beginning with “pisr-pisr”, then fast rising and falling notes, “sisisisisi-sisisisi-si”, and other warblings. Calls include repetitions of “chip”; also “zit-zit, zeet-zeet” or “psee”.

Habitat. Clearings in forest, cultivations, gardens, well-wooded savanna, coastal thickets and mangroves.

Food and Feeding. Insects, spiders (Araneae), nectar, seeds and bits of flowers. Forages mostly in pairs or small groups. Visits *Cogniauxia podolaena*, *Manihot esculenta*, *Manihot utilissima*, *Occhiothosmus africanus*, *Psidium guajava*, *Spathodea nilotica*, *Thevetia peruviana*, *Touracanthus africanus*, and flowers of genera *Bongainvillea*, *Canna*, *Clerodendrum*, *Coffea*, *Erythrina*, *Heliconia*, *Hibiscus*, *Ipomoea*, *Maerua*, *Musa*, *Solanum* and *Yucca*. Robs flowers of nectar, and hovers in front of flowers.

Breeding. Laying recorded in Oct–Nov in Sierra Leone, Feb and Nov in Liberia, Dec in Ivory Coast, Feb, Apr and Sept–Oct in Ghana, May–Oct in Nigeria, Feb–Jun, Aug–Dec in Cameroon, Sept in Bioko, Aug and Dec–Mar in Gabon, Jan and Sept–Oct in DRCongo, in all months except May and Jul in DRCongo, Jul in Ethiopia, Feb–Mar, Jul–Sept and Nov in Uganda, Nov in Tanzania, and Mar and Dec in Angola. Untidy oval nest made of grass, bark and leaves, with short messy “beard” and porch, lined with grass, plant material, feathers and/or wool, attached 1–10 m up on branch of bush or palm. Clutch 1–3 eggs, long pointed oval, white or grey, with grey blotches or stripes and grey or brown spots concentrated at wider end; incubation by female only, chicks fed by both parents; no information on duration of incubation and nestling periods. Nests parasitized by African Emerald Cuckoo (*Chrysococcyx cupreus*) and Western Green-backed Honeyguide (*Prodotiscus insignis*).

Movements. Partial migrant in W Africa, where some travel N at start of rainy season.

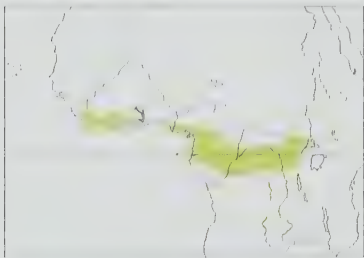
Status and Conservation. Not globally threatened. Generally common throughout much of range, but rare in Ethiopia and Sudan. Occurs in several protected areas, e.g. Korup National Park, in Cameroon.

Bibliography. Ash (1994), Atkins (1994), Baker & Baker (2007), Bannerman (1921a), Bates (1927), Borrow & Demey (2001), Brosset & Énard (1986), Butten (1967), Carroll (1988), Chapin (1954), Cheke & Mann (2001), David & Gosselin (2002b), Eizentraut (1963), Fry *et al.* (2000), Hall & Moreau (1970), Lachenaud (2006a, 2006b), Lewis & Pomeroy (1989), Mariaux & Vanher (1991), Nikolaus (1987), Prendergast (1983), Prigogine (1971, 1972, 1978b), Rand *et al.* (1959), de Roo-de Ridder & de Roo-de Ridder (1969), Seric (1957), Traylor & Parelus (1967), Waltert & Faber (2000), Zimmerman *et al.* (1996).

56. Tiny Sunbird
Cinnyris minullus

French: Souimanga minule **German:** Zwergnektarvogel **Spanish:** Suimanga Enano

Taxonomy. *Cinnyris minullus* Reichenow, 1899, Yaoundé, Cameroon. Genus often subsumed in *Nectarinia*. Supposedly larger birds from Bioko I described as race *amadoni*, and others, from R Luulaba, in DRCongo, described as race *marginatus*; both, however, fall within range of variation of populations elsewhere in species’ area of distribution. Monotypic. **Distribution.** Sierra Leone E to Ghana, and S Nigeria, Bioko I (Fernando Póo) and Gabon E to DRCongo and W Uganda.



Descriptive notes. 9–10 cm; 4.5–6.5 g. Male has head, chin, upper throat and upperparts metallic green, bluer on uppertail-coverts; upperwing very dark brown, greater wing-coverts narrowly edged metallic green, lesser and median coverts metallic green; tail black with metallic blue-purple wash; thin iridescent blue band on lower throat, above scarlet breastband with many metallic blue patches within it; pectoral tufts yellow, dark olive belly and below; inner borders of undersides of flight-feathers greyish-white, axillaries yellowish-white, underwing-coverts white; iris dark brown; bill and legs black. Female is dark olive-green above, with narrow olivaceous-yellow supercilium, dark line through eye, dark brown remiges edged dark yellowish and wing-coverts edged olive-yellow, tail very dark brown with blue gloss, outer rectrix paler, throat grey or dusky olive-green, flecked whitish, underparts olive with yellow wash, yellow most obvious on belly; underwing-coverts and axillaries as male; iris very dark brown, bill black but paler proximally, base of lower mandible yellowish, legs black. Juvenile is similar to female, but with dark grey throat bib (whitish-grey at margins), supercilium shorter and less distinct, underparts washed bright yellow, gape pink-tinged orange-yellow. **Voice.** Song a high-pitched succession of squeaky “tsi-tsi-tsi” or “suisui-sui-sui”, for c. 15 seconds, or shorter burst of “tsi” or “twee”, before a warble including “chip” notes, for 2–3 seconds. Calls “chip” or “chip-chip”.

Habitat. Occurs in mature or secondary forest, forest edges and clearings, and forest savanna mosaic; also found in gardens, cocoa plantations, abandoned agricultural fields, and around villages in forest.

Food and Feeding. Nectar, pollen and small insects. Forages singly and in pairs; joins mixed-species flocks in upper strata of forest. Visits flowers of *Anthoecista*, *Delonix regia*, *Leca*, *Maranthus*, *Mussaenda* and creepers.

Breeding. Egg-laying recorded in Apr–Jun and Oct in Cameroon and Mar, Jun and Dec in DRCongo, and occupied nests in Sept and Nov in Gabon. Small, ovoid nest 13 cm tall, 7.5 cm wide, side entrance 2.5 cm wide sited 9 cm below top, with porch of *Marasmius*, nest always includes bark, and is well made with rootlets of epiphytes, grass stems and dead leaves, held together with cobwebs and filaments of *Marasmius* fungus, lined with kapok, fine grass or pappus, and decorated with bark, lichen, dry leaves or flowers; placed 1.5–3 m up on leafy branch in tree; site sometimes reused in successive years. Clutch 1–2 eggs, long oval, white with green or blue tinge, heavily marked with grey-brown or dark brown spots, or with irregular grey or dark lilac-grey blotches concentrated at wider end; incubation by female alone, both sexes feed nestlings; no information on duration of incubation and nestling periods.

Movements. No data.

Status and Conservation. Not globally threatened. Locally common; rare in Nigeria and mainland Equatorial Guinea; scarce in Uganda, mostly restricted to W forests. Widespread and not uncommon in Gabon, where 2–3 birds/10 ha. Occurs in several protected areas.

Bibliography. Amadon (1953), Bannerman (1948, 1951), Bates (1911), Borrow & Demey (2001), Brosset & Énard (1986), Carswell *et al.* (2005), Chapin (1954), Cheke & Mann (2001), Christy & Clarke (1994), Eizentraut (1965, 1973), Fry *et al.* (2000), Hall & Moreau (1970), Pérez del Val (1996), Prigogine (1971, 1972), Rand *et al.* (1959).

57. Miombo Double-collared Sunbird
Cinnyris manoensis

French: Souimanga du miombo **German:** Miombonektarvogel **Spanish:** Suimanga del Miombo
Other common names: Miombo/Double-collared Sunbird; Pinto’s Double-collared Sunbird (*pintoi*)

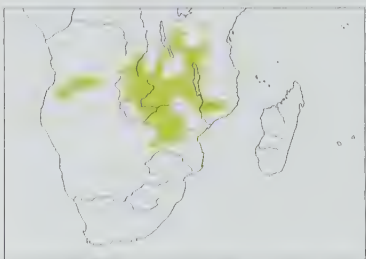
Taxonomy. *Cinnyris manoensis* Reichenow, 1907, Langenburg (= Missale), Malawi. Genus often subsumed in *Nectarinia*. Forms a superspecies with *C. chalybeus*, and sometimes considered conspecific. Recent work indicates that *pintoi* is probably best treated as a separate species; occurs in sympatry with nominate along Muchinga Escarpment in Zambia; apparent ecological separation in the same zone, *pintoi* occupying pure miombo, with nominate found more towards rocky edge habitat with aloes; eggs and nest reported to be recognizably different from those of nominate; also, consistent morphological differences, with no evidence of intergradation. An as yet undescribed taxon, apparently close to present species or to race *whytei* of *C. ludovicensis*, occurs in NE Zambia and Tanzania; may belong with either of these species or represent a distinct species (see page 201). Race *pintoi* formerly referred to by name *intermedius*, but that name is preoccupied. Other proposed races are *gertrudis* (described from Songea, in S Tanzania), *namwera* (Mangoche Mts, in S Malawi), *zonarius* (Zobuc, in border region Malawi–Mozambique) and *bractatus* (Fort Chiquaquia, in N Zimbabwe), all synonymized with nominate. Three subspecies currently recognized.

Subspecies and Distribution.

C. m. pintoi (Wolters, 1965) – C Angola, S DRCongo, SW Tanzania, Zambia (W of Luangwa rift) and N Malawi (N of Ntchisi).

C. m. manoensis Reichenow, 1907 – C & W Tanzania (also isolated populations in N), E Zambia, Zimbabwe, S Malawi (S of Ntchisi) and N Mozambique.

C. m. amicornum (Clancey, 1970) – Mt Gorongosa, in S Mozambique.



Descriptive notes. 13 cm; 6.8–12.8 g. Male nominate race is metallic green with bronze reflections from head to lower back and from chin to upper breast; rump pale olivaceous brown, tips of uppertail-coverts iridescent blue; upperwing greyish-brown, lesser wing-coverts metallic green; tail slightly glossy dark brown, outer rectrix paler and with greyish-white on outer margin; narrow (2 mm deep) violet-blue band above larger (10 mm deep) scarlet band on lower breast; pectoral tufts yellow, belly and vent pale olivaceous; underwing-coverts dull white, axillaries washed yellow; iris dark brown; bill and legs black. Female is greyish-brown on head and upperparts, with dusky brown lores, rump washed with olive, wing greyish-brown, edged pale brown; brownish-grey with some speckles below, belly paler with slight yellow wash, bare parts as male. Juvenile is similar to female. Race *amicornum* is slightly larger than nominate, male greener above, upper breastband more violet and belly darker, female darker above and browner below than nominate; *pintoi* male has uppertail-coverts greyish or narrowly tipped glossy green (without blue or violet), underparts paler grey, and bill shorter and finer than nominate, juvenile similar to female but more olive, male gains adult dress only at end of third year, until when retains many dull olive feathers above and on breast, red and blue chestbands are irregular, and no white on tail. **Voice.** Song a short descending trill and a complicated warble, in bursts of 7–8 seconds, of rising and falling “tsee-see-tsee-tsee”, usually preceding “chip-chip”. Latter also as call; other calls are variations of “zit”, or “zip-chip-chip-chip” or “zip-chip”.

Habitat. Miombo woodland, savanna, riverine woodland, gardens and parks; also thorn-scrub and highland *Leucospermum* areas in Zimbabwe, where reaches 1500 m; found in *Cryptosepalum* forest in Zambia.

Food and Feeding. Nectar, insects, also spiders (Araneae). Takes nectar from flowers of low-growing plants such as aloes (*Aloe*) and species of *Leonotis*, *Hibiscus* and *Kniphofia*, and from flowers of trees such as *Bauhinia*, *Brachystegia speciformis*, *Fauarea saligna*, *Erythrina abyssinica*, eucalypts (*Eucalyptus*) and *Jacaranda mimulopsis*, and from mistletoes (Loranthaceae). Hawks for insects; gleans for invertebrates among mopane trees (*Colophospermum mopane*). Males defend feeding areas from both conspecifics and other species; dominant over *C. talatata* and *C. bifasciatus* at *Cassia singuena* trees. Drinks from birdbaths.

Breeding. Egg-laying recorded in Sept in Tanzania, Aug and Oct–Nov in Zambia, May–Nov and Jan–Feb in Malawi, May in Mozambique, and all year (mainly Sept–Nov) in Zimbabwe. Male displays include swinging upside-down on perch while singing to female carrying nest material; partners perform pivoting actions and face-to-face bowing on perch. Pear-shaped or spherical nest made of grass, cobwebs or plant down, in Zambia of *Usnea* lichen, 2–6 m up on bush, attached by twigs through top of dome; sometimes on house verandah. Clutch 1–3 eggs, pinkish-white, dull grey or light brown with brown streaks along length of egg or brown blotches, in Zambia plain olive or chocolate-coloured; incubation period 14–16 days; nestling period 13–15 days. Undescribed form (possibly belonging to present species or *C. ludovicensis*, or a distinct species) has been found breeding in NE Zambia: nest made of grass; eggs pale and freckled.

Movements. Resident in some areas. Nomadic in Zimbabwe, where ascends to higher altitudes in droughts. One individual recovered 29 km from ringing site. Shifts to seek flowering plants.

Status and Conservation. Not globally threatened. Common in Malawi and Zimbabwe; locally common in Angola; uncommon in Tanzania and Zambia. Occurs in some protected areas; e.g. in Malawi found in Lilongwe Nature Sanctuary and Dzalanayama Reserve.

Bibliography. Baker & Baker (2007), Chapin (1954), Cheke & Mann (2001), Fry *et al.* (2000), Hamner (1997, 2001), Haugard (1995), Hoeky *et al.* (2005), Lane (1992), Macdonald (1958), Manson (1986), Shaw (2001a), Tarboton (2001), Tree (1990, 1997d, 2001), Vincent (1949).

58. Southern Double-collared Sunbird
Cinnyris chalybeus

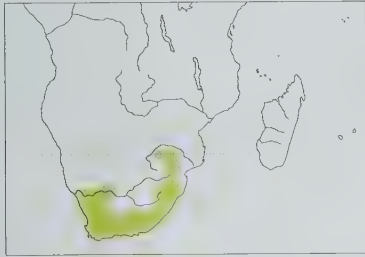
French: Souimanga chalybée **German:** Halsbandnektarvogel **Spanish:** Suimanga Acerado
Other common names: Lesser/Smaller/Grey-bellied Double-collared Sunbird, Red-collared Sunbird

Taxonomy. *Certhia chalybea* Linnaeus, 1766, Cape of Good Hope, South Africa.

Genus often subsumed in *Nectarinia*. Forms a superspecies with *C. manoensis*, and sometimes considered conspecific. Additional proposed races in South Africa are *capricornensis* (described from Soutpansberg, in Limpopo Province), synonymized with *subalaris*, and *albilateralis* (from Port Nolloth, in W Northern Cape), considered inadequately differentiated from nominate. Two subspecies recognized.

Subspecies and Distribution.

C. c. chalybeus (Linnaeus, 1766) – S Namibia and W South Africa (Northern Cape, Western Cape).
C. c. subalaris Reichenow, 1899 – E South Africa (Limpopo Province S to Eastern Cape) and Swaziland.



Descriptive notes. 12 cm; 6–10 g. Male nominate race breeding is metallic green on head, throat, upper breast, neck, mantle, back and rump; uppertail-coverts iridescent bright blue, tail black with blue sheen, outer web of outer rectrices whitish; upperwing and primary and greater wing-coverts dark brown, lesser coverts metallic green; green of upper breast bordered below by narrow band (2 mm deep) of iridescent bluish-violet, and under this a scarlet breastband 8–10 mm deep; yellow pectoral tufts, upper belly smoky grey, lower belly, flanks and undertail-coverts paler olive-grey, underwing-coverts pale brown; iris dark brown;

bill and legs black. Male non-breeding (eclipse plumage) is similar to female, but wings and tail as breeding male, metallic colours on mantle to uppertail-coverts and a few on head, chin and throat, and some red feathering on lower breast. Female has crown and nape grey-olive, upperparts grey-brown, washed olive on mantle and upperwing-coverts, pale yellow on bend of wing, tail blackish-brown, paler on outermost feathers, which have whitish outer web and tip; throat and breast olive-grey, sometimes with diffuse streaking, belly and undertail-coverts greyer, axillaries and underwing-coverts pale greyish-yellow; bare parts as male, buccal cavity orange (changing to pink when ready to lay). Juvenile as female; immature male similar to adult but with some olive feathering within metallic plumage, also has eclipse plumage with brown head and only 10–30% of feathers (mostly on nape) glossy green. Race *subalaris* male is darker grey, more olive-tinged, on abdomen than nominate, bill slightly longer (24–26 mm; nominate 21–23 mm), female generally greener and darker above. **VOICE.** Song starts and finishes with a series of 6–12 harsh “ptzzer” or “ssssweee” hisses, and is otherwise a warble of rising and falling “tsee” and a distinctive rising “weeto-weeto-weet” intermixed with rising and falling “weeta witta witta-weeta, witta witta, witta witta wit” and variants. Female also has subsong, indistinguishable from that of males. Calls include “cher-cher”, “swik-swik”, “chee-chee”, “zz, zz, zz, zhik” and a plaintive “tseet”.

Habitat. Varied, including scrub, gardens, fynbos, plantations, protea (*Protea*) areas of highlands and dune thickets; woodland and coastal, inland and evergreen montane forests.

Food and Feeding. Nectar, insects, spiders (Araneae); probes fig fruits (*Ficus*). Associated with the milkweed *Microlooma sagittatum*; the birds collect its pollinia, which become attached to the tongue by slotting into a specialized groove. Visits wide range of other foodplants, including *Brunsvigia orientalis*, *Burchellia bubalisia*, *Canna indica*, *Erythrina lysistemon*, *Erythrina tomentosa*, *Grevillea banksii*, *Halleria lucida*, *Justicia guttata*, *Kniphofia rhodesiana*, *Kniphofia uvaria*, *Lachenalia viridiflora*, *Lachenalia pendula*, *Manihot glaziovii*, *Pelargonium inquinans*, *Phygelius capensis*, *Schotia afra*, *Tecoma capensis*, species of genera *Aloe*, *Bauhinia*, *Cadaba*, *Callistemon*, *Carissa*, *Erica*, *Eucalyptus*, *Gladiolus*, *Lantana*, *Leonotis*, *Leucospermum*, *Lycium*, *Musa*, *Nicotiniana*, *Protea*, *Prunus*, *Salvia*, *Strelitzia*, and mistletoes (Loranthaceae). Hovers in front of flowers, and nectar-robs others. Hawks for insects.

Breeding. Egg-laying Apr–Dec in South Africa; sometimes double-brooded. Territorial. Males may sing from perches for 15 minutes or more, sometimes flashing pectoral tufts at each other; sometimes sings on the wing, and conducts wing-clapping display; male often pecks cloaca of female, usually before mating. Nest built by female, taking 1–4 weeks to do so (one nest built in a week, with peak rate of 39 visits per hour), compact and pear-shaped or oval, constructed with grass, lichen, wool, feathers, twigs and cobwebs, sometimes with porch over entrance, covered externally with cobwebs, lined with feathers, hairs, plant down or (in upland areas) *Usnea* lichen, usually without “beard” but one nest had dangling beard of *Usnea*, can be sited less than 0.2 m above ground, but usually c. 1.5 m up in ericaceous or other shrub and occasionally up to 8 m up (e.g. in *Podocarpus falcatus*); nest sometimes reused. Clutch 1–3 eggs, creamy to grey-white or green-white, densely covered with brown, grey, sepia or black mottles, lines and spots; incubation by female, period 2 weeks; chicks brooded by female, fed by both parents, both also remove faecal sacs, which may be passed to them by 10-day-old nestlings; nestling period 15–19 days; fledglings return to nest to roost for up to 9 nights, remain with parents for up to c. 1 month. Nests parasitized by Klaas’s Cuckoo (*Chrysococcyx klaas*).

Movements. Recoveries up to 34 km from where ringed suggest dispersion in search of food, and post-breeding movements indicated by regular times of arrival and departure at some sites. Leaves arid W areas in Jul–Dec, moving into S Eastern Cape May–Nov. Appears suddenly in synchrony with blooming of aloes (*Aloe*).

Status and Conservation. Not globally threatened. Common to fairly common or locally common throughout range.

Bibliography. Brieschke (1991), Cheke & Mann (2001), Chenaux-Repond (1975), Clancey & Irwin (1978), Compton *et al.* (1996), Follet (1990), Fraser (1989, 1997d), Fraser *et al.* (1989), Fry *et al.* (2000), Hall & Moreau (1970), Hockey *et al.* (2005), Keast (1968d), Leon & Nicolson (1997), Lotz & Nicolson (1996), Martin (1983), Martin *et al.* (1991), McCardle (1989), Mortimer & Martin (1991), Oatley (1995, 1997), Pauw (1998), Rebelo (1987b), Schmidt (1964, 1991), Skead (1967), Swynnerton (1916), van Tets & Nicolson (2000), Tree (2001), Uys (1981a), Vincent (1949), van Zijl (1999).



PLATE 14

inches 3
cm 8

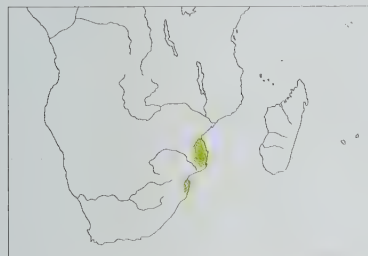
59. Neergaard's Sunbird

Cinnyris neergaardi

French: Souimanga de Neergaard **Spanish:** Suimanga de Neergaard
German: Neergaardnektarvogel
Other common names: Coguno Double-collared Sunbird

Taxonomy. *Cinnyris neergaardi* C. H. B. Grant, 1908, Coguno, Mozambique. Genus often subsumed in *Nectarinia*. Monotypic.

Distribution. SE Mozambique (Beira area S to Inhambane, and S from Maputo) and NE South Africa (coastal belt S to S of Richard's Bay, in KwaZulu-Natal).



Descriptive notes. 10–11 cm; male 6.2–7.1 g, female 5.6–5.9 g. Male has head, throat and upperparts, including median and lesser upwing-coverts, iridescent bright green, uppertail-coverts bright blue, tail dark brownish-black; remiges, primary coverts, alula and greater wing-coverts black; thin iridescent blue band beneath green throat; breast scarlet, thinly speckled with blue, pectoral tufts yellow, belly and undertail-coverts dull black, axillaries also black, underwing-coverts brown; iris dark brown; bill and legs black. Female is grey-brown above, rump more olive, rectrices dark brown, outer pair paler, particularly on outer webs, has narrow buff-white supercilium, dark grey-brown side of head; remiges dark grey-brown, primaries edged greyish-white, secondaries, tertiaries and greater wing-coverts with broader pale grey-brown edges, lesser and median coverts grey-brown; pale grey-brown below, lightly tinged yellow on lower breast and belly, underwing-coverts and axillaries off-white; bare parts as male. Juvenile is similar to female. Voice. Song consists of repetitions of sequence involving “tsui-tsui” followed by rapid burst of “ti-ti-ti-ti...”, for 1–3 seconds.

Habitat. Coastal scrubland, particularly dry sandy thornbush and woodland, clearings, and villages inland.

Food and Feeding. Nectar, small insects, and spiders (Araneae). Takes nectar from aloes (*Aloe*), *Ceroiops tagal*, *Schotia capitata* and *Syzgium cordatum*. Associates with *Chalcomitra amethystina*.

Breeding. Egg-laying in Sept–Jan in Mozambique and Jul, Oct and Nov in South Africa. Territorial males sing from tops of trees. Bulky nest, made of fibres and feathers, camouflaged with insect larvae, lined with white fibres from seedpods of the creeper *Strophanthus lucidus*, hidden in thick clump of *Usnea* lichen or suspended 5–6 m up in *Acacia burkei* tree. Clutch 2 eggs, dull brown with blackish spots and blotches. No other information.

Movements. Present in extreme S Mozambique only in austral summer, indicative of nomadism in non-breeding season.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species; present in South-East African Coast EBA. Not uncommon, but restricted to dry woodland and forest on sandy soil. Coastal habitat threatened by deforestation and by afforestation with non-native species in Mozambique. Occurs in Mkuze Game Reserve, in South Africa.

Bibliography. Anon. (1980a, 2007), Butchart & Stattersfield (2004), Cheke & Mann (2001), Chittenden (1995), Clancey (1952, 1964, 1971), Fry *et al.* (2000), Hall & Moreau (1970), Hockey *et al.* (2005), Johnson (1997), Skeud (1967), Stattersfield & Capper (2000), Tarboton (2001).

60. Stuhlmann's Double-collared Sunbird

Cinnyris stuhlmanni

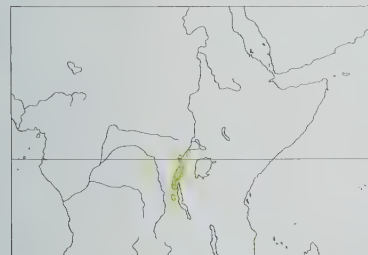
French: Souimanga de Stuhlmann **Spanish:** Suimanga de Stuhlmann
German: Stuhlmann-Nektarvogel
Other common names: Rwenzori Double-collared Sunbird

Taxonomy. *Cinnyris stuhlmanni* Reichenow, 1893, West Rwenzori, DR Congo.

Genus often subsumed in *Nectarinia*. Forms a superspecies with *C. prigoginei* and *C. ludovicensis*; sometimes treated as conspecific with first of those. Has been considered conspecific also with *C. afer*, and is closely related to *C. reichenowi*. Four subspecies recognized.

Subspecies and Distribution.

C. s. stuhlmanni Reichenow, 1893 – Rwenzori Mts, in NE DR Congo and W Uganda.
C. s. chapini Prigogine, 1952 – mountains of E DR Congo from W of L Edward (Nord-Kivu District) S to NW of L Tanganyika (Mt Kabobo, in Sud-Kivu).
C. s. graueri Neumann, 1908 – mountains S & E of L Edward (E DR Congo and SW Uganda) S to N tip of L Kivu (Virunga Volcanoes and NW Rwanda above 1800 m).
C. s. schubotzi Reichenow, 1908 – mountains of Nyungwe Forest, in SW Rwanda (S L Kivu), and W Burundi (mountains NE of Bujumbura).



Descriptive notes. 13–14 cm; 6–11.5 g. Male nominate race breeding has head to upper breast and upperparts, including scapulars and lesser and median wing-coverts, metallic emerald-green, uppertail-coverts metallic violet-blue, tail very dark brown with white tips and narrow white edges on two outer feather pairs, graduated, central feather pair 13 mm longer than outer feathers; upperwing mostly dark brown, feathers more olivaceous on edges; lower breast with thin (3 mm deep) metallic violet band, bordered below by broader (16–22 mm deep) scarlet band, with brown speckling; dark olive below, pectoral tufts yellow, underwing-coverts and axillaries grey; iris dark brown; bill and legs black. Non-breeding male resembles female, but wings darker and wing-coverts retain metallic coloration. Female is

dark olive-green above, darker on side of face, wings and tail dark brown, wing feathers with pale edges, primaries with yellow tinge on edges, lesser and median coverts dark olive-green; grey-olive with indistinct darker barring below, centre of belly pale, tinged yellow, underwing-coverts and axillaries white, washed yellow; bare parts as male. Juvenile undescribed. Race *chapini* male has shorter bill (22–25 mm) than nominate, darker red breastband, belly dark grey; *graueri* male is similar to nominate but smaller and shorter-billed (17.5–21.5 mm), with uppertail-coverts more violet blue, breastband brick-red, and abdomen buff-grey, less olive; *schubotzi* female has throat and upper breast darker grey than other races. Voice. Warbling song consists of “chee-oo, che che, chee-oo, che che, se, se, se, se, se, se, se, se, ee chit, che chit-che chit”, rising just before end and then dropping. Calls include “tsp”, “chee-chee” and drawn-out “iseeep”.

Habitat. *Hypericum* scrub, montane forest, bamboo, heaths, forest edges and clearings, above 2000 m.

Food and Feeding. Nectar, insects, and spiders (Araneae). Forages singly and in pairs; sometimes in larger flocks. Visits flowers of *Balthasaria schliehii*, *Crotalaria agatiflora*, *Hypericum revolutum*, *Kniphofia princiae*, *Labellia gibberoa*, *Labellia mildbraedii* and *Symphonia globulifera*. Forages also in manner of a tit (Paridae), in trees.

Breeding. Egg-laying in Jun, Sept and Dec in DR Congo and Sept and Dec in Uganda. Male displays involve hopping with drooped and quivering wings while singing, with pectoral tufts played at right angles to body. Nest built by female, small oval structure constructed from *Usnea* lichen, moss, leaves, feathers and pappus, held together with cobwebs, lined with pappus and feathers, placed 2–5 m up in tree. Clutch 1 egg, dark olive with darker olive freckles (nominate race) or matt white and covered with ash-grey or pale brown markings with dark ring at wider end (*graueri*); no information on incubation and nestling periods.

Movements. No information.

Status and Conservation. Not assessed. Restricted-range species; present in Albertine Rift Mountains EBA. Abundant in Burundi near Rwanda border between 2750 m and 3500 m, but rare below 2400 m. Uncommon in Rwenzori Mts in DR Congo. Abundant above 2750 m on Mt Muhavira, in Uganda.

Bibliography. Carswell *et al.* (2005), Chapin (1954), Cheke & Mann (2001), Clancey & Irwin (1978), Dowsett-Lemaire (1990), Fry *et al.* (2000), Grant & Mackworth-Praed (1943b), Gyldestolpe (1924), Mackworth-Praed & Grant (1945), Prigogine (1952, 1979), Schouteden (1938), Williams (1952).

61. Prigogine's Double-collared Sunbird

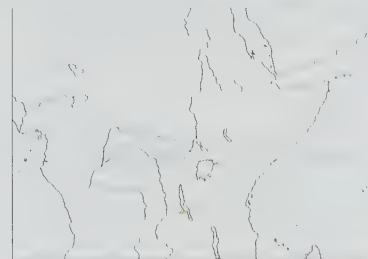
Cinnyris prigoginei

French: Souimanga de Prigogine **Spanish:** Suimanga de Prigogine
German: Marungunektarvogel
Other common names: Marungu/Prigogine's Sunbird

Taxonomy. *Cinnyris afer prigoginei* Macdonald, 1958, Marungu Highlands, DR Congo.

Genus often subsumed in *Nectarinia*. Forms a superspecies with *C. stuhlmanni* and *C. ludovicensis*; sometimes treated as conspecific with one or other of those. Has been considered conspecific also with *C. afer*, and is closely related to *C. reichenowi*. Considered by some to be possibly of hybrid origin, perhaps *C. stuhlmanni* × *C. medioeris*. Monotypic.

Distribution. Marungu Highlands, in SE DR Congo.



Descriptive notes. 13 cm; 8–10.9 g. Male breeding has head and mantle iridescent blue-green with golden reflections, rump blue, uppertail-coverts iridescent purple-blue; uppertail black with bluish tinge, tipped white with narrow white edges on two outer feather pairs; remiges and upperwing-coverts black; narrow breastband iridescent purplish-blue (more blue than uppertail-coverts), below which a very narrow (10 mm deep) dark red band; bright yellow pectoral tufts; belly yellow-olive, lower belly and undertail-coverts grey-brown, undertail dark brown, edged whitish; iris dark brown; bill and legs black. Non-

breeding male may have non-metallic olive intermixed with metallic green feathers on crown, side of head and back, with primaries and wing-coverts brown, not black, and lower abdomen greyish. Female has forehead to rump uniformly olive, uppertail black, outer feathers edged white, remiges dark brown or black, outer edges of primaries with olive-green edges and secondaries with edges more yellow-green; chin and throat dark olive with dusky markings, underparts olive, darker on upper breast, with flanks and vent yellow-olive, undertail black, broadly edged white; bill black with pale base, legs black. Juvenile undescribed. Voice. Song a high-pitched warble. Calls various cheeps and ticking notes.

Habitat. Montane forest, thickets and fields near rivers and streams, in montane areas to at least 1900 m.

Food and Feeding. No data; diet presumably nectar and invertebrates.

Breeding. Birds with active gonads in Feb and Apr. No other information.

Movements. No data.

Status and Conservation. Not assessed. Locally common. Deforestation by humans and streambank erosion by cattle pose threats to this species' restricted habitat.

Bibliography. Benson & Prigogine (1981), Chapin (1954), Cheke & Mann (2001), Clancey & Irwin (1978), Collar & Stuart (1985), Dowsett & Dowsett-Lemaire (1993), Dowsett & Prigogine (1974), Macdonald (1958), Prigogine (1979), Schouteden (1949).

62. Montane Double-collared Sunbird

Cinnyris ludovicensis

French: Souimanga d'Angola **German:** Bergnektarvogel **Spanish:** Suimanga Angoleño
Other common names: Ludwig's Double-collared Sunbird, Boeage's Montane Double-collared Sunbird

Taxonomy. *Nectarinea* [sic] *ludovicensis* Boeage, 1868, Biballa, Mossamedes, Angola.

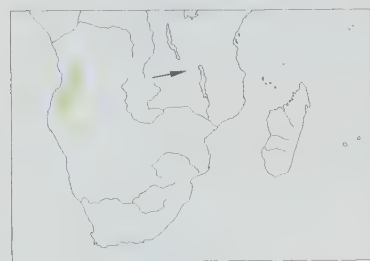
On following pages: 63. Northern Double-collared Sunbird (*Cinnyris reichenowi*); 64. Greater Double-collared Sunbird (*Cinnyris afer*); 65. Regal Sunbird (*Cinnyris regius*); 66. Rockefeller's Sunbird (*Cinnyris rockefelleri*); 67. Eastern Double-collared Sunbird (*Cinnyris medioeris*); 68. Moreau's Sunbird (*Cinnyris moreaui*); 69. Loveridge's Sunbird (*Cinnyris loveridgei*).

Genus often subsumed in *Nectarinia*. Forms a superspecies with *C. stuhlmanni* and *C. prigoginei*; sometimes treated as conspecific with one or other of those. Has been considered conspecific also with *C. afer*, and is closely related to *C. reichenowi*. Races geographically isolated from each other, possibly represent separate species. Further, an as yet undescribed taxon, apparently close to race *whytei*, occurs in NE Zambia and Tanzania (where fairly common at some localities in Eastern Arc mountains at forest edges and towards rainshadow NW of mountains); may belong with this species or *C. manoensis*, or represent a distinct species (see page 201). Two subspecies recognized.

Subspecies and Distribution.

C. l. ludovicensis (Bocage, 1868) – highlands of W Angola.

C. l. whytei Benson, 1948 – N Malawi (Nyika Plateau) and adjacent parts of Zambia.



Descriptive notes. 12–13 cm; 7–11 g. Male nominate race has head, upperparts and chin to breast iridescent green with gold reflections, uppertail-coverts metallic blue with violet sheen; uppertail black glossed blue, with white tips and narrow white edges on two outer feather pairs; lesser and median wing-coverts metallic green, rest of upperwing dark brown, flight-feathers edged olive-brown; green of upper breast divided from broad red lower breastband by narrow (2 mm wide) violet-blue band; pectoral tufts yellow, rest of underparts olive, pale grey underwing; iris dark brown; bill and legs black. Female is dark grey-brown

above, uppertail-coverts darker, tail black-brown, outermost rectrix and distal portion of adjacent one paler brown and with tips of inner webs grey-white, upperwing dark grey-brown, edged olive-brown, primaries thinly edged more golden olive-brown; narrow supercilium pale buff, face grey-brown, lores black-brown; chin grey-buff, throat and upper breast browner, mottled with buff, otherwise brown-grey below, middle of lower breast and belly paler and tinged olive-yellow, underwing and inner borders of underside of remiges grey-white; bare parts as male. Juvenile undescribed. Race *whytei* male has upper breastband more steel blue and wider (3 mm) than nominate and red breastband darker, more scarlet, and narrower, with some dusky bars, female is darker on chin and throat and with duller underparts greener. Voice. Song (race *whytei*) consists of bursts of high notes, “ti, ti, titi pitsy-pitsy, chu-chu-chu pitsy-pitsy, titititipitsy, piehew, chichichichi...”. Calls include variety of ticking notes; alarm call “tchep”.

Habitat. Montane forest, forest edge and grassland.

Food and Feeding. Nectar and insects. Forages singly and in pairs. Visits variety of flowers, including aloes (*Aloe*), mistletoes (*Loranthaceae*), *Canthium guenzii*, *Clerodendrum quadrangulatum*, *Crotalaria goetzei*, *Disa satyriopsis*, *Gladiolus natalensis*, *Halleria lucida*, *Hypericum revolutum*, *Impatiens gomphophylla*, *Lobelia giberroa*, *Pentas schimperana*, *Syzygium cordatum* and *Tecoma capensis*, and species of genera *Kniphofia*, *Leonotis* and *Protea*.

Breeding. Egg-laying in Feb–Aug in Malawi and birds with enlarged gonads Oct–Dec in Angola; two or three broods per season. Nest-building by female, nest suspended 1.5–5 m up in *Hagenia abyssinica*, *Buddleja salviifolia*, *Erica benguelensis*, *Rhus longipes* or *Anthospermum* species; material sometimes reused for subsequent nests; defended territory 0.1–0.5 ha. Clutch 1 egg, size (race *whytei*) 16.5–18.3 × 11.5–13.2 mm, otherwise undescribed; incubation by female, period c. 2 weeks; chicks brooded and fed by female, sometimes fed also by male, no information on duration of nestling period; fledglings fed by female or by both parents. Undescribed form (possibly belonging to present species or *C. manoensis*, or a distinct species) has been found breeding in NE Zambia; nest made of grass; eggs pale and freckled.

Movements. Apparently resident on Nyika Plateau.

Status and Conservation. Not assessed. Restricted-range species: present in Western Angola EBA. Locally common in Angola and Malawi.

Bibliography. Benson (1948), Cheke & Mann (2001), Dowsett (1983), Dowsett-Lemaire (1988, 1989a), Fry *et al.* (2000), Grant & Mackworth-Præd (1943b), Johnson & Brown (2004), Traylor (1962).

63. Northern Double-collared Sunbird

Cinnyris reichenowi

French: Souimanga de Preuss **German:** Preussnektarvogel **Spanish:** Suimanga de Preuss
Other common names: Preuss's/Nandi Double-collared Sunbird

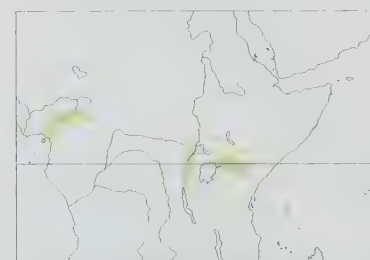
Taxonomy. *Cinnyris reichenowi* Sharpe, 1891, Sotik, south-west Kenya.

Genus often subsumed in *Nectarinia*. With such treatment, specific name of this species becomes preoccupied and is replaced by next available name, *kikuyuensis*; *preussi* then has date priority and becomes the nominate race. May form a superspecies with *C. afer*. Proposed races *genderuensis* (from Genduru Mts, in Adamaoua Plateau, in NC Cameroon) and *parvirostris* (from Bioko I) considered inseparable from *preussi*. Two subspecies recognized.

Subspecies and Distribution.

C. r. preussi Reichenow, 1892 – Bioko I (Fernando Pó), SE Nigeria, Cameroon and NW Central African Republic.

C. r. reichenowi Sharpe, 1891 – S Sudan, NE DR Congo, SW, NE & E Uganda, Rwanda, Burundi and W & C Kenya.



Descriptive notes. 11–12 cm; 5–10 g. Male nominate race has head, mantle, back, cheek and throat metallic green with steel-blue gloss, rump grey-brown with olive feather tips, uppertail-coverts metallic purple; tail black, glossed blue; upperwing and greater wing-coverts dark brown, lesser wing-coverts metallic green; thin purple band on lower throat, above scarlet breast; pectoral tufts yellow, rest of underparts dark olive-brown, somewhat paler on lowermost areas; underwing brown; iris black or dark brown; bill and legs black. Female is dull brownish olive-green above and on cheek, with remiges edged olive-yellow, tail very dark

brown; chin and throat greyer, latter strongly washed with olive, rest of underparts paler olive than upperparts, with yellow wash on belly, axillaries pale yellow, underwing-coverts white; iris dark brown, bill and legs black. Immature male resembles female. Race *preussi* is very like nominate, but has longer bill (16–19 mm; nominate 14–15 mm) and abdomen browner, less olive. Voice. Song of race *preussi* a burst of “chup-chup-ch-ch-ch” or “tsup-tsup” preceding a run of warbles, inter-

persed with up to c. 10 “psee” notes; song of nominate has a 2-note start before a fast twitter and then “tsip...tsweet...susususrisrisri-tsew-tsutsu-tsu”. Calls various high-pitched “zeet” or “chip”. **Habitat.** Montane heathland in Cameroon and on Bioko, and sometimes down to sea-level; montane, secondary and gallery forest, forest edge, plantations and gardens in E Africa. Reaches 2450 m in Rwanda, and above 1800 m in Sudan.

Food and Feeding. Insects, spiders (*Araneae*) and nectar. Forages singly and in pairs, outside breeding season also in groups; sometimes in mixed-species flocks. Nectar taken from *Erythrina* species, forest trees, aloes (*Aloe*), mistletoes (*Loranthaceae*), herbaceous plants, thistles and creepers. Nectar-robs from *Hibiscus*.

Breeding. Egg-laying recorded in Nov in Nigeria and Aug–Feb in Cameroon, May and Nov in DR Congo, Nov and Jan–Feb in Rwanda, Jan and Aug–Sept in Uganda and Jul in Kenya. Nest built by female alone, domed, with short porch, constructed from grass, moss, lichens and fibres, held together with cobwebs, lined with feathers, suspended 2–15 m above ground and well hidden in moss-covered branches of forest trees. Clutch 1–2 eggs, mauve-grey and pink-grey, heavily speckled black-brown or brown or grey, with grey blotches and blackish stripes. No other information.

Movements. Altitudinal migrant in Cameroon, appearing below breeding range during rainy season in Jul–Sept. Similar pattern in E Africa; common on Mt Elgon (Kenya) at 2800 m in Dec, but absent there in Jul.

Status and Conservation. Not globally threatened. Common on Bioko, and common to locally abundant in Cameroon and Nigeria; common to very common also in S Sudan, DR Congo and Burundi, and locally common elsewhere in E range.

Bibliography. Bannerman (1948, 1951), Bates (1927), Bennun (1986), Borrow & Demeu (2001), Boulton & Rand (1952), Carswell *et al.* (2005), Chapin (1954), Cheke & Mann (2001), Dowsett-Lemaire (1990), Eisenraut (1963), Eyckerman & Cuvelier (1982), Friedmann (1937), Fry *et al.* (2000), Grimes (1971), Hall & Moreau (1970), Lewis & Pomeroy (1989), Louette (1980), Newsome (1986), Nikolaus (1987), Serle (1951, 1957), Zimmerman *et al.* (1996).

64. Greater Double-collared Sunbird

Cinnyris afer

French: Souimanga à plastron rouge **Spanish:** Suimanga Bicollar
German: Doppelband-Nektarvogel

Other common names: Larger Double-collared/Red-breasted Sunbird

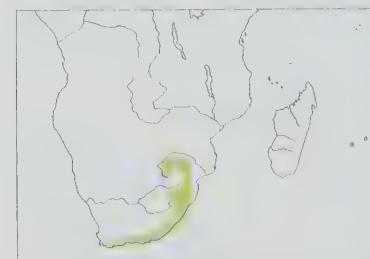
Taxonomy. *Certhia afra* Linnaeus, 1766, Cape of Good Hope, South Africa.

Genus often subsumed in *Nectarinia*. May form a superspecies with *C. reichenowi*; has sometimes been considered conspecific with *C. stuhlmanni*, *C. prigoginei* and *C. ludovicensis*. In addition, an undescribed taxon apparently close to present species, but probably closer to *C. ludovicensis* (of race *whytei*) or to *C. manoensis*, has recently been discovered in Eastern Arc mountains of Tanzania and in NE Zambia (see page 201). Races intergrade in SW Eastern Cape. Race *saliens* regarded by some authors as being of dubious validity. Two subspecies currently recognized.

Subspecies and Distribution.

C. a. afer (Linnaeus, 1766) – S South Africa (S Western Cape and SW Eastern Cape).

C. a. saliens (Clancey, 1962) – E South Africa (Limpopo Province and NE Gauteng S to NW KwaZulu-Natal and S Eastern Cape), W Swaziland and E Lesotho.



Descriptive notes. 11.5–12.5 cm; male 9–18 g, female 8.1–14 g. Male nominate race has head to rump metallic green with blue iridescence (but bases of feathers brown), uppertail-coverts iridescent violet, tail brown-black thinly glossed blue, with narrow whitish edges to outermost feather pair, flight-feathers, primary coverts and greater wing-coverts brown, median and lesser wing-coverts metallic green; throat metallic green, narrow blue-violet band above scarlet breast and upper belly, otherwise dark olive-buff below; iris dark hazel; bill and legs black. Female is smaller and shorter-billed than male, has head and upperparts dark

olivaceous grey, tail brown-black with slight blue gloss, outermost feather pair distally pale brown, wing grey-brown, flight-feathers, primary coverts and greater wing-coverts edged buffish; throat and breast grey, speckled with grey-olive, greyish-buff sometimes with yellow tinge below, paler on belly, flanks and undertail-coverts, axillaries and underwing-coverts pale green. Juvenile resembles female. Race *saliens* male is larger than nominate, has lighter non-metallic underparts, lighter red breastband with rest more yellow, female paler and greyish, more heavily patterned on throat and breast and greener on middle of lower underparts. Voice. Song, by both sexes, a melodious twitter involving “weetu” whistles, alternating between loud and soft, between series of 20 or more “tsi” notes, this followed by 3 or 4 “tsk” notes or fast repetitions of “weet” or “tscheep” (five times per second for 30 seconds). Varied calls include “sskert”, “tsig-tsig”, “chay-ing-chay-ing”, also “ch, ch, ch, cher-rrreee” and “issweeee”.

Habitat. Open habitats with scrub, from coastal plains to Afriomontane forest edge, including succulent karoo, *Protea* savanna, fynbos, moist woodland, parks and gardens.

Food and Feeding. Insects, including beetles (*Coleoptera*), flies (*Diptera*), homopteran bugs, Hymenoptera and Lepidoptera; also spiders (*Araneae*); also nectar and plant juices. Forages singly, in pairs and in small groups; joins mixed-species flocks. Takes spiders from their webs; seizes insects on the wing in sallies and by hovering. Gleans flowers and leaves for arthropods. Probes flowers for insects and nectar; takes juices of figs and grapes, and partial to liquid exudate at exit holes of fig-wasp *Elisabethiella baijnathi* in the fig *Ficus burtt-daveyi*. Visits *Acacia sieberiana*, aloes (*Aloe*), *Ananas comosus*, *Burchellia buhalisia*, *Crotalaria agatifolia*, *Disa chrysostachya*, *Hypericum revolutum*, *Kniphofia princiae*, *Lobelia giberroa*, *Lobelia mlsbraedii*, *Plumbago auriculata*, *Protea caffra*, *Protea roupelliae*, *Pyrostegia venusta*, *Spermacoce dibrachiata*, *Strelitzia reginae*, *Symphonia globulifera*, various figs (including *Ficus burtt-daveyi*), and species in the genera *Balthasaria*, *Bauhinia*, *Canna*, *Cotyledon*, *Erica*, *Erythrina*, *Gasteria*, *Hibiscus*, *Schotia*, *Tecoma* and *Vitis*.

Breeding. Egg-laying in all months in South Africa; up to three broods. Male sings with head pointing skywards in close proximity to rivals, which respond with head-bobbing; cloaca-pecking common. Displaying male sways left and right, bobs head, fans tail and shows pectoral tufts, also indulges in jerky display-flights; partners may swing upside-down from perches. Nest built by female, taking 10–24 days, oval, with side entrance near top, porch of grass extending 3.5–6 cm out, construction variable, some neat and others messy, materials include grass, bark, twigs, roots, leaves, lichen, string, rags, small fruits, leaf mould, feathers, wool or fur, held together with cobwebs, decorated with leaves, old snakeskin, lichen and even cloth, lined with feathers and wool, placed 1.5–7 m up in tree or shrub. Clutch 1–2 eggs, white, grey or green-white, heavily marked

with light slate-grey or olive or brown speckles, streaks, lines and spots; incubation by female, period 15 days; chicks fed by both parents, nestling period 2 weeks; both also feed fledglings for c. 10 days after latter leave nest. Nests parasitized by Klaas's Cuckoo (*Chrysococcyx klaas*).

Movements. Moves, including altitudinally, in response to flowering of plant sources.

Status and Conservation. Not globally threatened. Common or locally common in South Africa. **Bibliography.** Benson & Prigogine (1981), Brieschke (1991), Cheke & Mann (2001), Clancey (1962, 1970c), Clancey & Irwin (1978), David & Gosselin (2002b), Fry *et al.* (2000), Hall & Moreau (1970), Harebottle (1999), Harrison (1997a), Hockey *et al.* (2005), Hutton (1985), Johnson & Brown (2004), Keast (1968d), Lloyd (1989, 1991), Lloyd & Craig (1989), Macdonald (1985), Milstein (1963), Oatley & Best (1997), Schoeman (1990), Skead (1954, 1967), de Swardt (1991a), de Swardt & Schoeman (1997).

65. Regal Sunbird

Cinnyris regius

French: Souimanga royal

German: Königsnektarvogel

Spanish: Suimanga Real

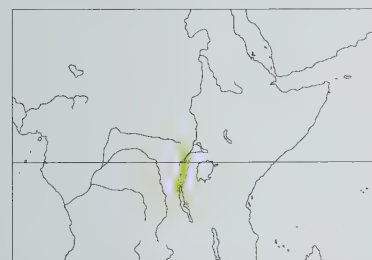
Taxonomy. *Cinnyris regia* [sic] Reichenow, 1893, Central Africa = Rwenzori, DR Congo. Genus often subsumed in *Nectarinia*. Probably closely related to *C. rockefelleri*. Proposed race *kivuensis* (from Kivu Volcanoes, in DR Congo) considered indistinguishable from nominate. Two subspecies recognized.

Subspecies and Distribution.

C. r. regius Reichenow, 1893 – E DR Congo, SW Uganda, W Rwanda and W Burundi.

C. r. anderseni J. G. Williams, 1950 – W Tanzania.

Descriptive notes. 10–11 cm; 5–8 g. Male nominate race is iridescent emerald-green from head to rump, including scapulars and median and lesser upperwing-coverts, and from chin to upper breast; uppertail-coverts violet; tail graduated, central rectrices protrude 3 mm beyond rest, dark brown with violet sheen, outer rectrices paler than others; remiges dark brown, edged olive-green; narrow violet upper breastband above scarlet centre of lower breast and belly, bright yellow on side of breast and flanks, olive-green thighs and vent, red undertail-coverts; underwing-coverts off-white with yellow wash, axillaries dull olive, under-



side of remiges grey; iris dark brown; bill and legs black. Female is dark olive-green above, remiges dark brown, secondaries with outer webs elongated and brown-olive, lesser and median wing-coverts olive, tail dark brown with violet sheen, outermost feathers paler; chin and throat dusky white, lightly streaked yellow, breast darker, otherwise yellow-green below, underwing-coverts white, tinged yellow, axillaries pale green, inner webs of undersides of remiges fringed pale grey; bare parts as male. Juvenile resembles female, but juvenile male has iridescent green throat patch and shoulder patches, red patches on chest, belly and base of undertail-coverts, pale yellow belly; immature male as adult male, except that upperparts, face and neck to chest as adult female but with a few metallic-coloured feathers. Race *anderseni* differs from nominate in having bill broader at base, male has red below altering posteriorly to orange, with abdomen duller olive-yellow; flanks more olive, undertail-coverts chrome-orange (not red), female has upperparts washed grey. Voice. Song consists of repetitions of rapid twitter of rising and falling notes, followed by "tsi". Calls include "djer", "dzit", "dit" and "tchic-tchic".

Habitat. Montane forest, clearings, bamboo and scrub, at 1500–3100 m.

Food and Feeding. Insects and nectar. Forages singly and in pairs. Seeks food from plants such as mistletoes (Loranthaceae), *Englerina woodfordioides*, *Lobelia giberroa*, *Oxyanthus troupinii*, *Symphonia gabonensis*, *Symphonia globulifera*, *Triumfetta cordifolia* and species in genera *Albizia*, *Canthium*, *Impatiens*, *Ipomoea*, *Pavetta*, *Sericostachys*, *Syzgium* and *Virecacia*.

Breeding. Egg-laying Apr–May in DR Congo and Apr–Jun and Oct in Uganda. Oval nest made of fibres and moss, lined with plant down and feathers, suspended 4–5 m up in bamboo, fern or other available plant. Clutch 1 egg, grey, grey-brown at wider end, where dark grey speckles concentrated. No other information.

Movements. No data.

Status and Conservation. Not globally threatened. Restricted-range species: present in Albertine Rift Mountains EBA. Common or locally common.

Bibliography. Carswell *et al.* (2005), Chapin (1954), Cheke & Mann (2001), Dowsett-Lemaire (1990), Fry *et al.* (2000), Grant & Mackworth-Praed (1943b), Hall & Moreau (1970), Kunkel (1966), Prigogine (1971), Schouteden (1938), Williams (1950a).

66. Rockefeller's Sunbird

Cinnyris rockefelleri

French: Souimanga de Rockefeller

Spanish: Suimanga de Rockefeller

German: Blutbrust-Nektarvogel

Taxonomy. *Cinnyris rockefelleri* Chapin, 1932, Mount Kandashomwa, eastern DR Congo.

Genus often subsumed in *Nectarinia*. Probably closely related to *C. regius*. Monotypic.

Distribution. Mountains of E DR Congo.

Descriptive notes. 12 cm; 5–5.5 g. Male has head to rump, including scapulars, bright metallic green with golden tinge, uppertail-coverts glossy violet-blue, tail blue-black; remiges black-brown, outer portions of outer webs edged olive-green, as are lesser and median wing-coverts, secondaries have unusually long outer webs (conspicuous even when wing folded); chin to upper breast metallic green, bordered below by narrow (4 mm) violet band, upper belly bright scarlet, bordered by yellow (sometimes belly brighter scarlet than lower breast, as some yellow feathers intermixed), pectoral tufts bright yellow; lower belly, flanks



and thighs dark olive-green with some brighter olive-green streaks, undertail-coverts scarlet; underwing-coverts dull white, some tipped olive, undersides of remiges with white borders on

outer edges of inner webs; iris brown; bill and legs black. Female has dark olive and black forehead and crown (appearing mottled), conspicuous pale olive supercilium reaching 3 mm behind eye, black lores and thin eyestripe, pale yellow-olive ear-coverts; upperparts dark olive-green, rounded tail dark brown, central feather pair tinged dark blue and 3 mm longer than outermost rectrix, remiges dark brown, broadly edged yellow-green, outer webs of secondaries elongated as in male; chin and throat yellowish-green, chest and breast darker, lower belly and undertail-coverts bright olive-green with creamy yellow tinge (but duller than chin and throat), underwing-coverts white with yellowish edges (visible on folded wing), underside of remiges grey-brown, inner webs edged white; bare parts as male. Juvenile undescribed. Voice. Song apparently undescribed. Contact calls reported as harsh "schick schick".

Habitat. Highland valleys and streams in tall bamboo and heath (Ericaceae) zones, including arborescent heather at 2050–3300 m.

Food and Feeding. Few data. Diet insects and, presumably, nectar. Forages singly and in pairs; occasionally joins mixed-species flocks.

Breeding. Birds with enlarged gonads in May and in primary moult in Jul. No other information.

Movements. No data.

Status and Conservation. **VULNERABLE.** Restricted-range species: present in Albertine Rift Mountains EBA. Poorly known. Thought to have very small population, estimated at merely 250–999 individuals, which is considered stable. Occurs in N Itombwe Mts and mountains to N & W of L Kivu, in E DR Congo; single unconfirmed records from Rwegura, in Burundi, and Nyungwe, in Rwanda. Maximum potential area of distribution estimated as 9800 km². Parts of restricted range probably threatened by deforestation. Some protection afforded by the Kahuzi-Biéga National Park, W of L Kivu, but illegal activities known to take place there at times (e.g. armed militias carried out illegal hunting, logging and mining in 2001). Protection of Itombwe Mts should be sought as a priority.

Bibliography. Anon. (2007f), Butchart & Stattersfield (2004), Chapin (1954), Cheke & Mann (2001), Collar & Stuart (1985), Collar *et al.* (1994), Dowsett-Lemaire (1990), Fry *et al.* (2000), Gaugris (1976), Gaugris *et al.* (1981), Hall & Moreau (1970), Hendrickx & Massart-Lis (1952), Prigogine (1971), Stattersfield & Capper (2000).

67. Eastern Double-collared Sunbird

Cinnyris mediocris

French: Souimanga du Kilimanjaro

Spanish: Suimanga del Kilimanjaro

German: Füllebornnektarvogel

Other common names: Usambara Double-collared Sunbird (*usambaricus*); Forest Double-collared Sunbird (*fuelleborni*)

Taxonomy. *Cinnyris mediocris* Shelley, 1885, Kilimanjaro, Tanzania.

Genus often subsumed in *Nectarinia*. May form a superspecies with *C. moreaui* and *C. loveridgei*. Recent analyses of mitochondrial DNA suggest that nominate race, *usambaricus*, and *fuelleborni* may represent three distinct species, but status of *bensoni* obscure. Four subspecies recognized.

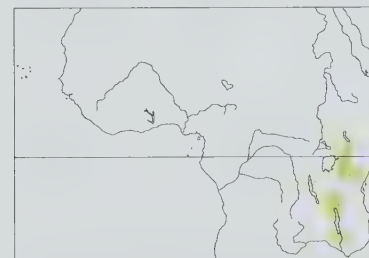
Subspecies and Distribution.

C. m. mediocris Shelley, 1885 – W & C Kenya and N Tanzania.

C. m. usambaricus Grote, 1922 – SE Kenya and NE Tanzania.

C. m. fueleborni Reichenow, 1899 – C & S Tanzania, NE Zambia (Mafinga Mts) and N Malawi (Karonga District).

C. m. bensoni J. G. Williams, 1953 – S Malawi and N Mozambique.



Descriptive notes. 11–12 cm; 5.2–10.7 g. Male nominate race has head and neck, upperparts, including lesser and median wing-coverts, and chin to breast iridescent golden-green, tinged blue near tips of feathers, lores black, uppertail-coverts metallic methyl-blue; tail very dark blackish-brown and glossy, slightly graduated, outermost feather and distal half of adjacent one paler and tipped white on inner webs, outermost also on outer web; upperwing dark greyish-brown, remiges and greater wing-coverts with olive-yellow edges; thin band of methyl-blue on uppermost breast, broad scarlet (grenadine-red) breastband (10–13 mm deep),

lemon-yellow pectoral tufts (11–21 mm long), belly and vent light olive-yellow; underwing-coverts off-white, axillaries pale greenish; iris dark brown or black; bill and legs black. Female is dark olive-green above, lores darker, tail glossy grey-brown, slightly graduated, outer two feathers tipped brown-white on inner webs and outermost also on outer web, remiges dark brown, edged olive-green, median and lesser wing-coverts dark olive; chin and throat olivaceous green with yellow speckling, underparts olive-yellow, darker on breast and flanks, underwing-coverts white with yellow wash, axillaries olivaceous yellow; bare parts as male. Juvenile resembles adult female, but darker below. Race *usambaricus* male has uppertail-coverts violet or royal-blue (instead of methyl-blue), grenadine-red breastband narrower (6–8 mm) than nominate and with grey-brown wash below it, belly more yellowish than in other races and washed grey, female greener, with deeper olive throat; *fuelleborni* male has uppertail-coverts grey or metallic green proximally, tipped violet or purplish (instead of blue), scarlet to orange-red breastband broader (11–20 mm deep) than those of nominate and previous and often with yellow at sides, differs further in having olive-green belly to vent without yellow (but sometimes with brown tinge) and undertail-coverts sometimes scarlet-tipped, scarlet-washed or all scarlet, female darker than nominate and previous; *bensoni* male differs from nominate in having uppertail-coverts violet, rather than blue, and breastband darker red, from all other races in dusky (sooty) olive-green belly and vent lacking any trace of yellow, female indistinguishable from last but darker than nominate. Voice. Song consists of "tseep", a 0.5-second gap, another "tseep" and then a descending "ts-szurr" followed by a warble, e.g. "peety-jateece-jatece-jatece-tsrrt-tsrrt-ja-peety-peety-peety-ja", likened to sound made by shaking a metal chain. Calls include "chek chek" and "tse", also fast series of "tchep tchep tchep tchep" as alarm.

Habitat. Upland areas such as montane forests, bamboo stands, heathland, open grassy areas and gardens.

Food and Feeding. Nectar; also insects, including flies (Diptera), Hymenoptera and Neuroptera, also spiders (Araneae) and small molluscs. Nectar taken from wide range of plants, including *Acaia abyssinica*, *Bridelia brideliifolia*, *Canthium guenzii*, *Carduus kinensis*, *Crotalaria goetzei*, *Dombeya goetzei*, *Echinops amplexicaulis*, *Erica arborea*, *Faurea saligna*, *Hagenia abyssinica*, *Halleria lucida*, *Hoslundia opposita*, *Protea kilimandscharica*, species in the genera *Clematis*, *Englerina*, *Erythrina*, *Hypericum*, *Impatiens*, *Kniphofia*, *Leonotis* and *Lobelia*; also visits *Usnea* lichen, presumably in search of invertebrates. Forages singly and in pairs; joins mixed-species parties. Forages on leaves, nectar-robs plants, and catches flying ants in flight.

Breeding. Egg-laying recorded in Jul and Dec in Kenya, Jun, Aug and Oct–Jan in Tanzania, and Apr–Oct in Malawi. Male displays pectoral tufts to other males while courting female. Male assists in building nest, a domed pouch made of *Usnea* lichen and grass strands, lined with down and feathers, suspended 2–2.5 m above ground; same territory of c. 0.2 ha of forest maintained by pair year after year. Clutch 1–2 eggs, pale green-white with indistinct grey-brown marks; no information on incubation and nestling periods.

Movements. Descends to lower altitudes after breeding.

Status and Conservation. Not globally threatened. Common throughout range.

Bibliography. Baker & Baker (2007), Benson & Benson (1977), Bowie *et al.* (2004a), Cheke (1971a, 1971b, 1972), Cheke & Mann (2001), Dowsett (1983), Dowsett & Dowsett-Lemaire (1984), Dowsett-Lemaire (1988, 1989a, 1989b), Friedmann (1937), Fry *et al.* (2000), Grant & Mackworth-Praed (1943b), Hall & Moreau (1970), McCarthy (2006), Selater & Moreau (1933), Stuart & van der Willigen (1980), Williams, A.A.E. (1978), Williams, J.G. (1950b, 1953c), Zimmerman *et al.* (1996).

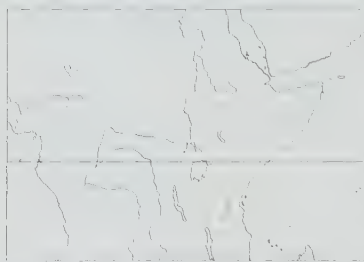
68. Moreau's Sunbird

Cinnyris moreau

French: Souimanga de Moreau **German:** Moreaunektarvogel **Spanish:** Suimanga de Moreau

Taxonomy. *Cinnyris mediocris moreau* W. L. Selater, 1933, Maskati, Nguru Range, Tanzania. Genus often subsumed in *Nectarinia*. May form a superspecies with *C. mediocris* and *C. loveridgei*; former suspicion that this species may be a hybrid between those two is not borne out by recent DNA analyses, which strongly indicate its validity as a full species and suggest that it is sister to *C. loveridgei*. Monotypic.

Distribution. Mountains of E Tanzania.



Descriptive notes. 11–12 cm; 5.1–10.4 g. Male has head to lower back, including scapulars and lesser and median wing-coverts, and chin to breast iridescent bronzy green, rump non-metallic olive-green, uppertail-coverts glossy purplish-violet at tip; slightly graduated tail dark brown, faintly glossed, with paler outer feathers, upperwing very dark brown, edged olive-yellow; narrow band (2 mm deep) of glossy blue on chest, above red to orange patch (10–15 mm deep) on middle of lower breast bordered by yellow on side of breast, strontium-yellow pectoral tufts not well defined (as yellow feathering continued on each side of scarlet breast

patch); belly to vent dark olive-yellow, underwing-coverts and axillaries pale greenish-yellow; iris dark brown or black; bill and legs black. Female is olive-green above, with metallic green-grey edges on crown and mantle, tail very dark brown with paler outer feathers, narrow olive-yellow edges to rectrices in fresh plumage, remiges and greater wing-coverts very dark brown, edged olive-ochre, breast and abdomen bright olive-yellow, chin and throat greyer, underwing-coverts and axillaries pale green-yellow; iris dark brown, bill and legs black. Juvenile male has head to uppertail-coverts dusky grey-olive, is dusky yellow-olive below, brighter and more yellow on lower breast and middle of abdomen, which is duskier and less yellow than adult; immature female resembles adult but duller below. **Voice.** Song a fast outburst of high-pitched notes. Calls consist of regularly spaced chirps.

Habitat. Areas with moist montane forest and clearings in mountainous regions; mainly at 1300–1850 m, but to 2500 m in Udzungwa Mts.

Food and Feeding. Few data available. Expected to take nectar and insects, but to date only foodplant known is *Achyroperum carvalhii*. Forages, sometimes in mixed-species groups, in canopy or in bushes.

Breeding. Egg-laying in Dec, and other breeding activity recorded in Aug–Oct. Small domed purse-shaped nest, built by female, of leaves or grass, suspended 1–10 m up in shrub or tree. Clutch assumed to be of 1–2 eggs (nest with two chicks, and two fledglings together in Aug–Sept); eggs whitish with grey-brown marks. No other information.

Movements. No data.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Tanzania–Malawi Mountains EBA. Has small range in Nguru, Nguu, Uvidunda, Ukaguru and Udzungwa Mts; common or abundant in suitable areas, e.g. in Nguu Mts and Ukagurus. Appears to be forest-dependent, and therefore presumably sensitive to destruction or degradation of forest habitat. Occurs in Udzungwa Mountains National Park and, in Ukagurus, Mamiwa Kisara Forest Reserve.

Bibliography. Anon. (2007), Baker & Baker (2007), Bowie *et al.* (2004a), Butchart & Stattersfield (2004), Cheke & Mann (2001), Dinesen *et al.* (2001), Evans & Anderson (1993a, 1993b), Ejlsdals *et al.* (1997), Fry *et al.* (2000), Fuggles-Coeleman (1986), Hall & Moreau (1970), Jensen & Brogger-Jensen (1992), McCarthy (2006), Selater & Moreau (1933), Seddon *et al.* (1999a, 1999b), Stattersfield & Capper (2000), Stuart & van der Willigen (1980), Williams (1950b, 1950c).

69. Loveridge's Sunbird

Cinnyris loveridgei

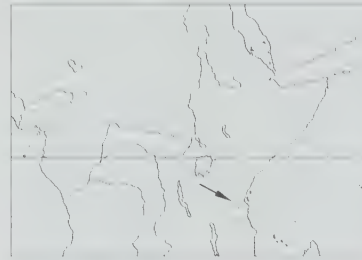
French: Souimanga de Loveridge

Spanish: Suimanga de Loveridge

German: Orangebauch-Nektarvogel

Taxonomy. *Cinnyris loveridgei* E. J. O. Hartert, 1922, Uluguru Mountains, east Tanzania. Genus often subsumed in *Nectarinia*. May form a superspecies with *C. mediocris* and *C. moreau*; recent DNA analyses suggest that present species is sister to latter. Monotypic.

Distribution. Uluguru Mts, in E Tanzania.



Descriptive notes. 12 cm; male 9–12.5 g, female 7.5–11 g. Male has head to breast and upperparts, including scapulars and lesser and median wing-coverts, iridescent green, apart from non-metallic olive-green rump and purple-violet terminal uppertail-coverts; graduated tail very dark brown, slightly glossy above; upperwing very dark, almost black, secondaries, tertials and primary coverts edged golden-olive (forming wing patch on folded wing); narrow (3 mm) band of metallic violet on upper breast, above orange-ochre breast patch that merges with warm aniline-yellow on side of breast and abdomen, latter tinged olive with

faint orange wash in middle; pectoral tufts not sharply defined (olive-yellow feathering continues onto side of breast); underwing-coverts pale grey-olive, axillaries yellow; iris brown; bill and legs black. Female has crown and side of face olive-grey, contrasting with olive-green upperparts, mantle feathers having green-grey or blue-grey metallic edges, tail very dark brown with paler outer feathers; upperwing dark grey-brown, primaries edged paler brown, secondaries and tertials edged yellowish, primary and greater wing-coverts dark greyish-brown, edged olive-green, median and lesser wing-coverts dark olive-green; chin pale olive-grey, throat dark olive-green, breast and abdomen olive-yellow, underwing-coverts and axillaries white with yellow wash; bare parts as male. Juvenile resembles female, young male distinguishable by pale grey throat and upper breast, remainder of underparts pale grey-green, crown grey, nape and upperparts green-grey. **VOICE.** Song, throughout day (from 25 minutes before sunrise, peak 15 minutes before sunrise and during hour before dusk), a very fast but short (3–4 seconds) warble of high-pitched “tsi” notes, uttered in such quick succession as to be reminiscent of sound made by an insect; these sequences may be initiated by “tsp-tee, tsp-tee”. Calls metallic “tsk” or “pzit”.

Habitat. Montane forest, clearings, plantations with a few trees and shrubs, and more open areas with bamboo, at 1200–2580 m.

Food and Feeding. Nectar; also insects, including caterpillars, flies (Diptera), beetles (Coleoptera) and mayflies (Ephemeroptera); also spiders (Araneae). Seen at flowers of a pea crop, an *Albizia*-like tree, *Lusitanthus cereiflorus* and *Impatiens ulugurensis*. Forages singly and in pairs, also in mixed-species flocks. Insect-catching methods include sallying.

Breeding. Egg-laying in Aug–Mar, and other breeding activity recorded in Apr and Aug. Territorial. Nest a bulky oval, with large side entrance 30–50 mm in diameter at top, no porch, made of grass and moss held together with cobwebs, lined with moss, fine grass or plant down, suspended from bush or tree at mean height of 3–1 m above ground in understorey. Clutch 1–3 eggs, shiny dark olive-green with irregular dark mottling; incubation and most parental duties by female alone; no information on duration of incubation and nestling periods.

Movements. No data.

Status and Conservation. ENDANGERED. Restricted-range species: present in Tanzania–Malawi Mountains EBA. Global population probably c. 37,000 individuals, and confined entirely within three forest reserves covering total of c. 260 km². Threatened by habitat destruction. Field research required in order to determine extent to which this species is capable of tolerating further degradation of its habitat.

Bibliography. Anon. (2007), Baker & Baker (2007), Bowie *et al.* (2004a), Cheke & Mann (2001), Fry *et al.* (2000), Grant & Mackworth-Praed (1943b), Hall & Moreau (1970), McCarthy (2006), Stuart & van der Willigen (1980), Svendsen *et al.* (1995), Tottrup & Larsen (2005), Tottrup *et al.* (2004), Williams (1950b, 1950c, 1951a).

PLATE 15



70. Beautiful Sunbird

Cinnyris pulchellus

French: Souimanga à longue queue **German:** Elfennektarvogel **Spanish:** Suimanga Colilargo
Other common names: Beautiful Long-tailed Sunbird

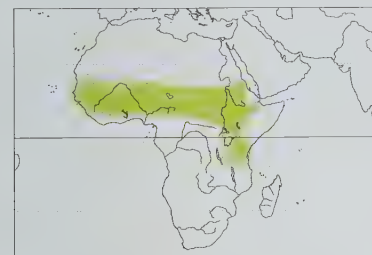
Taxonomy. *Certhia pulchella* Linnaeus, 1766, Senegal.

Genus often subsumed in *Nectarinia*. It has been suggested that this species and *C. nectarinioides* link the “*C. mariquensis* complex” with the “*C. chalybeus* complex”. Proposed races *aeger* (described from Aïr, in Niger) and *lucidipectus* (from Wad Medani, on Blue Nile in EC Sudan) considered inseparable from nominate. Two subspecies recognized.

Subspecies and Distribution.

C. p. pulchellus (Linnaeus, 1766) – Mauritania, Senegal and Guinea-Bissau E to Sudan, Eritrea and W Ethiopia, S to Sierra Leone, C Nigeria, N Cameroon, Central African Republic, NE DR Congo, Uganda and NW Kenya.

C. p. melanogastrus (G. A. Fischer & Reichenow, 1884) – W, C & S Kenya and Tanzania.



Descriptive notes. Male 14–17 cm, 5.6–10.2 g; female 9–11 cm, 5.6–8 g. Male nominate race breeding has head, upperparts and upperside-coverts bright metallic green, uppertail-coverts tipped bright metallic green, this merging to blue near dark brown bases; tail blue-black, inner rectrices narrowly fringed metallic green, central rectrices fringed broadly with metallic green at base but narrowly along elongated section (which projects 55–65 mm); remiges dark brown; chin to upper breast metallic green with golden reflections, lower border with narrow metallic blue band; scarlet patch in centre of breast,

yellow feather tips at side of breast, abdomen bright metallic green, undertail-coverts more metallic blue, thighs blackish-brown, vent, axillaries and underwing-coverts black; iris black or dark brown; bill and legs black. Male non-breeding (eclipse plumage; sometimes omitted in equatorial regions) is similar to female, grey-brown above and dull yellow below, but wing and tail feathers black, elongated rectrices sometimes (not always) retained, metallic green feathers on chin, throat, wing-coverts and a few on rump and uppertail-coverts retained (sometimes those on chin and throat lost, leaving pale throat patch). Female lacks iridescence, has crown to rump yellow-tinged dull brown, darker brown on ear-coverts, wing-coverts and tail-coverts, narrow white or pale yellow supercilium behind eye, black-brown tail slightly glossed bronze-green or bluish, rectrices narrowly tipped white, outer pair more broadly so and with white on edge of outer web, remiges and greater wing-coverts dark brown, all with pale olive edges, other wing-coverts, alula and tertials edged pale brown; chin and throat whitish, underparts yellow-tinged, with variable indistinct blackish-brown mottling on breast and flanks, white undertail-coverts, axillaries and underwing-coverts tinged yellow; bare parts as male. Juvenile male as female, but with vertical black streak on throat and upper chest flanked by cream moustachial stripes, and duller below; immature female as adult, but occasionally with brighter yellow underparts, and lacks black throat of immature male. Race *melanogastrus* has longer bill (20–22 mm) than nominate (14–19 mm), and male has black abdomen, red breast patch tends to be wider, undertail-coverts with metallic green-blue tips, and central tail feathers protrude less, female has more dusky streaking below. **VOICE.** Song consists of a warble of rising and falling high-pitched notes, involving “ti-tsu-tswée” and similar variants, lasting for nearly one minute, sometimes including rising series of 3–4 “tsi” notes, or sometimes intermixed with many fast repeats of “che” and a few bursts of “chip-chip”. Calls consist of “chip-chip” or similar sounds, repeated.

Habitat. Dry thorn savannas, riversides and gardens; also in mangrove scrub and along beaches at coast.

Food and Feeding. Nectar and small flowers (e.g. of *Acacia*); insects, and spiders (Araneae). Forages singly, occasionally in small groups. Visits flowers of genera *Acacia*, *Albizia*, *Aloe*, *Bauhinia*, *Bombax*, *Bougainvillea*, *Calotropis*, *Canna*, *Combretum*, *Commiphora*, *Delonix*, *Gmelina*, *Hibiscus*, *Ipomoea*, *Jacaranda*, *Lantana*, *Manihot*, *Moringa* and mistletoes (Loranthaceae); observed also at *Carica papaya* and *Leptadenia heterophylla*. Invertebrates sometimes taken from windows or eaves of houses.

Breeding. Breeds during rainy seasons; laying recorded in Jun–Oct in Mauritania and Senegal, Jun–Mar in Gambia, Jul in Mali, Jun in Burkina Faso, Jul–Sept in Ghana, Jun–Jul in Niger, Feb and Jun–Oct in Nigeria, Jul–Aug in Chad, Jul in Eritrea, Mar and Jun–Oct in Sudan, Feb–Mar, May–Jun and Aug–Oct in Uganda, May–Jul in Kenya, and Dec–Jul in Tanzania. Polygamy suspected, as male may court two females simultaneously. Male displays to female by spreading wings and tail. Territorial; males display to each other from treetops, showing colours of underparts in upright pose, flick wings, and jerk fanned tail from side to side. Nest purse-shaped, with central entrance, most without both porch and “beard” but either may be present occasionally; made variously of fibres, bark, twigs, grass, leaves, cobwebs, vegetable down, plant stems, feathers, lichen and snakeskin, lined with feathers or vegetable down, suspended 1–6 m above ground from tree. Clutch 1–2 eggs, slightly glossy, variously green, blue-grey, brown or grey-white with violet-grey spots, purple-black S-shaped marks, brown or ash streaks and blotches; incubation of eggs and brooding of chicks by female alone; no other information.

Movements. Some resident throughout range, except in far N. Complex movement patterns apparently related to flowering of mistletoes. Populations in S parts of W Africa travel N to breed Feb–Apr, returning S in Sept–Oct; in N part of range, some populations present in dry season migrate S at start of rains, breeding S of dry-season quarters.

Status and Conservation. Not globally threatened. Common throughout most of range. Occurs in many protected areas, examples being Comoe National Park, in Ivory Coast, Waza National Park, in Cameroon, Awash National Park, in Ethiopia, Murchison Falls National Park, in Uganda, and Serengeti and Arusha National Parks, in Tanzania.

Bibliography. Baker & Baker (2007), Bannerman (1948), Borrow & Demey (2001), Carroll (1988), Chapin (1954), Cheke & Mann (2001), Friedmann (1937), Fry (1970), Fry *et al.* (2000), Grant & Mackworth-Praed (1943b), Hall & Moreau (1970), Koenig (1956), Lewis & Pomeroy (1989), Mundy & Cook (1972), Newby (1980), Nikolaus (1987), Pettet (1977), Serle (1943a), Thonnerieux *et al.* (1989), Zimmerman *et al.* (1996).

71. Mariqua Sunbird

Cinnyris mariquensis

French: Souimanga de Mariqua **German:** Bindennektarvogel **Spanish:** Suimanga del Marico
Other common names: Marico/Southern Bifasciated Sunbird; Western Bifasciated Sunbird (*mariquensis*); Swahili Sunbird (*osiris*)

Taxonomy. *Cinnyris mariquensis* A. Smith, 1836, north of Kurrichaine [= Marico District], North West Province, South Africa.

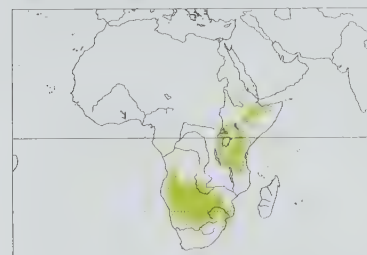
Genus often subsumed in *Nectarinia*. May form a superspecies with *C. shelleyi*, and both sometimes included in a larger superspecies with *C. congensis*, *C. erythrocerus* and *C. nectarinioides*. Proposed races *ovamboensis* (described from Ovamboland, in NC Namibia) and *lucens* (Pongola Town, in N KwaZulu-Natal, NE South Africa) both synonymized with nominate, and *hawkeri* (Jifa Medir, in Somalia) with *osiris*. Three subspecies recognized.

Subspecies and Distribution.

C. m. osiris (Finsch, 1870) – locally in Eritrea, Ethiopia, Somalia, SE Sudan (Didinga Mts), N Uganda and N Kenya.

C. m. swahelicus Reichenow, 1891 – locally in C Uganda, extreme E DR Congo, Rwanda, Burundi, C & S Kenya, Tanzania and NE Zambia.

C. m. mariquensis A. Smith, 1836 – WC & S Angola (S from Cuenza Valley) and Namibia E to SW Zambia, Botswana, C & S Zimbabwe, N South Africa and S Mozambique.



Descriptive notes. 11–14 cm; male 9.1–14.2 g, female 7–12.3 g. Male nominate race is metallic green with golden reflections on head to rump, including lesser and median upperside-coverts, and to throat and upper breast; uppertail-coverts metallic dark blue-green; tail very dark brown, all except outer two feather pairs edged metallic green; wing feathers very dark brown, but paler than tail; base of throat ringed by narrow band of iridescent dark violet-blue, below this a purple-maroon breastband (8–10 mm deep) mixed with violet feathering; otherwise black below, including underwing-coverts and axillaries; iris dark

brown; bill and legs black. Female has thin brownish-white supercilium, brown crown, ear-coverts, cheek and upperparts, much darker brown uppertail-coverts and tail, outer tail feather with wide white patch at tip of inner web and white on outer edge; throat and breast dull whitish with variable amounts of heavy black marks, belly also with brown patches, tinged with pale yellow, undertail-coverts buffy-white with black-brown and white streaks, dull white axillaries and underwing-coverts; bare parts as male. Juvenile resembles female, young male distinguished by having black or grey throat bordered white, malar streak and underparts washed yellow, heavy black streaks on breast, yellow-white supercilium and shoulder patch conspicuous, remiges and tertials tipped light brown, broader on secondaries and tertials, central rectrices glossy dark blue with green tinge, outer pair brown with white edges above and below. Race *swahelicus* is shorter-billed than nominate, male has greyer abdomen; *osiris* male has more violet-blue on abdomen and lower edge of throat, broader upper (violet) breastband, darker and narrower lower (maroon) breastband, female more heavily marked on throat and breast. **VOICE.** Complex song may last for a few minutes, involves jumble of “chur-chur”, “chip-chip-chip”, “tsi-tsi”, “b-r-r-r-zi” whistles, warbles and trills. Calls a repeated “chip-chip”.

Habitat. Inhabits dry acacia (*Acacia*) savanna, edges of riverine forest and swamp-fringing forest, as well as gardens and moist woodland. Lowlands and middle elevations; up to 2000 m in Sudan (Didinga Mts).

Food and Feeding. Feeds on nectar; also insects, including flies (Diptera), Lepidoptera, Hymenoptera and termites (Isoptera), as well as spiders (Araneae). Forages singly and in pairs, sometimes with other sunbirds. Visits flowers of genera *Acacia*, *Aloe*, *Bauhinia*, *Cadaba*, *Callistemon*, *Capparis*, *Crotalaria*, *Erythrina*, *Geranium*, *Grevillea*, *Jacaranda*, *Kigelia*, *Kniphofia*, *Leonotis*, *Schotia*, *Tecoma* and *Thevetia*, and mistletoes (Loranthaceae). Takes insects by leaf-gleaning, hawking and hovering.

Breeding. Egg-laying recorded in Mar in Somalia, May in Ethiopia, Feb, Jun, Aug–Sept and Nov in Uganda, all months except Aug and Oct in Tanzania, Feb and Sept–Oct in Zambia, Jan–Jul and Sept–Oct in Zimbabwe, Nov in Botswana, Jul in Mozambique and Aug–Apr in South Africa. Territorial throughout year; males sing from tops of trees near each other, in duetting duels, maintaining upright poses. Courting male flies around female, hovers in front of her and then lands beside her. Nest built by female alone, a thick-walled oval with small porch, made of white down or woolly material and grass, decorated with bark, seeds, flowers and feathers and held together by cobwebs, lined with feathers, suspended 1–8 m up in tree or shrub; same site may be used in successive years or twice in a season. Clutch 1–3 eggs, whitish to greyish-white or greenish-white, heavily marked with pale brown, black, grey or olive streaks, dots, lines and blotches; incubation by female, period 2 weeks; no information on nestling period; fledglings return to nest to roost. Nests parasitized by Diederik Cuckoo (*Chrysococcyx caprius*) and Klaas’s Cuckoo (*Chrysococcyx klaas*).

Movements. Apparently nomadic in Zimbabwe, Mozambique and Uganda. In Uganda presence at Kampala erratic, although noted there in all months. In Zimbabwe moves to C plateau May–Jun to breed, leaving for lower altitudes Nov–Dec. One individual recovered 51 km from ringing site in South Africa. Abandons arid Kalahari areas during droughts.

Status and Conservation. Not globally threatened. Generally common in most of range, but less common in S Tanzania. Occurs in several protected areas, among which are Awash National Park, in Ethiopia, Lake Mburo National Park, in Uganda, Shaba and Buffalo Springs Game Reserve, in Kenya, Serengeti and Tarangire National Parks, in Tanzania, and Etosha National Park, in Namibia.

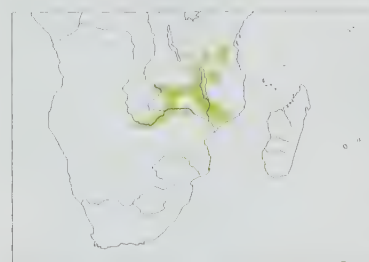
Bibliography. Baker & Baker (2007), Benson & Irwin (1967), Carswell *et al.* (2005), Chapin (1954), Cheke & Mann (2001), Clancey (1964, 1973, 1979b), Clarke (1985), Dowsett (1977a), Friedmann (1937), Fry *et al.* (2000), Hall & Moreau (1970), Ilanmer (2001), Herremans (1997b), Hockey *et al.* (2005), Lewis & Pomeroy (1989), Milstein (1963), Nikolaus (1987), Oatley (1995), Skead (1967), Tree (1990, 1991), Vincent (1949), Zimmerman *et al.* (1996).

On following pages: 72. Shelley’s Sunbird (*Cinnyris shelleyi*); 73. Congo Sunbird (*Cinnyris congensis*); 74. Red-chested Sunbird (*Cinnyris erythrocerus*); 75. Black-bellied Sunbird (*Cinnyris nectarinioides*); 76. Common Purple-banded Sunbird (*Cinnyris bifasciatus*); 77. Tsavo Purple-banded Sunbird (*Cinnyris tsavoensis*); 78. Violet-breasted Sunbird (*Cinnyris chalcornelas*); 79. Pemba Sunbird (*Cinnyris pembae*).

72. Shelley's Sunbird

Cinnyris shelleyi

French: Souimanga de Shelley

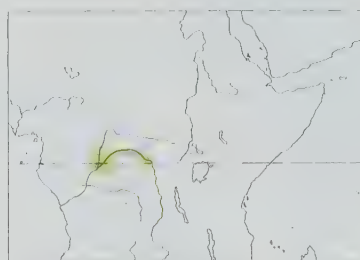
Spanish: Suimanga de Shelley
German: Scharlachbrust-NektarvogelOther common names: Shelley's Double-collared/Black-bellied Sunbird, Zambesi Valley (Double-collared) Sunbird; Hofmann's Sunbird (*hofmanni*)**Taxonomy.** *Cinnyris shelleyi* Alexander, 1899, Zambezi River, 60 miles [c. 95 km] below junction of Kafue-Zambezi Rivers, on Zambia-Zimbabwe border.Genus often subsumed in *Nectarinia*. May form a superspecies with *C. mariquensis*, and both are sometimes included in a larger superspecies together with *C. congensis*, *C. erythrocerus* and *C. nectarinioides*. It has been suggested that the races may represent two distinct species, and that these may not necessarily be sister taxa; further study required. Two subspecies currently recognized.**Subspecies and Distribution.***C. s. hofmanni* Reichenow, 1915 – E Tanzania.*C. s. shelleyi* Alexander, 1899 – SW Tanzania, extreme SE DR Congo, Zambia, extreme NW Zimbabwe, Malawi and N Mozambique.**Descriptive notes.** 9–13 cm; 8 g. Male nominate race breeding has metallic emerald head, throat and neck with bright yellowish-green, gold and copper reflections, mantle, back and median and lesser upperwing-coverts similar but with less kaleidoscopic reflections; uppertail-coverts dark emerald; remiges, primary coverts, alula, greater wing-coverts and tail dark brown-black, flight-feathers with olive-yellow edges, central rectrices narrowly edged metallic green; thin blue-violet band below green throat, broad (10–15 mm wide) scarlet breastband; belly, flanks and undertail-coverts very dark brown, axillaries andunderwing-coverts brown; iris brown; bill and legs black. Non-breeding male (eclipse plumage) has remiges and rectrices as breeding plumage, and red breastband present and some black may remain on belly; otherwise as female, apart from some metallic feathers on head and mantle and, mainly, on chin, throat and uppertail-coverts. Female is grey-tinged green-brown above, darker on cheek, with thin brownish-white supercilium, tail very dark brown, outermost feather paler and broadly tipped white, remiges dark brown, primaries with dull white edges, secondaries edged pale green; pale brown below, tinged green-yellow posteriorly, chin and throat heavily dark-mottled, dark streaking on breast, flanks and undertail-coverts, brownish-white underwing-coverts and axillaries; bare parts as male. Juvenile both sexes has black chin and throat between pale moustachial stripes, dark upper breast and dark marks on breast and flanks, and more yellow on underparts than female; immature male has scarlet breastband. Race *hofmanni* has bill shorter (18–20 mm) and more curved than that of nominate (20–23 mm), and is smaller with shorter wing (mean 58.5 mm; nominate mean 63.8 mm), male also has scarlet chestband narrower and flanks, belly and undertail-coverts blacker, female greener above with yellowish supercilium, blacker tail, some orange-red on breast, and dusker centres of breast and flank feathers. Voice. Fast warbling song, including “chibbee-cheeu-cheeu” phrase. Calls are a “chip”, a chattering “didi” and a high-pitched “seep-seep”.**Habitat.** Usually in brachystegia (*Brachystegia*) woodland, occasionally in *Baikiaea* or acacia (*Acacia*) woodland and gardens. Occurs in woodland, scrub and gardens at 500–1200 m in E Tanzania (race *hofmanni*).**Food and Feeding.** Nectar, insects, and spiders (Araneae). Forages high in trees. Visits flowers of *Holmskioldia*, *Lagerstroemia*, *Tecoma* and mistletoes (Loranthaceae); forages in *Terminalia* and in *Phragmites* reedbeds.**Breeding.** Laying recorded in Feb and Apr in Tanzania, Aug–Nov in Zambia, Nov in Zimbabwe, and Aug and Oct in Malawi; double-brooded. Nest constructed of leaves, bark and grass or lichen, bound with cobwebs and lined with feathers, which protrude from and hide entrance, positioned 2–3 m up in bush. Clutch 1–2 eggs, pale olive, with fine purple specks or black blotches all over or restricted to wider end. No other information.**Movements.** No data.**Status and Conservation.** Not globally threatened. Locally common to uncommon in Tanzania; uncommon and sparingly distributed in Malawi and Zambia. In Malawi, occurs in Lilongwe Nature Sanctuary, where rare, and in Dzalanama Reserve.**Bibliography.** Baker & Baker (2007), Brooke (1964), Chapin (1954), Cheke & Mann (2001), Dowsett *et al.* (2008), Fry *et al.* (2000), Hall & Moreau (1970), Hooley *et al.* (2005), Irwin (1981a, 2005), Newby-Varty (1945, 1948), Pollard (2001), Skead (1967), Tree *et al.* (1991).

73. Congo Sunbird

Cinnyris congensis

French: Souimanga du Congo

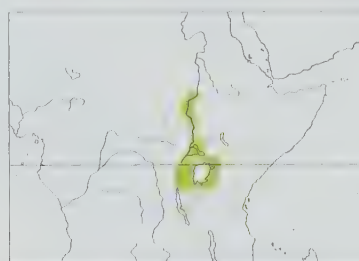
German: Kongonektarvogel

Spanish: Suimanga Congoleño
Other common names: Congo Black-bellied/Long-tailed Congo Sunbird**Taxonomy.** *Nectarinia congensis* van Oort, 1910, Boma, Lower Congo; error = Irebu, Upper Congo, DR Congo.Genus often subsumed in *Nectarinia*. Forms a superspecies with *C. erythrocerus*, and both sometimes included in a larger superspecies with *C. mariquensis*, *C. shelleyi* and *C. nectarinioides*. Monotypic.**Distribution.** PR Congo and DR Congo (forested banks of R Congo and lower R Ubangi).**Descriptive notes.** Male 19 cm, 15.5–19 g; female 11 cm, 15.5–16.5 g. Male is metallic green above, bluer on uppertail-coverts; greater upperwing-coverts black with purple-blue reflection, median and lesser coverts metallic green, remiges black; graduated tail dull black, edged metallic blue-green, narrow elongated central pair of rectrices protrude 46–75 mm; lores black, chin to upper breast metallic green above narrow strip of metallic blue, merging with broad scarlet band (24 mm deep, 15 mm wide) on lower breast; otherwise dull black below, apart from green tips on some flank feathers and undertail-coverts; axillaries and underwing-coverts black; iris dark brown; bill and legs black. Female is dark brown-olive above, with narrow pale line running from above eye to behind eye; tail black-brown with faint green sheen (especially on edges) and brownish feather tips increasing in size towards outer tail, outermost pair with brownish-white distal half of**Habitat.** Forested riverine areas.**Food and Feeding.** Takes small spiders (Araneae), and probably insects and nectar. Visits flowers of *Caesalpinia regia*.**Breeding.** Male seen next to nest suspended from bush 2 m above river and birds in breeding condition in Jul–Dec. No other information.**Movements.** No data.**Status and Conservation.** Not globally threatened. Locally common to rare. Common along banks of R Congo. In DR Congo, fairly common on upper R Congo up to Isengi (at mouth of R Lomami) and on lower Ubangi (S from Impfondo, at least) and lower R Momboyo. Rare and local in PR Congo part of range, where occurs along R Ubangi and R Lefini.**Bibliography.** Bannerman (1948), Borrow & Demeu (2001), Chapin (1954), Cheke & Mann (2001), Fry *et al.* (2000), Hall & Moreau (1970), Rand *et al.* (1959).

74. Red-chested Sunbird

Cinnyris erythrocerus

French: Souimanga à ceinture rouge

Spanish: Suimanga Pechirrojo
German: Schmucknektarvogel**Taxonomy.** *Nectarinia erythrocerus* Hartlaub, 1857, White Nile, S of 8° N, south Sudan.Genus often subsumed in *Nectarinia*. Forms a superspecies with *C. congensis*, and both sometimes included in a larger superspecies with *C. mariquensis*, *C. shelleyi* and *C. nectarinioides*. Monotypic.**Distribution.** S Sudan, E DR Congo, Rwanda, Burundi, Uganda, W Kenya and NW and extreme W Tanzania, with isolated records in C & E Tanzania.**Descriptive notes.** Male 15 cm, 8.2–10 g; female 12 cm, 7.4–9.5 g. Male has head and upperparts metallic green, more blue-green from nape to rump and on scapulars, lores black, uppertail-coverts violet; very dark brown tail tinged glossy blue and edged blue-green, narrow central rectrices protruding 18–25 mm; median and lesser upperwing-coverts iridescent green-blue, rest of wing very dark brown, with faintly bluish glossed edges; thin violet-blue band on upper breast above broader red band, otherwise black below, including underwing-coverts and axillaries; iris dark brown; bill and legs black. Female is green-brown above, with dark mottling on forehead and crown, thin supercilium pale yellow-brown, cheek dark, broad malar stripe green-yellow, very dark brown remiges fringed green-yellow, very dark brown tail graduated and tinged glossy blue; chin and throat heavily mottled dark, underparts pale green-yellow, heavily streaked dark on breast and upper belly, thighs dark green-brown, undertail-coverts brown-white with dark centres, axillaries and underwing-coverts pale green-yellow, latter with dark centres; bare parts as male. Juvenile is as female but greener, young male with blacker chin and throat. Voice. Brief twittering song “tsi-si-sip-see-see-swee” or about seven repetitions of “tsi” followed by “tsip”. Calls include repetitions of “jik” or “trink”.**Habitat.** Edges of rivers and wetlands in savanna areas; also near water in forest, cultivations and gardens. To 1800 m.**Food and Feeding.** Nectar, insects, and spiders (Araneae). Forages generally in pairs. Visits flowers of genera *Erythrina*, *Nectarosia* and *Tamarindus*.**Breeding.** Egg-laying in Feb–Nov in Uganda and Feb, Mar and May in Tanzania. Small, neat, elongated ovoid nest, with or without porch, made from grass, down, leaves, bark and cobwebs, thickly lined with plant down, feathers and wool, adorned externally with leaf skeletons and dead flowers, and suspended 2–5 m up from bush or tree branch. Clutch 1–3 eggs, white, bluish-white or grey with grey or brown streaks and blotches. No other information.**Movements.** No data.**Status and Conservation.** Not globally threatened. Common throughout range in suitable habitat.**Bibliography.** Baker & Baker (2007), Carswell *et al.* (2005), Chapin (1954), Cheke & Mann (2001), Fry *et al.* (2000), Grant & Macleworth-Praed (1943b), Hall & Moreau (1970), Lewis & Pomeroy (1989), Schouteden (1938), Zimmerman *et al.* (1996).

75. Black-bellied Sunbird

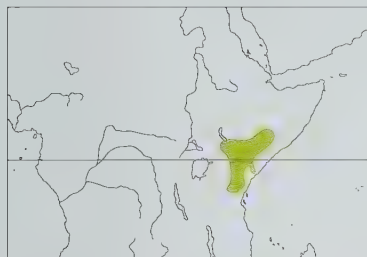
Cinnyris nectarinioides

French: Souimanga nectarin

Spanish: Suimanga Ventrinegro
German: Mennigbrust-Nektarvogel

Other common names: Smaller Black-bellied Sunbird

Taxonomy. *Cinnyris nectarinioides* Richmond, 1897, plains east of Kilimanjaro, Tanzania.Genus often subsumed in *Nectarinia*. Has been thought possibly to be part of a superspecies which includes also *C. mariquensis*, *C. shelleyi*, *C. congensis* and *C. erythrocerus*. Has been suggested that this species and *C. pulchellus* link the “*C. mariquensis* complex” with the “*C. chalybea* complex”. Two subspecies recognized.**Subspecies and Distribution.***C. n. erlangeri* (Reichenow, 1905) – extreme SE Ethiopia (banks of R Daua), S Somalia and NE Kenya.*C. n. nectarinioides* Richmond, 1897 – SE Kenya and NE Tanzania.



Descriptive notes. Male 13 cm, female 10 cm; 4–6 g. Male nominate race breeding has head, upperparts, including lesser wing-coverts, and chin and throat metallic golden-green with blue reflections, bases of feathers black, uppertail-coverts dark metallic blue, edges purple occasionally; uppertail black, tinged glossy greenish-blue at edges and with faint glossy blue bands across feathers, elongated central rectrices protrude 16–22 mm beyond the rest; brown-black remiges, primaries browner, secondaries tinged glossy purple-blue; metallic dark purple-blue band on chest above broad (13–19 mm deep) orange-red breastband, pectoral tufts yellow, rest of underparts black, slightly streaked white on flanks; iris brown or black; bill and legs black. Non-breeding male (eclipse plumage) similar to breeding, but upperparts dull brown with green metallic patches, some metallic green on throat, and some whitish-yellow feathers in breastband and underparts. Female is dull yellow-olive above, streaked dark brown on crown and mantle, with yellow streak over eye, dark brown remiges with pale yellow outer edges; tail as male, but outer feathers broadly tipped white on inner margin and with narrow white strip on outer edge, inner web of end of adjoining pair also tipped white, central rectrices not elongated; pale yellow below, chin to throat, side of breast and flanks finely streaked dusky brown to olive-grey, pale yellow malar streak, middle of belly and undertail-coverts pale yellow; bare parts as male. Juvenile is as female, but wing feathers yellower at margins, chin and throat brown-grey and contrasting malar stripe pale yellow, breast mottled, not streaked. Race *erlangeri* male has breastband redder and less deep (12 mm), metallic feathering blue-green, less golden-green, and lacks pectoral tufts. **VOICE.** Song consists of 6–20 “tsk”, “chip” or “che” notes, repeated 6–7 times per second, followed by brief warble of rising and falling “tsi” notes accelerating at end of sequence; whole song repeated during periods of more than three minutes. The “tsk”, “chip” or “che” notes are used also as calls.

Habitat. Arid acacia (*Acacia*) savanna and riverine vegetation. **Food and Feeding.** Nectar, insects, and spiders (Araneae). Forages mainly at higher levels in trees. Visits flowers of acacias, baobab (*Adansonia digitata*) and mistletoes (Loranthaceae, especially genus *Loranthus*). **Breeding.** Nest with egg in late Apr in Somalia; laying recorded in Apr–Aug and Nov in E Africa. Nest purse-shaped, usually with porch and “beard”, made of grass and cobwebs, adorned with bark and dead leaves, lined with feathers or vegetable down, and placed in low tree or bush. Clutch 1–2 eggs, pale olive-grey or olive-brown or yellow-green, densely covered with dark olive-brown stripes and speckles. No other information. **Movements.** No data. **Status and Conservation.** Not globally threatened. Locally common in Kenya and NE Tanzania; uncommon in Somalia; rare in Ethiopia. Possibly occurs also in SW Ethiopia, where reportedly seen at L Abaya; confirmation required. **Bibliography.** Cheke & Mann (2001), Friedmann (1937), Fry *et al.* (2000), Grant & Mackworth-Praed (1943b), Hall & Moreau (1970), Kahindi & Kageci (1995), Lewis & Pomeroy (1989), Mackworth-Praed & Grant (1960), Zimmerman *et al.* (1996).

76. Common Purple-banded Sunbird

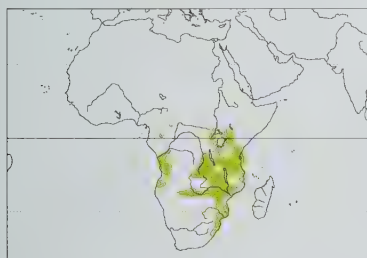
Cinnyris bifasciatus

French: Souimanga bifascié **German:** Porphyrektarvogel **Spanish:** Suimanga Bandeado
Other common names: Purple-banded Sunbird, Little Purple-banded/(Little) Bifasciated/Short-billed Sunbird

Taxonomy. *Certhia bifasciata* Shaw, 1811, Malembo, Cabinda, Angola. Genus often subsumed in *Nectarinia*. Forms a superspecies with *C. tsavoensis*, and the two are sometimes treated as conspecific. Proposed race *strophium*, described from Manhiça (Sul do Save), in Mozambique, considered indistinguishable from *microrhynchus*. Two subspecies currently recognized.

Subspecies and Distribution.

C. b. bifasciatus (Shaw, 1811) – SW Central African Republic and Gabon S, discontinuously, to W Angola (Cabinda S to Benguela, also Namibe and C Huila). *C. b. microrhynchus* Shelley, 1876 – E DR Congo, Uganda and Kenya S to extreme E Angola (NE Moxico), NE Namibia (Caprivi), extreme N Botswana, E Zimbabwe, Mozambique and E South Africa; Zanzibar and Mafia I, off Tanzania.



Descriptive notes. 9–12 cm; male 6.5–8.1 g, female 6–6.5 g. Male nominate race in breeding plumage has head to throat and upperparts, including lesser and median wing-coverts, metallic green, tinged gold, becoming metallic blue on uppertail-coverts; remiges and greater upwing-coverts black, glossed dark blue, rectrices dark blue, outer webs edged metallic blue-violet; metallic purple-blue upper breastband above second band of purple-red or red-maroon (6–9 mm deep), otherwise brown-black below; iris dark brown; bill and legs black. Non-breeding male retains breeding plumage on wings and tail, with some metallic feathers still on upperparts, head, throat and breast, and some black feathers on abdomen. Female lacks iridescence, is all greyish-olive above apart from narrow white stripe above eye, lores darker than forehead, wing dark brown, remiges narrowly edged yellowish-olive, blue-black tail, outermost two pairs of rectrices edged white or pale grey; chin and throat whitish, slight olive tinge on throat, otherwise pale yellow below, with dark streaks on breast, axillaries white, tipped pale yellow, underwing-coverts white, washed yellow; bare parts as male. Immature male is darker brown above than adult female, has chin and throat black, otherwise yellowish below with heavy black mottling, first metallic feathers appear on lesser wing-coverts and throat; immature female as adult but darker brown on upperparts, with throat and breast grey, abdomen with yellow wash. Race *microrhynchus* male is brighter green, less bronzy, on head and upperparts and has maroon breastband broader (8–12 mm deep) and more violet than nominate, female more heavily streaked below, both sexes have shorter bill (male 16–20 mm) than nominate (male 21.5–23 mm). **VOICE.** Song consists of either high-pitched descending “titiitititi-trooo” trill, occasionally preceding a

warble, or repetitions of 0.5-second sequences of “treeee-ti-ti-tooo”. Male call “b-r-r-r-zi”, to which female responds with “b-r-r-r”; another call is “tsikit-y-dik”.

Habitat. Coastal and riverine habitats, savanna woodland, broadleaf woodland, miombo woodland, dry forest, moist evergreen forest, cultivation, grassland and gardens.

Food and Feeding. Nectar, seeds and insects. Also takes spiders (Araneae) from webs and feeds them to fledglings. Forages singly and in pairs; often mixed with other sunbirds. Visits flowers of *Acacia albidia*, *Albizia*, aloes (*Aloe*), *Cassia singuena*, *Leonotis*, *Manihot glaziovii*, *Mimusops caffra*, *Punica granatum*, *Syzygium cordatum*, *Tecoma mollis* and mistletoes (Loranthaceae).

Breeding. Egg-laying recorded in May and Oct in Angola, Aug in DR Congo, Jun and Aug–Sept in Uganda, Jul in Kenya, Jan and Aug–Sept in Tanzania, Mar–Dec in Zanzibar, Jan and Aug–Nov in Zambia, May and Aug–Oct in Malawi, Mar, Jun and Sept–Dec in Zimbabwe, and Sept–Nov in Mozambique and South Africa. Small ovoid nest made of grass, fibres, down and cobwebs, extravagantly adorned with leaves, lichens and seeds and often with “beard”, lined with feathers and down, and suspended 1–10 m up in e.g. tree or bamboo. Clutch 1–2 eggs, white to pale grey or dark greenish or purple-grey, with darker grey streaks and black, purple or grey speckles and lines concentrated at wider end; no information on duration of incubation and nestling periods; both parents feed nestlings.

Movements. Resident and migratory. In NE Gabon present Feb–May. In South Africa present as far S as Durban only during austral winter. In Zimbabwe, leaves lowveld in Apr–Jul and moves to highveld, returning Nov–Jan, when some may go as non-breeders to S Mozambique Nov–May. In Tanzania, ascends to higher elevations in cooler season.

Status and Conservation. Not globally threatened. Common in most of geographical range, but less so in DR Congo, Kenya, Uganda, Tanzania and S Zambia. Range of *microrhynchus* possibly extends N to S Sudan, S Ethiopia and S Somalia, but possible confusion in those areas with *C. tsavoensis* unresolved; field study required. Occurs in several protected areas, e.g. Mikumi National Park, in Tanzania, and Mkuze Game Reserve, in South Africa.

Bibliography. Baker & Baker (2007), Benson (1944), Borrow & Demey (2001), Brooke (1970b), Chapin (1954), Cheke & Mann (2001), Clancey (1979a), Clancey & Williams (1957), Edwards (1988), Fry *et al.* (2000), Hall & Moreau (1970), Hamner (1981, 1989), Hockey *et al.* (2005), Jones (1996), Lewis & Pomeroy (1989), Prinzing *et al.* (1989), Sclater & Moreau (1933), Shead (1967), Tree (1991, 1997b), Zimmerman *et al.* (1996).

77. Tsavo Purple-banded Sunbird

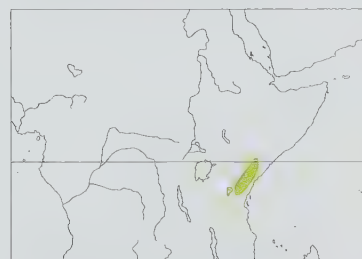
Cinnyris tsavoensis

French: Souimanga du Tsavo **German:** Tsavonektarvogel **Spanish:** Suimanga del Tsavo

Taxonomy. *Cinnyris bifasciatus tsavoensis* van Someren, 1922, Tsavo, Kenya.

Genus often subsumed in *Nectarinia*. Forms a superspecies with *C. bifasciatus*, and sometimes treated as conspecific. Monotypic.

Distribution. E Kenya and NE Tanzania.



Descriptive notes. 9–11 cm; 6–7.6 g. Male has head to throat and upperparts, including median and lesser wing-coverts, iridescent green, rump and uppertail-coverts blue; very dark brown rectrices, slightly glossed on top, with metallic green margins, remiges black; two narrow breastbands, upper one (2 mm deep) violet, lower one (3–5 mm deep) maroon, otherwise underparts, including underwing-coverts and axillaries, black; iris, bill and legs black. Female is grey-green above, with narrow brown-white supercilium, grey-brown cheek, long whitish malar stripe; tail darker and slightly glossy, outer three pairs of rectrices

tipped whitish, whitish edges on outermost feather pair, wings dark brown, edged olive, grey tips on median and lesser wing-coverts; throat pale creamy, underparts pale brownish-white, breast streaked grey-brown, yellow wash below, underwing-coverts and axillaries off-white; bare parts as male. Juvenile is as female, but has darker chin and throat and contrasting pale malar stripes, dark brown barring on abdomen. **VOICE.** Song consists of rapid sequence of “tsusitiseesee, chuchiti-tsi-tsi-tsi-tsi-tsitisee-see-see-see-chitisee” or similar.

Habitat. Dry savanna with acacia (*Acacia*) or *Commiphora*, and riverine woodland.

Food and Feeding. Nectar and insects. Forages singly and in pairs. Visits flowers of *Delonix elata*. Gleans items from small branches; also catches insects in flight.

Breeding. Egg-laying in Oct in Kenya. Compact ellipsoid nest made of strips of wood, grasses, bark, dried acacia buds and twigs, held together with cobwebs, suspended 2 m above ground near end of small branch of acacia. Clutch 1 egg, matt pale grey, with darker grey blotches and spots concentrated at wider end, superimposed with fine grey-brown spots and speckles. No other information available.

Movements. No data.

Status and Conservation. Not assessed. Generally not uncommon. Fairly common in Tsavo National Park, in Kenya. Possibly present also in S Sudan, S Ethiopia and S Somalia, but whether individuals recorded in those areas are of this species or *C. bifasciatus* is unresolved; research needed.

Bibliography. Cheke & Mann (2001), Clancey & Williams (1957), Fry *et al.* (2000), Hall & Moreau (1970), Lack (1985), Serle (1943a), Sinclair & Ryan (2003), Stevenson & Fanshawe (2002), Zimmerman *et al.* (1996).

78. Violet-breasted Sunbird

Cinnyris chalcornelas

French: Souimanga à poitrine violette **Spanish:** Suimanga Pechivioleta
German: Veilchenbrust-Nektarvogel

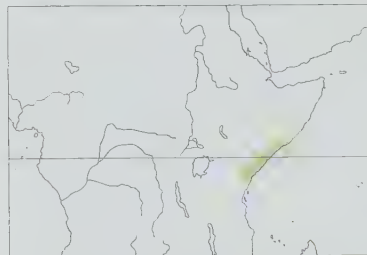
Other common names: Kenya Violet-breasted Sunbird

Taxonomy. *Cinnyris chalcornelas* Reichenow, 1905, Kismaayo, southern Somalia.

Genus often subsumed in *Nectarinia*. Forms a superspecies with *C. pembae*, and often considered conspecific. Also, a possible relationship with *C. notatus* has been proposed. Monotypic.

Distribution. S Somalia and SE Kenya.

Descriptive notes. 11–12 cm; 7–9.5 g. Male breeding has head and upperparts, including median and lesser wing-coverts, iridescent emerald-green, uppertail black with slight blue gloss, remiges blue-black; chin and throat iridescent blue-green, broad (7–8 mm deep) band on upper breast violet, otherwise black below, including underwing-coverts and axillaries; iris dark brown; bill and legs black. Non-breeding male retains blue-black remiges and tail and iridescent wing-coverts, but



otherwise as female except for iridescent green patches interspersed on grey-brown plumage of back, crown and cheeks, grey line 3 mm broad from base of bill to lower chest, and grey patches in black of belly. Female has brownish-white supercilium, brown cheek, with crown and upperparts grey-brown, tinged green, uppertail-coverts darker, very dark brown rectrices slightly glossy above, variably some with whitish tips, outermost pair with narrow whitish outer margin, dark grey-brown remiges with greyish margins; pale brownish-white below, slightly streaked on throat, breast and flanks, with yellow wash on centre of abdomen, underwing-coverts dark brown, axillaries off-white; bare parts as male. Juvenile male resembles adult female, but has black throat with iridescent green centre, iridescent green shoulder patch, some black on lower belly, and broad white margins on outer edges of inner primaries. VOICE. Trilling song as "chrrrrrrrrsssswwzzzzlllll" or slower sequence of notes, ending with "chee-per-chichi-woo-per-chichi-chee-dzurr". Calls "chip" and "chut".

Habitat. Coastal thornbush.

Food and Feeding. Few data. Diet presumably includes nectar and insects. Forages singly and in pairs, at times in small groups; one group of 100 individuals seen at acacia trees (*Acacia*). Visits flowers of acacias, *Hibiscus* and *Millingtonia*.

Breeding. Nestlings in Dec and nest-building observed in Apr, Jul and Oct in Somalia. Female alone builds nest. No other information.

Movements. No data.

Status and Conservation. Not globally threatened. Locally fairly common in Somalia; rather uncommon in Kenya.

Bibliography. Ash & Miskell (1998), Cheke & Mann (2001), Clancey & Williams (1957), Fry *et al.* (2000), Hall & Moreau (1970), Sinclair & Ryan (2003), Stevenson & Fanshawe (2002), Zimmerman *et al.* (1996).

79. Pemba Sunbird

Cinnyris pembae

French: Souimanga de Pemba **German:** Pembanektarvogel **Spanish:** Suimanga de Pemba
Other common names: Pemba Violet-breasted/Pemba Purple-banded Sunbird

Taxonomy. *Cinnyris pembae* Reichenow, 1905, Pemba Island.

Genus often subsumed in *Nectarinia*. Forms a superspecies with *C. chalcomelas*, and often considered conspecific. Also, a possible relationship with *C. notatus* has been proposed. Monotypic.

Distribution. Pemba I and adjacent islets, off E Tanzania.



Descriptive notes. 9–10 cm. Male has head and upperparts, chin and throat iridescent green with blue reflections; lesser upperwing-coverts purple, largest outer lesser coverts and median coverts iridescent green, rest of wing black, with narrow metallic green edges on greater coverts; glossy violet band on upper breast, remaining underparts, underwing-coverts and axillaries black; iris dark brown; bill and legs black. Female is greenish grey-brown above, with white supercilium, uppertail grey-brown, glossed dark blue, with dark olive margins, T3–T5 with white tips, outermost feather with white patch at tip of inner web and white edge

on outer web; remiges dark grey-brown with pale yellow margins; pale cream or yellow below, yellower on belly and sometimes towards vent, underwing-coverts and axillaries white; bare parts as male. Juvenile is as female, but chin and throat darker, has broad off-white malar stripe and grey mottling below. VOICE. Song consists of up to 15 "tslink" notes before warble of rising and falling notes. Calls repetitive "tslink-tslink-tslink" or "tslunk".

Habitat. Varied, with no particular preferences. Found in tropical moist forest dominated by *Odyenda zimmermannii*, coastal rag scrub, clove and rubber plantations and farmland. Visits habitations.

Food and Feeding. Insects; also nectar, and berries of *Flueggia virosa* and fruits of *Areca catecha*. Visits flowers of *Carica papaya*, *Cocos nucifera*, *Manihot esculenta*, *Musa*, *Phoenix reclinata* and *Syzygium aromaticum*.

Breeding. Egg-laying in May–Jan. Thick-walled, purse-shaped nest, lined with down from *Imperata cylindrica*, without "beard", suspended 1–2 m up in shrub. Clutch 2 eggs, green-white with ashy-brown streaks and blotches. No other information.

Movements. No data.

Status and Conservation. Not globally threatened. Restricted-range species: present in Pemba EBA. Common on Pemba and nearby small islands.

Bibliography. Archer & Parker (1993), Archer & Turner (1993), Baker & Baker (2007), Catry *et al.* (2000), Cheke & Mann (2001), Clancey & Williams (1957), Fry *et al.* (2000), Hall & Moreau (1970), Lewis & Pomeroy (1989), Pakenham (1979), Zimmerman *et al.* (1996).

PLATE 16

inches 2
cm 5



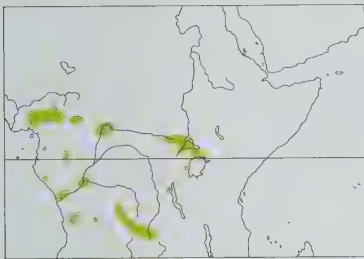
80. Orange-tufted Sunbird

Cinnyris bouvieri

French: Souimanga de Bouvier **German:** Bouviernektarvogel **Spanish:** Suimanga de Bouvier
Other common names: Bouvier's (Orange-tufted) Sunbird, Southern Orange-tufted Sunbird

Taxonomy. *Cinnyris bouvieri* Shelley, 1877, Landana, Cabinda, Angola. Genus often subsumed in *Nectarinia*. Has been thought perhaps to form a superspecies with *C. osea*, *C. oustaleti*, *C. talatala* and *C. asiaticus*. Birds from W shore of L Tanganyika, in E DR Congo, described as race *tanganyicae*, but considered inadequately differentiated from birds elsewhere in species' range. Monotypic.

Distribution. Scattered localities from SE Nigeria (Obudu and Mambilla Plateaux) and W & C Cameroon S to Equatorial Guinea, S & E Gabon, PR Congo and N Angola, E to W & S Central African Republic, DR Congo, Uganda, extreme W Kenya, NW Tanzania and NW Zambia.



Descriptive notes. 11–12 cm; 7–10 g. Male is metallic green above, except for metallic purple forehead, copper-tinged green ear-coverts and bluer uppertail-coverts; dark brown wing feathers, including greater wing-coverts; black tail, central feathers glossed dark blue and with metallic green edges on both webs, other rectrices except outermost pair with metallic green edges on outer webs; chin and upper throat dull black, bordered with metallic purple, lower throat and upper breast metallic green, narrow purple band on chest above broader dark maroon band; pectoral tufts orange above and lemon-yellow below, rest of

underparts, including axillaries and underwing-coverts, dark brown; iris dark brown; bill and legs black. Female is mouse-brown above, with indistinct olive wash on rump, sometimes a pale supercilium present; upper tips of tertials edged off-white and outer edges of secondaries edged buff, black tail, outer feathers of which edged and tipped white; grey-brown chest streaked yellow, belly pale yellow, undertail-coverts and underwing-coverts pale yellow, axillaries a mixture of pale yellow and white; bare parts as male. Immature male is as adult female, but throat and breast darker and belly less yellow. **VOICE.** Song begins with quiet "tswee" before a louder "tsi" and then a warble terminating in "tsi-pu, tsi-pu, tsi-pu, tsi-pu, tsi-pu, tsi-pu tsi" or "chieta-chieta-chieta-chit" or similar; some notes may be repeated in sequences lasting for more than 2 minutes. Calls include "cheep", "ziet" and "chip-ip".

Habitat. Varied, including grassland, savanna woodland, forest edge and plantations; to 2050 m. **Food and Feeding.** Nectar and insects. Forages singly, but sometimes in groups; occasionally with other sunbirds. Visits flowers of *Acanthus*, *Erythrina*, *Manihot glaziovii* and leguminous shrubs.

Breeding. Egg-laying recorded in Oct in Cameroon, Nov in Kenya, Jun in DR Congo, and Mar in Zambia. Purse-shaped nest made of grass and cobwebs, lined with down, suspended from thistle, bush or grass. Clutch 2 eggs. No other information.

Movements. Unknown. Some possible migration, as records in Gabon and Uganda apparently seasonal, but timing of records could be attributable also to species' scarcity.

Status and Conservation. Not globally threatened. Generally uncommon. Locally common in NW parts of range, e.g. at edge of montane forest in Nigeria and in N highlands of Cameroon.

Bibliography. Baker & Baker (2007), Bannerman (1948, 1951), Benson (1966), Benson & Irwin (1966), Benson *et al.* (1971), Borrow & Deme (2001), Brosset & Éard (1986), Chapin (1954), Cheke & Mann (2001), Fry *et al.* (2000), Hall & Moreau (1970), Lippens & Wille (1976), Lynes (1938), McCarthy (2006), Rand *et al.* (1959), Serle (1950, 1957), Zimmerman *et al.* (1996).

81. Palestine Sunbird

Cinnyris osea

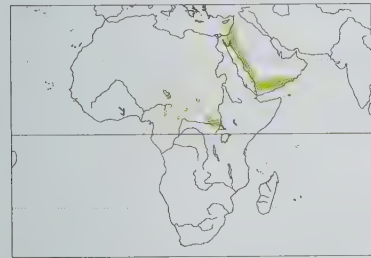
French: Souimanga de Palestine **German:** Jerichonektarvogel **Spanish:** Suimanga Palestino
Other common names: (Northern) Orange-tufted Sunbird; Chad Orange-tufted Sunbird (*decorsei*)

Taxonomy. *Cinnyris osea* Bonaparte, 1856, "Plaines de Jéricho" = Palestine. Genus often subsumed in *Nectarinia*. Has been thought perhaps to form a superspecies with *C. bouvieri*, *C. oustaleti*, *C. talatala* and *C. asiaticus*. Proposed race *butteri* (described from Kajo Kaji, in S Sudan) considered inseparable from *decorsei*. Two subspecies recognized.

Subspecies and Distribution.

C. o. osea Bonaparte, 1856 – Lebanon, Israel, Palestine, NE Egypt, S Syria, Jordan, W Saudi Arabia, Yemen and S Oman.

C. o. decorsei Oustalet, 1904 – widely scattered localities at L Chad and in E Cameroon, Central African Republic, W & S Sudan, NE DR Congo and NW Uganda.



Descriptive notes. 8–10 cm; male average 7.6 g and female average 6.8 g (nominate). Male nominate race breeding has purple forehead, metallic blue-green (blue in some lights) on rest of head and upperparts, except for dark metallic blue uppertail-coverts; tail as back, lesser and median upperwing-coverts metallic green, rest of wing dark brown; side of face metallic green, chin black, throat metallic purple with green gloss in lower section, breast violet with gold reflections, pectoral tufts orange-red above and yellow below; rest of underparts, including underwing-coverts, black, lower breast and belly with metallic tinge; iris

dark or dark brown; bill and legs black. Male non-breeding resembles female below, but wings and tail as in breeding plumage, underparts dull black with iridescent patches, and some white near tail. Female is dull grey-brown above with indistinct bluish-green tinge on rump, darker brown wing-coverts, tail black glossed blue; light greyish-brown below, belly very faintly washed yellow,

axillaries pale yellow, underwing-coverts grey-white mixed with yellow and brown, no pectoral tufts; bare parts as male. Immature male is like adult female but brighter yellow on belly, when moulting into breeding plumage has dark areas broken up by white and metallic green patches; immature female as adult but more yellow on underparts. Race *decorsei* is smaller than nominate, male lacks iridescence on lower breast and belly, no non-breeding plumage known, female is darker and browner (less grey) above and with indistinct olive tinge on rump, light brown with yellow tinge below. **VOICE.** Song of race *decorsei* described as "chwing-chwing-chwing..." or "chwee-chwee-chwee...", that of nominate much more varied and with dialects; repertoire includes repetitions of "tsk, tsk, wee, wee, wee, tsk-choo, choo, choo", a warble of fast high-pitched rising and falling notes and various trills and whistles, in addition to mimicry of songs of other bird species. Calls of nominate include "tsk", "tchoo-twit", "tiu", "fifi", "seep seep", "seep tehink tehink", "pee-pee", "dzee" and "teweeit te-weeit"; of *decorsei* "chip-ip-ip-ip".

Habitat. Savannas, bushy riversides, rocky valleys, gardens and parks, orchards, juniper (*Juniperus*) woods and cypress (*Cupressus*) groves. In Yemen, absent at sea-level but occurring at 250–3200 m.

Food and Feeding. Nectar, fruits, seeds, also spiders (Araneae) and insects. Forages singly and in pairs; sometimes gregarious outside breeding season, when small groups of up to eight individuals observed to feed together. Visits flowers of many genera, including *Acacia*, *Aloe*, *Anagallis*, *Anchusa*, *Bauhinia*, *Begonia*, *Bougainvillea*, *Capparis*, *Citrus*, *Clerodendrum*, *Cordia*, *Convolvulus*, *Cordia* (*Cordia abyssinica*), *Cytisus*, *Echinops*, *Euphorbia*, *Hibiscus*, *Jasminum*, *Lavandula*, *Nolana*, *Lonicera*, *Loranthus*, *Lupinus*, *Lycium*, *Malvaviscus*, *Moringa*, *Nerium* (oleander), *Nicotiana*, *Orostegia*, *Phoenix*, *Plicosepalus*, *Punica*, *Pyrostegia*, *Robinia*, *Tecoma*, *Thevetia*, *Yucca*, *Zinnia* and *Zygophyllum*. Feeds by perching on plants, and by hovering in front of flowers.

Breeding. Egg-laying recorded in Apr–May in Lebanon and Jordan, Feb–Sept in Israel. Feb, Mar and May in Arabia, Jun in Egypt and Nov–Dec in Sudan, and breeds Jan–Feb in N DR Congo; two or three broods. Forms pair-bonds and holds territory, but male promiscuous, up to at least six males following receptive female for as long as 4 days before laying begins; rivals have singing duels and commit infanticide. Courting male approaches female, exposes pectoral tufts, and jerks up and down, with head held erect and neck outstretched, while spreading tail and drooping wings.

Nest built by female alone, taking 8–21 days, an untidy and pear-shaped structure made from grass, stems, roots, leaves, down, bark, paper and polythene shreds, bound with hair, wool and cobwebs, and with "beard" of leaves and twigs, lined with feathers, wool, leaves and bits of paper, suspended 0.5–1.0 m up in bush; territory 0.3–14.3 ha. Clutch 1–3 eggs, rarely 4, slightly glossy, white, covered with fine grey or grey-brown or red-brown or yellow-green spots, concentrated at wider end; incubation by female, leaving nest four times per hour during daylight, incubation period 12–14 days; chicks brooded by female, fed by both parents, both also remove faecal sacs, nestling period 13–14 days; fledglings return to roost in nest for 7–10 days after leaving nest.

Movements. Nominate race mostly resident, but wanders and makes altitudinal movements, e.g. in Jordan and Oman; some visit Syria in non-breeding season. Race *decorsei* ascends to higher altitudes (2000–3000 m) in Sudan (Jebel Marra) to breed during Sept–Jan; breeders present in Uelle grasslands, in N DR Congo, only in Oct–Mar, but non-breeding destinations unknown.

Status and Conservation. Not globally threatened. Uncommon in much of range; locally common, and in some places abundant, especially in N of range. Very common and widespread in Israel and Palestine, where population increased during last century; locally common in Jordan, where densities of 2–8 pairs/km²; common above 1500 m in SW Saudi Arabia and at 250–2800 m in N Yemen. Has increased numbers and expanded range in S Syria following establishment of settlements.

Bibliography. Andrews *et al.* (1999), Baha el Din (1985), Borrow & Deme (2001), Chapin (1954), Cheke & Mann (2001), Cramp & Perrins (1993), David & Gosselin (2002b), Eisikowitch & Nahari (1982), Eriksen (1998), Fry *et al.* (2000), Gallagher & Woodcock (1980), Goldstein & Yom-Tov (1988), Goldstein *et al.* (1986), Hall & Moreau (1970), Hambly *et al.* (2007), Harrison (1975), Kumerloeve (1960), Leader *et al.* (2000, 2005), Markman, Pinshow & Wright (1999), Markman, Tadmor-Melamed *et al.* (2006), Markman, Yom-Tov & Wright (1995, 1996), Nikolaus (1987), Paz (1983), Rahmani *et al.* (1994), Ramadan-Jaradi *et al.* (2008), Roxburgh & Pinshow (2000), Sclater & Mackworth-Præd (1918), Shirihai (1996), Tadmor-Melamed *et al.* (2004).

82. Shining Sunbird

Cinnyris habessinicus

French: Souimanga brillant **German:** Glanznektarvogel **Spanish:** Suimanga Brillante
Other common names: Abyssinian Sunbird

Taxonomy. *Nectarinia habessinica* Hemprich & Ehrenberg, 1828, Eilat, Eritrea. Genus often subsumed in *Nectarinia*. Five subspecies recognized.

Subspecies and Distribution.

C. h. habessinicus (Hemprich & Ehrenberg, 1828) – NE Sudan, Eritrea and N & C Ethiopia.

C. h. kinnearyi Bates, 1935 – W Saudi Arabia (S Hijaz S to Asir).

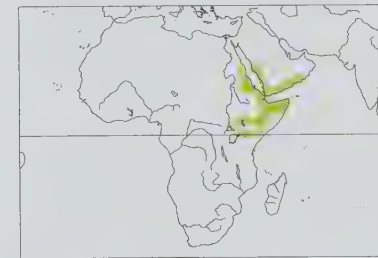
C. h. hellmayri Neumann, 1904 – extreme SW Saudi Arabia, Yemen and SW Oman.

C. h. alter Neumann, 1906 – E Ethiopia and N Somalia.

C. h. turkanae van Someren, 1920 – SE Sudan, NE Uganda, Kenya, S Ethiopia and S Somalia.

Descriptive notes. 13 cm; male 9.5–11.5 g, female 7–11 g. Male nominate race has purple forehead, otherwise head and upperparts iridescent green, with golden sheen above and on chin to upper breast, also lesser and median wing-coverts, uppertail-coverts bluer; rectrices black, tinged violet, central pair with narrow metallic green margins, upperwing dull black with violet tinge; thin blue-green band above broad (7.5–11 mm deep) scarlet breast-band, latter bordered below by narrow iridescent dark blue band, pectoral tufts yellow, otherwise black below, including underwing-coverts and axillaries; iris dark brown; bill and

legs black. Female has crown and upperparts pale grey-brown, uppertail-coverts darker, dark brown tail with faint blue tinge, inner webs of two outer pairs of rectrices tipped off-white, remiges dark grey-brown, edged buff; chin grey-white, otherwise pale brown-grey below, with slight mottling on throat and breast, yellow tinge on belly, dark streaks centrally on grey-white undertail-coverts, whitish underwing-coverts darker at bases, light brown axillaries; bare parts as male. Juvenile resembles female, but with black throat (darker in male), bordered off-white, reaching onto breast;



immature often with dark centres of breast feathers, male with chin to neck metallic green and indications of red chestband. Race *alter* male has slightly deeper breastband (9–13 mm) bordered metallic blue or violet-green, and larger bill (22.5–25 mm; nominate 18.5–20.5 mm), female darker than nominate and often with greenish-orange breastband; *hellmayri* male has crown metallic blue, breastband made indistinct by subterminal green-blue bars (suggesting narrow red collar below metallic throat), female darker than previous; *kinneari* male has shorter bill (18.5–20 mm) than last (21.5–23.0 mm), red breastband less obscured by blue subterminal bars, female very dark, more black-brown, and appears scaly (especially on throat, belly and undertail-coverts); *turkanae* male has broader (14–19 mm deep) and paler red breastband than nominate, with imperceptible or no metallic fringe, female with palest underparts of all. Voice. Song a warbling sequence of fast “eh eh eh ch ch” preceding series of attenuated “chee-chee-chee”. Calls include sharp “tsp, tsp, tsp” notes. **Habitat.** Dry thornbush and dry riverbeds with flowering plants, cultivations, gardens, rocky hill-sides and montane forest; sea-level to 1800 m.

Food and Feeding. Nectar, fruits of *Salvadora persica*; insects and spiders (Araneae). Forages singly, in pairs and in groups; sometimes large flocks of up to 75 individuals. Visits flowers of *Acacia*, *Alone*, *Calotropis procera*, *Capparis decidua*, *Delonix elata*, *Ficus*, *Phoenix dactylifera*, *Salvia*, *Stereospermum*, *Ziziphus spina-christi* and others. Feeds by perching on plants and by hovering in front of flowers.

Breeding. Laying recorded in Mar–Jul in Arabia, Dec–Jan in Sudan, Dec–Feb in Eritrea, Apr in Ethiopia, Feb–May Somalia and Apr–Jul in Kenya; sometimes double-brooded. Displaying male stretches up and shuffles along perch towards female, then swings body from side to side before suddenly fluffing out plumage and exposing pectoral tufts; may take off vertically and return to perch to sing. Nest built by female, oval in shape and with distinct porch, made from fibres, grass, leaves, insect cocoons and cobwebs, lined with plant wool (from seeds of *Ipomoea* or *Calotropis*) and feathers, suspended 1–7 m up in thorny tree or shrub, e.g. *Euphorbia*. Clutch 1 egg, white, with pale grey-brown blotches and black scrawls at wider end; nestling fed by both sexes; no information on incubation and nestling periods.

Movements. Wanders in search of flowering plants.

Status and Conservation. Not globally threatened. Very common in N of range, e.g. Red Sea hills of Sudan; becomes uncommon in S, e.g. in N Kenya. Occurs in Awash National Park, in Ethiopia, and in Buffalo Springs National Reserve and Shaba Game Reserve, in C Kenya.

Bibliography. Al Safadi & Kasperek (1995), Archer & Goodman (2001), Cheke & Mann (2001), Eriksen (1998), Friedmann (1937), Fry *et al.* (2000), Gallagher & Woodcock (1980), Granichi (1988), Hall & Moreau (1970), Lewis & Pomeroy (1989), Meinertzhagen (1954), Rahmani *et al.* (1994), Williams (1954), Zimmerman *et al.* (1996).

83. Splendid Sunbird

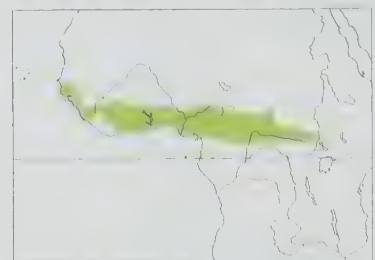
Cinnyris coccinigastrus

French: Souimanga éclatant **German:** Rotbauch-Nektarvogel **Spanish:** Suimanga Espléndido

Taxonomy. *Certhia coccinigastra* Latham, 1801. Africa – Senegal.

Genus often subsumed in *Nectarinia*. Monotypic.

Distribution. Senegal E to S Sudan and NE DRCongo, and NC Gabon.



Descriptive notes. 13–14 cm; 12.3–15.3 g. Male has forehead to centre of crown and ear-coverts metallic purple, lores black, back of head metallic steel-blue, lower neck, mantle, scapulars, back, rump, and lesser and median upperwing-coverts metallic golden-green, uppertail-coverts steel-blue, some edged purple; remiges and greater wing-coverts black; black tail edged metallic steel-blue or green on outer webs; side of face and throat metallic purple, breast metallic steel-blue with scarlet feather edges (appearing barred), long pale yellow pectoral tufts; rest of underparts, including axillaries and underwing-coverts, black.

undertail-coverts broadly tipped metallic steel-blue; iris dark brown; bill dark brown or black; legs blackish-purple or black. Female has grey forehead, lores, cheeks and ear-coverts dark olive, faint white stripe over eye, otherwise olive-washed grey-brown above, upperwing dark brown, edged olive-green, inner secondaries with pale tips, tail black-brown with green sheen, all rectrices except central pair with narrow white tip; chin and throat white, underparts pale yellow with grey feather centres (appearing mottled), but centre of belly pure yellow, axillaries pale yellow, underwing-coverts white, some tipped yellow; iris dark brown, bill and legs greenish-black. Immature male is as adult female but without grey forehead, and has upperparts browner, chin and throat grey-black (glossy purple on subadult), bill dark brown; immature female has darker brown crown than adult, throat patch less extensive than on young male, underparts duller, breast darker. Voice. Common song a series of 6–9 clear descending whistles, “chip-chee-cho-cho-choo-choo-choo” or “pitew-tew-pitew-pitew-pitew”, alternative song of 6–8 notes rendered as “Oh—what a splendid-bird-I am”; local variations in dialect maintained for up to 3 years, but not after 30 years, and some males only 40 m apart sing different dialects. Fluty calls, chirps and plaintive “chee-tee, chip, tsehp” and “choo”; “djew-djew-djew” as alarm.

Habitat. In most habitats from coast to N Guinea savanna, except mature forest.

Food and Feeding. Nectar, seeds, also spiders (Araneae) and insects, including flying ants (Formicidae) and termites (Isoptera), taken in the air. Forages singly and in pairs, also sometimes in groups of twelve or more individuals in flowering tree. Visits flowers of *Berlinia grandiflora*, *Bombax*, *Caesalpinia pulcherrima*, *Carica papaya*, *Manihot glaziovii*, *Milletia thomingii* and *Parkia*. Hovers at flowers and leaves; probes bark of oil palm (*Elaeis guineensis*) to take sap.

Breeding. Egg-laying recorded in Sept–Oct in Senegal and Sierra Leone, Jul–Oct in Gambia, Mar–Apr, Jun, Sept–Oct and Dec in Ghana, and Mar–Jun in Nigeria; sometimes double-brooded. Territorial male sings from regular perches and performs courtship song flights before landing high up, to be joined on branch by female, latter holding tail depressed and wings drooped. Nest built by female alone, pouch-shaped and with porch, made of fibres, grass, bark, down and cobwebs, lined with down, suspended from thin branch 2–3 m up. Clutch 1–2 eggs, matt and varying in colour from pale grey to dark brown, with grey and brown mottles, streaks, speckles and blotches concentrated at wider end; incubation of eggs and rearing of young by female alone; no information on duration of incubation and nestling periods.

Movements. Resident and migratory. In W Africa, migratory populations tend to move N to N savanna during May–Oct wet season, returning S in Dec–Apr; in Liberia, however, reported in N only in Oct–Jan and in Burkina Faso only Nov–May. Present NE: Gabon Sept–Nov.

Status and Conservation. Not globally threatened. Common throughout most of range. Occurs in several protected areas, such as Comoé National Park, in Ivory Coast.

Bibliography. Blancou (1939), Borrow & Demeey (2001), Bouet (1942), Chapin (1954), Cheke & Mann (2001), Fry *et al.* (2000), Girmes (1974, 2007), Grote (1924), Hall & Moreau (1970), Payne (1978), Schnell *et al.* (1985), Serle (1950, 1956, 1957), Traylor & Parelius (1967), Walsh *et al.* (1990).

84. Johanna's Sunbird

Cinnyris johannae

French: Souimanga de Johanna

Spanish: Suimanga de Johanna

German: Grünscheitel-Nektarvogel

Other common names: Madame Verreaux's Sunbird

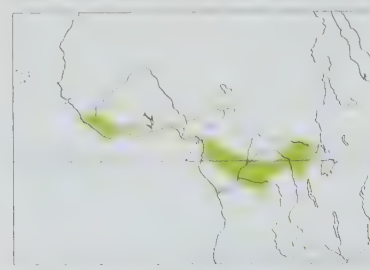
Taxonomy. *Cinnyris johannae* J. Verreaux and É. Verreaux, 1851. Gabon.

Genus often subsumed in *Nectarinia*. Racial affiliation of populations in Nigeria uncertain; tentatively included in nominate, but further study required. Two subspecies recognized.

Subspecies and Distribution.

C. j. fasciatus (Jardine & Fraser, 1852) Sierra Leone and SW Mali E to SW Benin.

C. j. johannae J. Verreaux & É. Verreaux, 1851 – SW & SE Nigeria and S Cameroon E to Central African Republic and NE DRCongo, and S to PRCongo and NW Angola (Cabinda).



Descriptive notes. 13–14 cm; male 12.6–14.7 g, female 11–15 g. Male nominate race has lores black, rest of head to upper throat and upperparts, including lesser and median upperwing-coverts, metallic golden-green, greater wing-coverts and remiges black, tail black with blue-purple sheen; metallic purple lower throat and upper breast above dark crimson middle and lower breast and upper flanks, feathers in upper section of breast with metallic purple subterminal bands; large pectoral tufts lemon-yellow, rest of underparts, axillaries and underwing-coverts black; iris dark brown; bill black; legs black, yellow on soles.

Female has head and upperparts dark brown-olive, rump brown with olive edging, narrow creamy supercilium and thin dark eyestripe, dark olive lores, dark grey-brown upperwing, remiges narrowly edged olive, tertials and wing-coverts narrowly edged pale olive, tail black-brown with brown-white tips, tips broader on outer two feather pairs; chin and throat cream-coloured, thinly streaked dark brown, underparts light yellow and heavily streaked, streaks heaviest (and dark olive-grey) on breast and flanks, abdomen pale olive-yellow, undertail-coverts pale olive-yellow with dark olive-grey streaks, axillaries pale yellow, inner underwing-coverts white and outer ones brown, mottled white; iris dark brown, bill and legs black. Immature male is as adult female, with striped underparts, but grey streaking denser and side of throat, flanks and breast darker. Race *fasciatus* is very like nominate, but male has lighter red on underparts and female is generally less dark. Voice. Song a complex high-pitched warble of rising and falling whistling notes. Calls include “wit”, singly or many in quick succession, also a descending “tsiooooo” and “tswee”.

Habitat. Mature forest, secondary forest, clearings, gardens and cocoa plantations.

Food and Feeding. Insects, spiders (Araneae), pollen, fruits of *Macaranga assava* and *Macaranga barteri*, and nectar. Forages singly and in groups of up to five individuals; mostly in upper levels of vegetation. Visits flowers of *Anthocheista*, *Psydrax*, *Syzygium congolense* and mistletoes (Loranthaceae); looks for insects in *Usnea* lichen.

Breeding. Egg-laying recorded in May in Liberia and Jul in Ghana. Messy nest with loose “beard”, made of bark and moss or lichen, held together by fungal fibres, adorned with leaves, lined with palm fibres, suspended 2–35 m up in palm or other tree. Clutch 1–2 eggs, very pale blue, with many red-brown spots concentrated at wider end. No other information.

Movements. No data.

Status and Conservation. Not globally threatened. Common in Liberia; uncommon or rare in rest of its geographical range. Occurs in Tai National Park, in Ivory Coast.

Bibliography. Bannerman (1948), Borrow & Demeey (2001), Bouet (1942), Chapin (1954), Cheke & Mann (2001), Fry *et al.* (2000), Gray (1986), Hall & Moreau (1970), Holman (1949), Lachenaud (2006b), Rand *et al.* (1959).

85. Superb Sunbird

Cinnyris superbus

French: Souimanga superbe

German: Prachtnektarvogel

Spanish: Suimanga Soberbio

Taxonomy. *Certhia superba* Shaw, 1811, Malembo, Cabinda, Angola.

Genus often subsumed in *Nectarinia*. Four subspecies recognized.

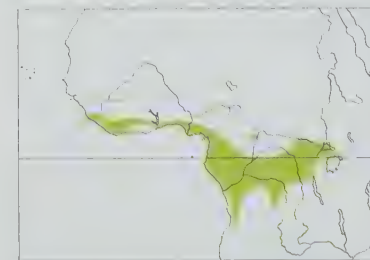
Subspecies and Distribution.

C. s. ashantiensis Bannerman, 1922 – Sierra Leone and S Mali E to Togo and NW Benin.

C. s. nigeriae (Rand & Traylor, 1959) – SE Benin and S Nigeria.

C. s. superbus (Shaw, 1811) – S Cameroon, Central African Republic and DRCongo (except NE) S to W Angola.

C. s. buvuma van Someren, 1932 – NE DRCongo, Uganda, W Kenya and extreme NW Tanzania.



Descriptive notes. 14–16 cm; male 13.8–14.7 g (*ashantiensis*), 17–24 g (*buvuma* and nominate), female 13.2 g (*ashantiensis*), 16–20.6 g (*buvuma* and nominate). Male nominate race has dark metallic blue-green on forehead and crown (reflecting greenish at some angles), black lores, metallic green stripe over eye, bronzy ear-coverts and cheek, metallic gold-green or blue-green upperparts; remiges and greater upperwing-coverts black, lesser and median coverts metallic green; chin metallic purple, throat and upper breast deep metallic blue (looking purple in some lights), rest of underparts dark maroon-red except for black

central and lower belly, thighs and undertail-coverts, the last with maroon tips; axillaries and underwing-coverts black; iris dark brown; bill and legs black. Female is grey-brown with olive wash above, with broad yellow-white supercilium from lores to behind dark olive ear-coverts, uppertail-coverts olive-green, wing dark brown, flight-feathers with light yellow or olive margins, except for grey-brown lesser wing-coverts, black-brown rectrices tipped pale brown (apart from

central pair); chin yellow-white, otherwise green-yellow below, with varying amounts of brown mottling on breast, undertail-coverts orange-yellow, axillaries and underwing-coverts yellow-white; iris dark brown, bill black, legs dark grey. Young male resembles female but slightly larger, occasionally with green tinge on back. Race *ashantiensis* is smaller (male wing 67–74 mm, male bill 26–29 mm) than nominate (72–83 mm, 28–33 mm), metallic cap of male smaller, not extending back to nape; *huvuma* male has upperparts darker and greener, less golden, than nominate and is darker below; *nigeriae* male is brighter red below than nominate. VOICE. Song consists of sequences of “weet-choo weet-choo witchoo witch”, “weetch-doo, weetch-doo” and variants. Calls “chip” and “sweet”.

Habitat. Mature forest and secondary forest, gallery forest, forest edge, coffee plantations, savanna, mangroves, tree nurseries, overgrown cultivations and clearings. Found in forest at up to 1400 m in Liberia and Uganda, but does not penetrate montane forest.

Food and Feeding. Nectar, seeds, including those of *Xylopia aethiopica*, fruits, also insects, spiders (Araneae) and snails. Forages generally singly and in pairs. Visits *Berlinia grandiflora*, *Bombax*, *Carica papaya*, *Citrus limon*, *Citrus sinensis*, *Coffea*, *Erythrina abyssinica*, *Erythrina indica*, *Erythrina mildbraedii*, *Markhamia*, *Musa*, *Occhthocosmus africanus*, *Spathodea* and mistletoes (Loranthaceae). Grabs chironomid midges in flight; hovers in front of flowers.

Breeding. Egg-laying recorded in Feb and Nov in Ghana, Jul in Nigeria, Feb, Jul and Oct–Nov in Cameroon, Oct–Mar in Gabon, Apr in PR Congo, Mar–May and Jul–Sept in Uganda and Dec in Angola; season probably Jul–Dec in DR Congo and breeding activity observed in Nov in Tanzania. Male displays with wings outstretched, song and fast movements. Nest built by female alone, taking a day to a month to complete the task, an untidy structure made variously of grass, fibres, strips of banana bark, leaves, *Usnea* lichens and moss, decorated with lichen or moss, loose “beard” hanging for 30–60 cm below, lined with grass, fibres, banana bark or seed down, suspended 2–10 m above ground and usually well hidden, appearing like bundle of dead grass. Clutch 1 egg, sometimes 2, glossy cream or pale blue-white with grey, dark slate or purple-black speckles and blotches, sometimes concentrated at wider end; incubation by female, but male assists in feeding of chicks; no information on duration of incubation and nestling periods. Male may start breeding activities before gaining full adult plumage.

Movements. No data.

Status and Conservation. Not globally threatened. Common in Liberia and Gabon; locally common in Angola; not uncommon in Ghana, Togo and Nigeria, and in Uganda. Occurs in several protected areas, e.g. Korup National Park, in Cameroon.

Bibliography. Baker & Baker (2007), Bannerman (1948), Borrow & Demey (2001), Bouet (1942), Carroll (1988), Chapin (1954), Cheke & Mann (2001), David & Gosselin (2002b), Friedmann & Williams (1971), Fry *et al.* (2000), Hall & Moreau (1970), Herroelen (2006), Lachenaud (2006a, 2006b), Rand & Traylor (1959), Rand *et al.* (1959), Traylor & Parelius (1967).

86. Rufous-winged Sunbird

Cinnyris rufipennis

French: Souimanga à ailes rousses **German:** Rotflügel-Nektarvogel **Spanish:** Suimanga Alirrojo

Taxonomy. *Nectarinia rufipennis* Jensen, 1983, Udzungwa Mountains, Tanzania.

Genus often subsumed in *Nectarinia*. Relationships of this species unclear. Monotypic.

Distribution. E escarpment of Udzungwa Mts, in E. Tanzania.



grey, tipped grey, underwing dark grey with pale grey underwing-coverts; iris dark brown; bill and legs black. Male non-breeding plumage has white patches on red chestband and mottling on head. Female has crown, face and nape greyish-olive and back and underwing-coverts olive-green, feathers of crown, nape, underwing-coverts and back with black centres (these areas appear mottled), lower nape to uppertail-coverts glossed turquoise, uppertail-coverts more green-tinged olive than back; uppertail black, outer edges brown with turquoise tinge and tipped white; underwing blackish-grey, remiges with red-brown outer edges, broadest on secondaries, greater wing-coverts with grey outer edges; olive-green below, paler on chin and belly, black feather centres giving streaked or spotted effect (variable), undertail black, tipped white, underwing-coverts grey; bare parts as male. Juvenile undescribed. VOICE. Male song a high-pitched trilling, accompanied by high-pitched chirping by female. Varied calls include “see-it” during foraging, loud “tyew”, trilling “tiddit”, and a “drep-drep” flight call.

Habitat. Moist montane forest with lichens, mosses and epiphytes, venturing out into glades within 20 m of forest edge. At 600–1700 m; most common at 1500–1700 m.

Food and Feeding. Nectar; probably also insects, as leaf-gleaning observed. Forages singly and in pairs; joins mixed-species flocks. Feeds 0.5–30 m from ground. Visits flowers of *Achyrosperrum carvalhi*, *Achyrosperrum radicans*, *Leucas densiflora*, *Tecoma capensis* and mistletoes (Loranthaceae).

Breeding. Juvenile being fed by female in Jan, and other breeding activity observed in Feb. Nest made of grass, rootlets and cobwebs, suspended at 5 m from shoot of *Sinarundinaria alpinum* bamboo. No other information.

Movements. Probably undertakes altitudinal movements in synchrony with availability of flowers and insects, but some resident at preferred sites.

Status and Conservation. VULNERABLE. Restricted-range species: present in Tanzania–Malawi Mountains EBA. Locally common. Has small range covering c. 3360 km² and decreasing population estimated at 10,000–19,999 individuals. Known from eight localities, all within well-protected areas: occurs in forests of Mwanibana and Iwonde, both in Udzungwa Mountains National Park, at Ukami, Ndundulu and Nymbanitu, in West Kilombero Scarp Forest Reserve, and in Katemele, Kiranzi-Kitungulu and Uzungwa Scarp Forest Reserves. Any suitable habitat in intervening, non-protected areas probably declining in extent and/or quality as a result of deforestation and forest degradation. This species’ future survival appears to be dependent on conservation of forests in its restricted geographical range.

Bibliography. Anon. (2007), Baker & Baker (2007), Butchart & Stattersfield (2004), Cheke & Mann (2001), Collar & Stuart (1985), Collar *et al.* (1994), Dinesen *et al.* (1993), Fry *et al.* (2000), Jensen (1983), Jensen & Brøgger-Jensen (1992), Stattersfield & Capper (2000), Stuart *et al.* (1987).

87. Oustalet’s Sunbird

Cinnyris oustaleti

French: Souimanga d’Oustalet **German:** Angolanektarvogel **Spanish:** Suimanga de Oustalet
Other common names: Oustalet’s White-bellied/Angola (White-bellied)/Caconda White-bellied Sunbird (*oustaleti*); Zambian Sunbird (*rhodesiae*)

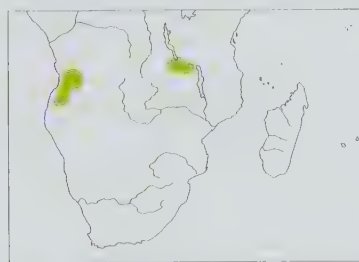
Taxonomy. *Nectarinia oustaleti* Bocage, 1878, Caconda, Huila, Angola.

Genus often subsumed in *Nectarinia*. Forms a superspecies with *C. talatala*; both have sometimes been considered to be part of a superspecies that also includes *C. bouvieri*, *C. oseae* and *C. asiaticus*. Two subspecies recognized.

Subspecies and Distribution.

C. o. oustaleti (Bocage, 1878) – WC Angola.

C. o. rhodesiae Benson, 1955 – NE Zambia and W & SW Tanzania.



Descriptive notes. 10–11 cm. Male nominate race breeding is iridescent green above, except for iridescent blue-green crown and iridescent blue uppertail-coverts; remiges very dark brown with paler margins; rectrices black, faintly tinged blue, webs of central pair and outer webs of T2–T5 edged iridescent blue, outermost rectrix brown, tipped white on outer web; chin and throat iridescent green-blue above two breastbands, upper one purple with some maroon at base, narrower lower one brown-black; otherwise white below, with orange-and-yellow pectoral tufts, whitish underwing-coverts and axillaries; iris dark

brown; bill and legs black. Male non-breeding (eclipse plumage) resembles female, but has pectoral tufts and metallic colours on wing-coverts and uppertail-coverts, is greyer on throat and breast, and has sparse metallic feathering on body. Female has head and upperparts dark grey-brown, with thin pale supercilium backwards from above eye, longest uppertail-coverts blacker with tips glossed greenish; remiges dark grey-olive with narrow pale buff edges; rectrices black, central two or three pairs narrowly edged metallic green, outer pair dusky white on outer web and with broad white tips on inner webs, other rectrices narrowly tipped white; greyish-buff to greyish-olive throat, breast and flanks appear streaked (as feathers have off-white fringes), rest of underparts somewhat paler and unstreaked; bare parts as male. Juvenile is dark grey-brown above, including wings, black tail with outer webs of outermost feather pair tipped dusky white, the rest except central pair narrowly tipped off-white, throat and breast grey, otherwise dusky white below, with pale yellow wash in middle of abdomen. Race *rhodesiae* is very like nominate, but bill smaller (male 17–19 mm; nominate male 19–22 mm), female has paler belly. VOICE. Song consists of ascending and descending high-pitched notes. Calls include repetitions of “cheep” and varied notes and sequences such as “chip”, “chip-chuu-chuu”, “tu-ter-twee, tu-ter-twee” with the “tu” higher-pitched, and “tzzip”.

Habitat. *Brachystegia*–*Isoberlinia* woodland, dense scrub and secondary growth.

Food and Feeding. Insects and spiders (Araneae); also, presumably, nectar. Forages singly and in small groups, often low down. Visits flowers of *Diplolophium*, *Canna*, *Nectaros* and *Parinari mohoba*.

Breeding. Egg-laying months Oct–Feb in Angola and Mar–Jun in Zambia. No other information.

Movements. Poorly known. Recorded as vagrant in N Malawi.

Status and Conservation. Not globally threatened. Locally common in Angola; rare in Zambia and Tanzania.

Bibliography. Aspinwall (1989), Baker & Baker (2007), Benson *et al.* (1971), Chapin (1954), Dillingham (1984), Dowsett-Lemaire & Dowsett (2006), Fry *et al.* (2000), Hall (1960), Hall & Moreau (1970), Moyer (1983), Williams (1955).

88. White-breasted Sunbird

Cinnyris talatala

French: Souimanga à ventre blanc

German: Weißbauch-Nektarvogel

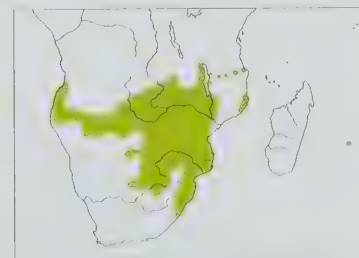
Spanish: Suimanga Pechiblanco

Other common names: (Southern) White-bellied Sunbird

Taxonomy. *Cinnyris talatala* A. Smith, 1836, between Orange River and Kurrichaine, South Africa.

Genus often subsumed in *Nectarinia*. Forms a superspecies with *C. oustaleti*; both have sometimes been considered to be part of a superspecies that also includes *C. bouvieri*, *C. oseae* and *C. asiaticus*. Proposed races *anderssoni* (described from NW Namibia), *lumbo* (from Lumbo, in N Mozambique) and *arestus* (from near Eshowe, in KwaZulu-Natal) considered inadequately differentiated from birds elsewhere in species’ range. Monotypic.

Distribution. SW & S Angola and N Namibia E to Zambia, Malawi and patchily to SE Tanzania, S to N & E Botswana, Zimbabwe, Mozambique, Swaziland and E South Africa (North West and Limpopo Provinces S to N Free State and Kwazulu-Natal).



Descriptive notes. 10–12 cm; 6–4–10 g. Male breeding has head and upperparts, including median and lesser underwing-coverts, iridescent green, uppertail-coverts iridescent blue-green, remiges and primary and greater coverts brown, outer margins of remiges pale buff when fresh, rectrices green-black with green margins, outermost feather pair tipped whitish on inner web; chin and upper throat iridescent blue, lower throat reflecting green; upper breastband blue above and purple below, bordered below by black band; yellow pectoral tufts; belly normally yellow-white but sometimes grey with yellow middle, or white with yellow in centre

or completely pale yellow, flanks and undertail-coverts whitish; iris dark brown; bill and legs black. Male in supposed non-breeding plumage has wing and tail as breeding, but metallic feathers re-

stricted to middle of chin, upper breast, head, back and uppertail-coverts, otherwise as adult female (existence of this eclipse plumage in doubt, and such individuals may be subadults). Female is grey-olive or brown above, wing-coverts without iridescent green (but some are glossy on lesser wing-coverts), tail olive-black, rectrices (except outer two pairs) glossy green on outer edges, outer rectrices with outer web and tip and part of inner web white; throat and breast greyish-olive, belly yellow or off-white, undertail-coverts pale yellow-white; bare parts as male. Juvenile male is as adult female, but with black throat and hint of iridescence on forehead, shoulders and rump. Voice. Song complex and varied, often starting with up to 6 "tsk" notes, sometimes leading into melodic warble, before "tsweet-tsweet-tsi-tsi-tsi" for 2 seconds and then a trill or "weeah-weeah, tchwee-tchwee" followed by up to 18 "teli" notes; both sexes sing. Calls and songs sometimes include mimicry of Common Bulbul (*Pycnonotus barbatus*), Chestnut-vented Warbler (*Sylvia subcaerulea*), Neddicky (*Cisticola fulvicaupilla*), Rattling Cisticola (*Cisticola chiniana*), Black-chested Prinia (*Prinia flavicans*), Bronze Mannikin (*Lanius cucullata*) or Streaky-headed Seed-eater (*Serinus gularis*).

Habitat. Dry savanna woodland, *Banksia*, *Combretum*, mombi and mopane woodlands, gardens, parks and riverine forest.

Food and Feeding. Insects, such as aphids (Aphidoidea), and nectar. Forages singly, in pairs and in small, loose groups. Visits variety of flowering plants, including *Acacia sieberiana*, *Aloe arborescens*, *Banksia plurijuga*, *Bauhinia galpinii*, *Callistemon viminalis*, *Capparis tomentosa*, *Cassia singuena*, *Combretum mossambicense*, *Cordia africana*, *Dalbergia nitidula*, *Dicentra spectabilis*, *Dioscorea chrysostachya*, *Erythrina abyssinica*, *Erythrina lysistemon*, *Halleria lucida*, *Ipomoea lobata*, *Jacaranda mimosifolia*, *Leonotis leonurus*, *Rosmarinus officinalis*, *Tecoma capensis*, *Tithonia tagetiflora* and mistletoes (Loranthaceae). Hovers in front of flowers to feed, and capable of flying backwards. Drinks from birdbaths.

Breeding. Laying recorded in Sept–Oct in Zambia, Jan and Apr–Oct in Malawi, Jun–Dec in Zimbabwe, Feb–Mar in Namibia, Jan, Mar, Jul and Sept–Dec in Botswana, Feb–Aug in Mozambique, and Jul–Feb in South Africa; sometimes double-brooded. Male display involves uttering warbling song while in semi-circular flight, before returning to perch. Nest built by female, taking 4–8 days, consisting of an untidy oval structure made from grass, leaves and cobwebs, with or without porch and lining, occasionally adorned with dead leaves and other material (such as newspaper), suspended 0.2–3.2 m above ground from shrub or tree, including from exotic cactus *Cereus peruvianus*. Clutch 1–2 eggs, white with purple-grey and olive speckles concentrated at wider end or with indistinct pale fawn and light ash speckles; incubation by female, period 13–14 days; both sexes may feed chicks and remove faecal sacs, nestling period 14–15 days; fledglings return to nest to roost for up to 4 nights, and continue to be fed by female for a week.

Movements. Resident and migratory. Some apparently move from drier W & S areas of S Africa to wetter E & N areas in dry austral winter months, and may go farther W if austral summer rains above average; influxes in Zimbabwe in May–Sept, and common Feb–Jul but rare Aug–Jan at Mazabuka (Zambia). Breeding visitor Namibia, Oct–Apr. Active migration to NE observed in N Botswana in Apr.

Status and Conservation. Not globally threatened. Abundant to locally common throughout geographical range. Occurs in several protected areas, e.g. Etosha National Park, in Namibia, Lwonde National Park, in Malawi, and Mkuze Game Reserve, in South Africa.

Bibliography. Borello (1992), Buchanan & Steyn (1964), Chapin (1954), Cheke & Mann (2001), Cliney (1962, 1967a), Cole (1992), Cyrus (1989), David & Gosse (2002b), Earle (1981a, 1981b, 1981c, 1982), Fry *et al.* (2000), Hall & Moreau (1970), Hamner (1981, 1989), Herremans (1992), Hockey *et al.* (2005), Hustler (1985), Johnson & Brown (2004), Kochler *et al.* (2006), Mackworth-Praed & Grant (1948), McCarthy (2006), Medland (1992), Nicolson & Fleming (2003), Shaw (2001a), Skead (1967), Tree (1988, 1990, 1991, 1997f), Traylor (1962), Vincent (1949).

89. Variable Sunbird

Cinnyris venustus

French: Soumanga à ventre jaune. **German:** Ziernektarvogel. **Spanish:** Suimanga Variable. **Other common names:** Yellow-bellied/Yellow-breasted/Buff-breasted/Buff-chested Sunbird; White-bellied (Variable)/Somali Sunbird (*albiventris*); Orange-bellied (Variable) Sunbird (*igniventris*).

Taxonomy. *Certhia venusta* Shaw, 1799, Sierra Leone.

Genus often subsumed in *Nectarinia*. Has been thought to be closely related to, and possibly forming a superspecies with, *C. ustulata*. Other proposed races include *bliski* (described from S shore I, Stefanie, in SW Ethiopia), synonymized with *albiventris*, and *sukensis* (from R Turkwell, in N Kenya), merged with *fazoglensis*; *kunziae* (Malanje, in N Angola), *massae* (Malawi), *cymescens* (Zanzibar) and *stierlingi* (Uhehe, in S Tanzania) are all treated as synonyms of *falkensteini*. Five subspecies recognized.

Subspecies and Distribution

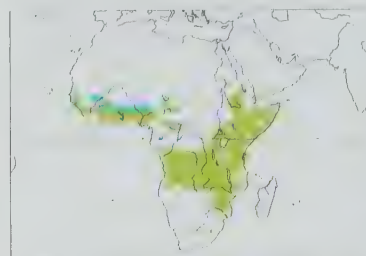
C. v. venustus (Shaw, 1799) = Senegal, Gambia and Sierra Leone E to Nigeria, N Cameroon and Central African Republic.

C. v. fazoglensis (Heuglin, 1873) = E Sudan, Eritrea and W Ethiopia.

C. v. albiventris (Strickland, 1852) = E & S Ethiopia, Somalia and NE Kenya.

C. v. falkensteini G. A. Fischer & Reichenow, 1884 = SE Sudan S to W & S Kenya, and from S Gabon and W Angola E to S DR Congo, Tanzania (including Pemba I and Zanzibar), Zambia, Malawi, Zimbabwe and Mozambique.

C. v. igniventris Reichenow, 1899 = E DR Congo, Uganda, Rwanda and Burundi.



Descriptive notes. 10–11 cm; 5–10 g. Male nominate race has front half of crown metallic purple, lores black, rest of crown, ear-coverts, throat, neck and upperparts, including lesser and median upperwing-coverts, metallic green, uppertail-coverts metallic blue (green in some lights); remiges and greater upperwing-coverts brown, greater coverts, primary coverts and alula finely edged metallic green when fresh, black tail edged metallic blue or green, outer two feather pairs tipped pale grey; chin and upper breast metallic purple, latter fusing with unglossy black area at lower border, otherwise pale yellow below, pectoral tufts yellow and

scarlet (sometimes only yellow), undertail-coverts white, tinged yellow, underwing-coverts white, axillaries pale yellow or white; iris dark brown; bill and legs black. Non-breeding male may retain metallic feathers on chin, throat, upper breast, lesser wing-coverts and uppertail-coverts and a few on back, otherwise resembles female but more olive-brown; some populations may lack eclipse plumage. Female is smaller than male, has crown and upperparts grey-brown, tinged olive on rump and lesser wing-coverts, wing darker, rectrices black, tinged glossy green, with whitish tips, broadest on outer pair of feathers, which also with pale outer webs; chin and throat whitish, otherwise pale yellow below, underwing-coverts and axillaries white with yellow tinge; bare parts as male. Immature male is as adult female, but throat and breast with dusky markings, appearing as dark streak on throat, and no pale tips on outer tail feathers. Race *albiventris* male has white abdomen, female grey-brown above, faint streaking on throat and breast, off-white below; *falkensteini* male is deeper yellow below than nominate, eclipse plumage (not acquired by all males) more like breeding (only 10–20% of metallic feathers lost, dusky feathers present on crown and chest), immature at end of first year acquires plumage with only 50–80% of full metallic complement, becoming fully adult after third moult (at end of second year); *fazoglensis* male resembles previous, but has metallic green, not purple-blue, on throat above purple breast; *igniventris* male differs in having orange-scarlet in centre of chest, scarlet pectoral tufts. Voice. Song consists of repetitions of a sequence of 3–4 "tsch-tsch-wee" notes followed by fast trilling of up to 15 "eh" notes, sometimes preceding high-pitched warble of rapid ascending and descending notes. Subsong of "tsrrr" trill followed by "tschi-pu". Calls include "chip-chip", "chop-tsee-tsk-tsk", "tser-tze-zip" and "tew-tew-tew"; "cheer-cheer" or "tshwee, tshwee, tshwee" alarm calls.

Habitat. Thornbush savanna, brachystegia (*Brachystegia*) woodland, forest, forest edge, wooded ravines, farmland, parks, open coastal habitats, mangroves, coconut plantations, inselbergs, montane savanna, slopes with proteas (*Protea*), also in gardens in urban areas; generally in moister and more wooded areas in S part of range. Lowlands and mountains; to 2700 m in Rwenzori Mts (DR Congo–Uganda).

Food and Feeding. Nectar, insects, and spiders (Araneae). Forages singly, in pairs and in small groups; joins mixed-species flocks. Visits variety of flowers, including those of *Acacia sieberiana*, *Acrocarpus fraxinifolius*, *Aloe*, *Albizia coriaria*, *Berlinia grandiflora*, *Callistemon citrinus*, *Combretum mozambicense*, *Erythrina humeana*, *Fourea speciosa*, *Grevillea banksii*, *Grewia similis*, *Halleria lucida*, *Hibiscus*, *Jacaranda mimosifolia*, *Kniphofia*, *Leonotis mollissima*, *Parkia filicoides*, *Protea*, *Prunus*, *Symphonia globulifera*, *Tecoma*, *Thevetia peruviana*, and mistletoes (Loranthaceae). Mistletoes include e.g. *Tapinanthus globiferus*, closed flowers of which the bird itself opens in order to reach the nectar. Gleans leaves for insects, and probes and hovers in front of flowers; catches insects on the wing. Drinks from birdbaths.

Breeding. Laying recorded in Mar in Gambia, Oct in Sierra Leone, Dec in Liberia, Jul in Togo, Oct–Jan in Nigeria, Nov–Jan Sudan, Jun in Eritrea and Apr–Oct Ethiopia, Aug–Sept in DR Congo, Feb–Mar and Sept–Oct in Uganda, all months (peaks Jan, May and Jul) in Tanzania, Apr and Jul–Oct in Zambia, Feb–Aug and Dec in Malawi, Jan–Dec in Zimbabwe and Apr–Sept in Mozambique; sometimes double-brooded. Female does bulk of nest-building, male helping occasionally, task taking 10–20 days, nest an untidy flimsy oval with porch, sometimes short "beard", made variously from grass, reeds, rootlets, fibres, flowers, leaves and cobwebs, lined with vegetable down or feathers, placed 0.9–2 m up in creeper, bush or small tree. Clutch 1–3 eggs, matt white to grey-green or grey-white, very densely speckled with ash-brown, brown, fawn, greyish or purple-grey spots, concentrated at wider end; incubation by female, period c. 2 weeks; chicks fed by both sexes, nestling period 18 days. Nests parasitized by Klaas's Cuckoo (*Chrysococcyx klaas*).

Movements. Variously resident, nomadic and migratory, but movements unclear. Ascends to higher altitudes during droughts in Zimbabwe, where one ringing recovery showed movement of 25 km. Resident on coast in Nigeria but absent in other S habitats there during Apr–Oct, when occurs in N Nigeria. Present Gabon Mar–Oct.

Status and Conservation. Not globally threatened. Common over most of its geographical range; rare in extreme S. Occurs in a number of protected areas in most parts of range.

Bibliography. Baker & Baker (2007), Bannerman (1948), Blancou (1939), Borrow & Demey (2001), Chapin (1954), Chasko & Mwamusi (2006), Cheke (1976), Cheke & Mann (2001), Elgood *et al.* (1973), Friedmann (1937), Fry *et al.* (2000), Granchi (1988), Hall & Moreau (1970), Hamner (1981, 1989, 1997, 2001), Hockey *et al.* (2005), Hustler (1985), Irwin (1981a, 1984), Lane (1996), Lees (1999), Lewis & Pomeroy (1989), Prinzing & Jackel (1986), Prinzing *et al.* (1989), Rand *et al.* (1959), Rüppell (1840), Sclater & Moreau (1933), Serle (1940, 1957), Shaw (2001a, 2001b), Siemens (1983), Sievi (1974), Skead (1967), Traylor (1962), Traylor & Parelius (1967), Tree (1997e), Wilhelm *et al.* (1980, 1982), Zimmerman *et al.* (1996).



PLATE 17

inches 2
cm 5

90. Dusky Sunbird

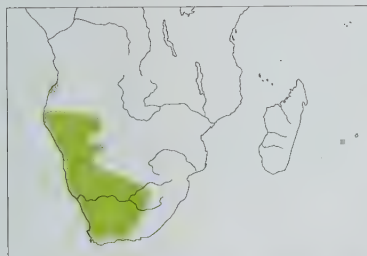
Cinnyris fuscus

French: Souimanga fuligineux **German:** Rußnektarvogel **Spanish:** Suimanga Oscuro
Other common names: White-vented Sunbird, Namaqua Sunbird

Taxonomy. *Cinnyris fuscus* Vieillot, 1819, Great Namaqualand, Namibia. Genus often subsumed in *Nectarinia*. Has been thought to form a superspecies with *C. cupreus*. Two subspecies recognized.

Subspecies and Distribution.

C. f. inclusus (Clancey, 1970) – coastal SW Angola (Benguela, and Namibe S to R Cunene).
C. f. fuscus Vieillot, 1819 – Namibia, W & C South Africa and S Botswana.



Descriptive notes. 10 cm; male 7–10 g, female 6–7 g. Male nominate race breeding has head blackish-brown with faint purple-blue iridescence, upperparts dark brown with blue, purple and bronze-green iridescent tinge; tail black slightly glossed blue above, upperwing brown, lesser and median upperwing-coverts very dark brown with green reflections; throat and breast black-brown with purple and bronze-green reflections, lower breast sooty black, pectoral tufts orange (sometimes yellowish-orange), upper belly white, lower belly and undertail-coverts whitish or buffish, axillaries and underwing-coverts dark brown; iris dark

brown; bill and legs black. Male non-breeding (eclipse plumage) lacks black plumage except on throat and from head to rump, and a few metallic feathers may remain on upperparts and lesser wing-coverts. Female has head, upperparts and upperwing dull brown, uppertail-coverts and tail very dark black-brown, throat and underparts very pale grey-olive, whitish on lower belly and undertail-coverts, underwing-coverts white, axillaries grey; bare parts as male. Juvenile is like female, but greener upperparts and tinged yellow on underparts. Race *inclusus* male has purple-tinged glossy (not matt) black area below metallic throat, and whiter flanks and undertail-coverts than nominate, lacking brown feathers. Voice. Song begins with “tst” and then a “trr-trr-trr...” trill for c. 2 seconds, changing down in tone half-way through before ending with “tschut”; trill variable, and variety of other songs noted, e.g. “sweek, week, wee-aswirrik, e.e.e.” and husky “shreep-chip, chip, chip, chip, chip, chip, chip, chip”. Calls also varied, include “tsk”, “weeh, weeh” and flight call of “ji-dit”.

Habitat. Dry country, including semi-arid coastal plains with sand dunes (but not sandy desert), acacia (*Acacia*) scrub along watercourses, inselbergs with scattered bushes, hillside scrub, also orchards and gardens.

Food and Feeding. Insects and nectar. Forages mostly in pairs, sometimes in groups; aggregations of hundreds occasionally recorded, e.g. at large patches of *Nicotiana*. Associates with other sunbirds. Food taken from such plants as *Drosanthemum luderitzii*, *Leonotis oxymifolia*, *Lycium campanulatum*, *Nicotiana glauca*, and those of genera *Acacia*, *Aloe* (of at least seven species), *Cadaba*, *Canna*, *Crassula*, *Crocosmia*, *Hibiscus*, *Lantana*, *Psilocaulon*, as well as *Tapinanthus oleifolius* and other mistletoes (Loranthaceae). Hawks for insects; hovers in front of flowers. Drinks water at pools.

Breeding. Egg-laying recorded in all months (peak Feb–Apr) in Namibia and Aug–Mar in South Africa; in years when rains begin early, males may breed when still moulting out of eclipse plumage; possibly double-brooded. Aerial courtship displays; moth-like flights during male encounters with other males. Oval nest made of grass, fibres, bark, leaves and cobwebs, adorned with wool or miscellanea such as tissue paper, lined with plant down or hair from gemsbok (*Oryx oryx*), placed low down, 0.1–1.65 m above ground, in shrub or tree, often beside watercourse. Clutch 1–3 eggs, white with a few grey-blue, purple-brown or brown blotches, mottles and spots; incubation by female, period 12–13 days; female alone broods chicks and removes faecal sacs, but both sexes feed chicks, of which only one usually survives, nesting period 13–15 days; young fed by parents for 2–3 weeks after leaving nest. Nests known to be parasitized by Klaas’s Cuckoo (*Chrysococcyx klaas*).

Movements. Nomadic in response to availability of flowering plants and droughts; may irrupt into SW Cape region of South Africa.

Status and Conservation. Not globally threatened. Locally common to very common in Angola and Namibia; rather uncommon in South Africa but locally more numerous, mainly in W of range there. Occurs in Spitskop Nature Reserve, in South Africa.

Bibliography. Cheke & Mann (2001), Clancey (1970b), Fraser & Wheeler (1991), Fry *et al.* (2000), Hall & Moreau (1970), Harrison (1997b), Hockey *et al.* (2005), Jensen & Clinning (1974), Molyneux (1976), Sked (1967), Williams *et al.* (1986).

91. Ursula’s Sunbird

Cinnyris ursulae

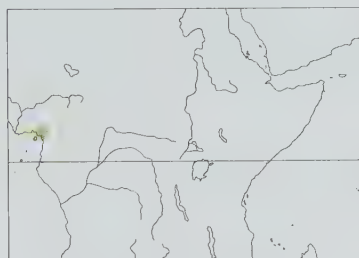
French: Souimanga d’Ursula **German:** Graubrust-Nektarvogel **Spanish:** Suimanga de Úrsula
Other common names: Fernando Po (Mouse-coloured) Sunbird, Ursula’s Mouse-coloured Sunbird

Taxonomy. *Cyanomitra ursulae* Alexander, 1903, Mount St Ysabel, Bioko.

Genus often subsumed in *Nectarinia*. Has been thought to be closely related to, and possibly forming a superspecies with, *C. venustus*. Monotypic.

Distribution. Mountains of SW Cameroon and Bioko I (Fernando Póo).

Descriptive notes. 9–10 cm; 5.3–7.3 g. Male has forehead and forecrown grey, tinged metallic blue, sides of face grey, hindcrown and upperparts olive-green, upperwing black-brown, edges of remiges and all upperwing-coverts yellowish, tail black-brown with olive-yellow edges; chin and throat pale brown, breast greyer, otherwise pale yellow-tinged olive below, orange-red pectoral tufts; axillaries and underwing-coverts white; iris brown; bill and legs black, toes dark grey. Female is like male, but pectoral tufts duller orange. Immature resembles adult but without pectoral tufts and metallic feathering, has chin and upper throat mottled grey and whitish, throat and upper chest dark grey-green, otherwise yellow-olive below, brightest on belly. Voice. Songs include de-



scending high-pitched trill and complex sequence with “tzip-tzip-tzip”, a whistling warble, trills, “tseep” and “weet”. Calls include “tsit-tsit”, “tche-tchu”, and bursts of accelerating and slightly falling “tseep-tseep-tseep-tseep”.

Habitat. Primary and secondary forest and forest edges in highlands. At 950–1250 m on Mt Cameroon, 950–2050 m on Mt Kupé; 1000–1200 m on Bioko, where found particularly in moss forest.

Food and Feeding. Nectar, seeds, insects, some spiders (Araneae). Forages singly and in pairs; associates with other sunbirds. Visits

flowers of *Rauvolfia vomitaria*, also those of families Flacourtiaceae and Rubiaceae; forages in shrubs on forest floor and in trees.

Breeding. Egg-laying in Jan, Mar and Dec in Cameroon. Nest a compact cushion, mostly of moss with some rootlets and cobwebs, short moss porch but no “beard”, placed low down (3.5–4.2 m) among moss-covered branches, creepers, lianas or shrub. Clutch 1–2 eggs, white, tinged chestnut; chicks fed by both parents. No other information.

Movements. No data.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Cameroon Mountains EBA. Uncommon to locally common in Cameroon, but possibly often overlooked; rare on Bioko. Appears to be dependent on largely undisturbed forest within its small range, and is potentially at risk from further forest clearance.

Bibliography. Anon. (2007f), Bannerman (1948), Borrow & Demeu (2001), Butchart & Stattersfield (2004), Cheke & Mann (2001), Fry *et al.* (2000), Hall & Moreau (1970), Pérez del Val (1996), Stattersfield & Capper (2000), Stuart & Jensen (1986).

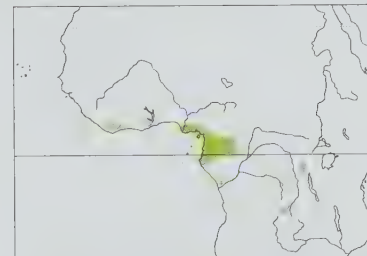
92. Bates’s Sunbird

Cinnyris batesi

French: Souimanga de Bates **German:** Einfarb-Nektarvogel **Spanish:** Suimanga de Bates
Other common names: Bates’s Olive Sunbird

Taxonomy. *Cinnyris batesi* Ogilvie-Grant, 1908, River Ja, Cameroon, and Camma River, Gabon. Genus often subsumed in *Nectarinia*. Monotypic.

Distribution. E Liberia, Ivory Coast, Ghana, and from Nigeria and S Cameroon E to N PR Congo and Central African Republic, and S, including Bioko I (Fernando Póo), to S Gabon; also NW Angola (Cabinda), E, C & SE DR Congo and extreme NW Zambia.



Descriptive notes. 9–10 cm; 5.7–7 g. Male is dark olive above, with faint pale stripe above eye, dark brown wings edged pale yellow, black tail widely edged green-olive, outer rectrices tipped olive; paler grey-olive below, yellowish on central belly; wispy pale yellow feathers (paler, sometimes white, at base) at side of breast appear as pectoral tufts, but probably elongated axillaries or underwing-coverts; iris dark brown; bill black, pale base of lower mandible; legs black. Female is like male, but elongated underwing-coverts paler, less yellow, and sometimes all white or reduced. Juvenile is similar to adult. Voice. Song a quiet

trill followed by nasal “ts-tsp” or repetitions of “ts”. Calls include “tsk”, “weet”, “tseep” and “tsp-tsp ch-ch-chur”.

Habitat. Primary forest, forest edges and cultivations with tall trees, also clearings and secondary growth.

Food and Feeding. Nectar, berries, fruits, insects and spiders (Araneae). Forages singly and in small groups in canopy; joins mixed-species flocks. Visits flowers of *Macaranga assas* and flowers in forest canopy, where usually found on mossy branches with epiphytes.

Breeding. Laying recorded in Jul and Dec in Cameroon, Feb in DR Congo and Feb–Mar in Gabon. Nest a pouch made of pappus, leaves and cobwebs, adorned with moss, lined with cottony fluff, suspended 2–3 m above ground in bush. Clutch 1–2 eggs, matt light pink with grey-green or pinkish spots and blotches, or brown with a few deep brown or yellow-brown blotches. No other information.

Movements. No data.

Status and Conservation. Not globally threatened. Rare to uncommon in most of its range, but may be overlooked. Common in Cameroon and locally common in Equatorial Guinea and in Gabon. Densities of 30–60 birds/km² recorded in Gabon.

Bibliography. Amadon (1953), Bannerman (1948), Bates (1911), Benson & Irwin (1966), Borrow & Demeu (2001), Bouet (1942), Brosset & Erard (1986), Chapin (1954), Cheke & Mann (2001), Eisentraut (1963), Fry *et al.* (2000), Hall & Moreau (1970), Mackworth-Præd & Grant (1973), Pérez del Val (1996), Prigogine (1971, 1972), Prinzing *et al.* (1989), Williams (1958, 1959).

93. Copper Sunbird

Cinnyris cupreus

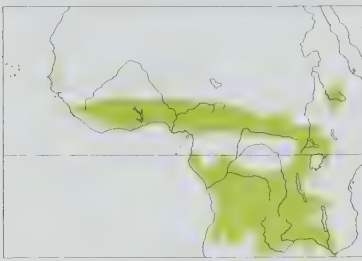
French: Souimanga cuivré **German:** Kupfernektarvogel **Spanish:** Suimanga Cobrizo
Other common names: Coppery/Copper-coloured Sunbird

Taxonomy. *Certhia cuprea* Shaw, 1811, Malembo, Cabinda, Angola.

Genus often subsumed in *Nectarinia*. Has been thought to form a superspecies with *C. fuscus*. Nominative race exhibits clinal variation in size, which increases from W to E. Described race *septentrionalis* (from Mpumu, in Uganda) is synonymized with nominate and *vaughanjonessi* (from Kasempa, in Zambia) with *chaleus*. Two subspecies recognized.

Subspecies and Distribution.

C. c. cupreus (Shaw, 1811) – SW Mauritania, Senegal, Gambia and Sierra Leone E to Cameroon, Central African Republic, S Sudan, W Ethiopia, Uganda and W Kenya (W of Rift Valley), and from Gabon and NW Angola (Cabinda) E to DR Congo (except SE) and W Tanzania.
C. c. chalcus (Hartlaub, 1862) – Angola (except Cabinda), SE DR Congo, Zambia, SW Tanzania, Malawi, NE Namibia (Caprivi Strip), N Botswana (Chobe National Park, Kasane) N Mozambique and N Zimbabwe.



Descriptive notes. 12–13 cm; male 8.4–11.4 g (*chalcus*), 6.8–8.4 g (*cupreus*, W Africa) and 7.5–11 g (*cupreus*, Kenya), female 7.3–10.2 g (*chalcus*), 5.5–8.3 g (*cupreus*, W Africa) and 7.2–8.9 g (*cupreus*, Kenya). Male nominate race breeding has head, throat and neck metallic copper with gold, red, green or black reflections; upperparts, lesser and median upperwing-coverts and breast metallic purple, greater upperwing-coverts and remiges blackish with blue gloss, tail similar but more purple; underparts below breast black with slight gloss, underwing-coverts and axillaries black; iris dark brown; bill black; legs black. Male

non-breeding (eclipse plumage) has almost no iridescence, although a few metallic feathers retained among otherwise olive upperparts, and lesser wing-coverts and uppertail-coverts have metallic purple tips; underparts yellowish, some black on belly and flanks. Female is smaller and significantly less heavy than male, lacks metallic colours, has crown and upperparts brownish-olive, darker olive-brown ear-coverts, black lores, narrow pale yellow supercilium, dark brown remiges edged olive and pale-tipped, black tail glossed dark blue and outer rectrices browner with paler ends and outer webs; underparts olive with yellow wash, axillaries pale yellow, underwing-coverts white, yellow at edges; iris dark brown, bill and legs black. Immature male is like male in eclipse plumage but without any metallic colour on lesser wing-coverts; immature female as adult. Race *chalcus* male is more green-bronze, less purple, and longer-winged than nominate, in eclipse plumage head, mantle and throat olive-green (not metallic) and metallic patch on wing-coverts and uppertail-coverts retained. **Voice.** Song of nominate race an oft-repeated sequence of c. 18 “chip” notes, speeding up into trill of up to 10 fast notes; song of *chalcus* a warble with “tsck” notes intermixed. Calls include various utterances such as “pst”, “cht-cht”, “keek”, also high-pitched “cher, cher, cher...” alarm.

Habitat. Mainly savannas; also degraded forest, woodland, swamps, mangroves, coastal thickets, cultivations, gardens and urban areas. To 2100 m in mountains.

Food and Feeding. Nectar, fruits, insects, sometimes taken in mid-air, and spiders (Araneae). Forages singly, males sometimes in groups; sometimes joins mixed-species flocks, normally if certain other sunbirds present. Visits variety of species, such as *Acacia polyacantha*, *Aloe cameronii*, *Bauhinia petersiana*, *Berlinia grandiflora*, *Brachystegia boehmii*, *Callistemon viminalis*, *Combretum mossambicum*, *Erythrina latissima*, *Jacaranda acutifolia*, *Leonotis leonurus*, *Passiflora quadrangularis*, *Prunus persica*, *Tecoma capense*, *Thunbergia lancifolia* and *Trichodesma physaloides*. Probes flowers, also often nectar-robbs from bases of flowers. Insects sometimes taken in mid-air.

Breeding. Egg-laying recorded in May–Jun and Sept–Oct in Gambia, Aug–Oct in Sierra Leone, Jun–Jul in Ghana and Togo, Aug–Oct in Nigeria, Sept–Oct in Cameroon, Jul–Aug in Sudan, Apr and Nov in Angola, Dec–Apr, Jun and Sept in DR Congo, Mar–Dec in Uganda, Mar–Jun, Aug and Dec in Tanzania, Dec–Mar and Jun in Zambia, Jan–Mar in Malawi, and Sept–Feb in Zimbabwe; sometimes double-brooded, e.g. in Nigeria. Territorial; intruders, including other bird species, aggressively repelled. Displaying male flies to above tree height, then zigzags in undulating flight, singing all the time; courtship behaviour involves leaning forwards, stretching neck, with bill held open and secondaries crossed over rump, tail twisted to one side, puffing out body feathers and shivering while calling. Nest built by female alone, pear-shaped, with grass porch and “beard”, made of grass, leaves, lichen, bark, roots, fibres, down and cobwebs, lined with roots and pappus, suspended 0.75–4.5 m up in creeper, bush or tree. Clutch 1–3 eggs, brown to light grey or pale green-white, with sepia, olive, dark brown, black, purple-brown or ash-grey blotches, spots and streaks; incubation by female or by both parents, period 2 weeks; both parents feed chicks, female removes faecal sacs and tidies nest, nestling period 11–16 days. Nests parasitized by Diederik Cuckoo (*Chrysococcyx caprius*) and Klaas’s Cuckoo (*Chrysococcyx klaas*).

Movements. Partially migratory in W Africa, where some move N into savanna during rainy season (Apr–Oct) to breed. In Malawi recorded above 475 m only in Sept–May, and present in C of country (at Lilongwe) Oct–Mar, but in S (at Nchalo) noted only in Apr–Dec. Nomadic in Zimbabwe, and ringing recoveries reveal movements of up to 43 km.

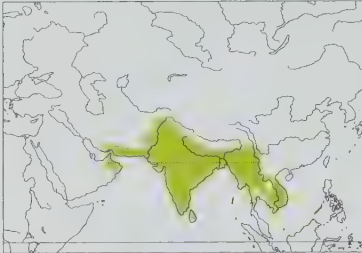
Status and Conservation. Not globally threatened. Abundant or common throughout most of range; locally common in Zambia and Malawi, and uncommon in Sudan. May breed rarely in extreme SW Mauritania (Lower R Senegal area). Occurs in a number of protected areas, such as Murchison Falls National Park, in Uganda, and Lilongwe Nature Sanctuary, in Malawi.

Bibliography. Baker & Baker (2007), Bannerman (1948, 1951), Borrow & Demei (2001), Carroll (1988), Chapin (1954), Cheke & Mann (2001), Davey & Davey (1990), Fry *et al.* (2000), Hall & Moreau (1970), Hanmer (1981, 1989), Hockey *et al.* (2005), Howells (1971), Irwin (1981a), Lynes (1938), Mackworth-Præd & Grant (1945), Mariaux & Vaucher (1991), Nikolaus (1987), Oatley (1996), Prinzing & Jackel (1986), Rand *et al.* (1959), Serle (1957), Skead (1967), Tree (1990, 1991, 1997c), Tyler *et al.* (2008), Zimmerman *et al.* (1996).

94. Purple Sunbird
Cinnyris asiaticus

French: Souimanga asiatique **German:** Purpurnektarvogel **Spanish:** Suimanga Asiático

Taxonomy. *Certhia asiatica* Latham, 1790, Gurgaon, Haryana, north India. Genus often subsumed in *Nectarinia*. Has sometimes been considered to be part of a superspecies that also includes *C. bouvieri*, *C. osea*, *C. oustaleti* and *C. talatala*. Three subspecies recognized. **Subspecies and Distribution.** *C. a. brevirostris* (Blanford, 1873) – E Arabian Peninsula (N United Arab Emirates, N & C Oman), and SE Iran, E Afghanistan, Pakistan and W India (W Rajasthan and W Gujarat). *C. a. asiaticus* (Latham, 1790) – India (except W & E), Nepal and Sri Lanka. *C. a. intermedius* (Hume, 1870) – E India (Assam S to Orissa and N Andhra Pradesh) and Bangladesh E to Myanmar, S China (S Yunnan) and Indochina. **Descriptive notes.** 10–11 cm; male 6.9–11 g, female 5–10 g. Male nominate race breeding is dark metallic blue and purple above, with uppertail black, glossed blue; metallic purplish-blue on lesser upperwing-coverts, sometimes also on margins of median and faintly on greater upperwing-coverts and remiges; dark metallic blue and purple on throat and breast, sides blue-green, belly dark purple



brevirostris has shorter bill than nominate, male greener above and often lacks reddish-brown pectoral band, female paler, juvenile whiter on flanks; *intermedius* male has more violet-purple upperparts, chin and throat than nominate, female is darker above and richer yellow below, juvenile more buffy grey below. **Voice.** Song an excited “cheewit-cheewit” rapidly repeated 2–6 times, usually by male, and warbling “swi-swi-swi-a-col-a-oli” or “sisisi-sew-sew-sew”; also “t’k’k’k’...k’k’/ché/wing!- ché/wing!- ché/wing!” and variants, sometimes interspersed with call notes. Calls include “chip”, frequent loud “chweet”, rising “sweep”, hard “zik”, upslurred “chwing” and similar; in flight a shrill chirp; loud, harsh, monotonous whistle; crackling alarm call.

Habitat. Usually around flowering shrubs and trees in dry and deciduous forests, thorn-scrub, cultivation and gardens. Lowlands, generally to 1500 m, but to 1830 m in Nepal, to 2100 m in Oman and to 2400 m in S India (Nilgiri Hills).

Food and Feeding. Small insects, and spiders (Araneae); nectar, also fruits, particularly of mistletoes (Loranthaceae) but also grapes. Forages singly, in pairs and in small to medium-sized groups; larger groups (up to 200 individuals) observed in non-breeding season. Visits flowers of aloes (*Aloe*), *Avicenna marina*, *Calotropis procera*, *Lycium*, *Prosopis cineracea*, *Prosopis juliflora* and *Maerua crassifolia*.

Breeding. Breeding in all months, chiefly in dry season; laying recorded in Jan–Jul (also nestlings and a female with enlarged ovary, both Jul) in Oman, and Apr–May in Pakistan; in India, mainly May–Aug in N (but Mar–Jun in Haryana and Feb–May in Bihar) and Nov–Aug (earlier in S) in Deccan; May–Jun in Nepal, Jan–Jun (mostly Mar–Apr, occasionally to Sept) in Sri Lanka, and Feb–May in Myanmar; nest with young in Cambodia, Feb; often double-brooded in Oman and C India, and at two or more broods in quick succession in Bihar. Nest, built in 5–15 days, an oblong purse, usually with porch, made of soft grass and fibres, leaves, cobwebs, etc., decorated with detritus and rubbish, including pieces of bark and caterpillar frass, lined with silky-white seed down; suspended on twig 2–6 m (rarely, 13 m) from ground, often from inner branch of bush (including *Opuntia*), or may be hung from trelliswork, creepers, rope, chain, rafter or electric wire (including wire attached to live bulb) on verandah or even inside building, or placed among spider nest mass. Clutch 1–3 eggs, greyish-white, chocolate-brown streaks forming band around broad end; incubation period 14–15 days; nestling period 13–17 days. Nests parasitized by Plaintive Cuckoo (*Cacomantis merulinus*).

Movements. Mostly resident. Wanders to S Oman in non-breeding season, when moves in search of flowers; flocks of up to 200 seen in Jan; seen in flight over deserts 30 km from nearest suitable habitat. Recently recorded in Kuwait, Jan–Feb 2008, during very cold weather; status uncertain.

Status and Conservation. Not globally threatened. Common in Indian Subcontinent and N Oman. Expanding in United Arab Emirates in response to afforestation, which provides new nesting habitats. Occurs in many protected areas, such as Keoladeo and Nagarhole National Parks, in India, Chitwan National Park, in Nepal, and Doi Inthanon National Park, in Thailand. This sunbird’s habit of eating grapes has afforded it the status of a pest species in parts of India (Haryana and around Hyderabad).

Bibliography. Al Hajji *et al.* (2008), Ali (1931, 1932, 1969), Ali & Ripley (1974), Anon. (1994a, 1998a), Badhwar (1990), Bharucha (1982), Cheke & Mann (2001), Cunningham (2000), Das (1963), Davidar (1985a), Eriksen (1998), Etchecopar & Ilie (1983), Farrow (2008), Fleming *et al.* (1976), Gallagher & Woodcock (1980), Grimmett *et al.* (1998), Henry (1955), Inskipp & Inskipp (1985), Kumar, A. *et al.* (1999), Kumar, S. T. *et al.* (1984), Majumdar (1981a), Mason & Maxwell-Lefroy (1912), McClure (1998), Meyer de Schauensee (1984), Nowak & Sachanowicz (2002), Oates (1890b), Rahman *et al.* (1993), Raju (1998, 2001), Raju & Reddi (1989), Rand & Fleming (1957), Rasmussen & Anderton (2005b), Rawat & Dookia (2007), Robson (2000b), Sharma & Kashyap (1999), Smythies (1986), Stuart Baker (1926), Suter (1945), Ticehurst (1918), Wait (1931), Whistler & Kinnear (1949).

95. Olive-backed Sunbird
Cinnyris jugularis

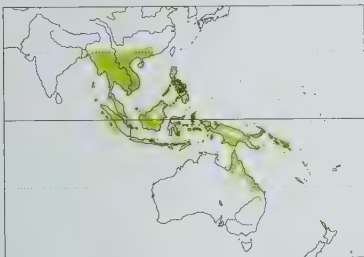
French: Souimanga à dos vert **Spanish:** Suimanga Dorsioliva
German: Grünrücken-Nektarvogel
Other common names: Yellow-breasted Sunbird (*frenatus*, *flavigaster*); Yellow-bellied Sunbird (“nominate group”); Black-breasted/Black-throated Sunbird (*idenburgi*)

Taxonomy. *Certhia jugularis* Linnaeus, 1766, Philippine Islands. Genus often subsumed in *Nectarinia*. Forms a superspecies with *C. buettikoferi*, and possibly conspecific; closely related also to *C. solaris*, but considerable overlap in range. Races fall within two (sometimes treated in three) groups: “nominate group”, comprising populations from Continental Asia, Greater and Lesser Sundas, Sulawesi, parts of Moluccas, and Philippines S to New Guinea, Bismarck Archipelago, Solomon Is and Australia, and “*clementiae* group”, with remaining races (*buruensis*, *clementiae*, *keiensis*, *idenburgi*, *teysmanni*) from some small islands of Lesser Sundas, Moluccas and R Mamberamo region of N New Guinea. These groups may represent two separate species; moreover, the second group could arguably be split into three species, *teysmanni* and *idenburgi* each being accorded species rank and *clementiae* (with *buruensis* and *keiensis*) treated as an additional species. Alternatively, if all are deemed to belong to one species, *teysmanni* could be separated into a group of its own. It is possible that tendency for development of dark plumage is dependent on gene pool of colonizing population, and that *clementiae* (with *buruensis* and *keiensis*) descended from one “typical” race, *idenburgi* from another, and *teysmanni* from a third. It is not known if ranges of the two New Guinea races (*frenatus*, in “nominate group”, and *idenburgi*, in “*clementiae* group”) are contiguous, although a female of former and a male of latter have apparently been found together at Aiome, in R Ramu drainage (in NE part of island). Birds on Andaman is currently placed in race *andamanicus*, but some variation exists, indicating that perhaps more than one race is involved. Conversely, several races poorly differentiated, e.g. *blanfordi* could perhaps be included in *klossi* or *ornatus*, and *robustirostris* in *frenatus*. Race name *pictus*, described from NW Basilan (in W Philippines), was based on a composite specimen, major parts deriving from nominate race. Many additional races have been described, all considered insuffi-

ciently distinct to warrant retention: *tamdaoensis* (from NE Vietnam) treated as synonym of *rhizophorae*, and *annamensis* (Nha Trang, in C Vietnam) included in *flammaxillaris*; *heliobletus* (Tanjung Dungun, in Peninsular Malaysia), *microleucus* (Pulo Taya, off SE Sumatra), *helioretetus* (Tanjung Rengsam, on Bangka I, off SE Sumatra), *zapezus* (Pulo Subi, in Natuna Is), *heliomanis* (Salintukan, in E Borneo) and *pectoralis* (Java) all synonymized with *ornatus*; in Philippines, *dinagatensis* (from Dinagat) and *mindanensis* (Zamboanga, in W Mindanao) both included in nominate; *meyeri* (N Sulawesi), *dissentiens* (Indralaman, in S Sulawesi) and *saleyerensis* (Salayer I, off SW Sulawesi) all merged with *plateni*; *zenobius* (Ambon, in S Moluccas) considered inseparable from *clementiae*; and *hachisuka* (Obi, S of Halmahera), *valia* (Goodenough I, off SE New Guinea) and, in Australia, *macgillivrayi* (Cape York, in N Queensland), *olivet* (Cairns, in NE Queensland) and *australis* (Port Molle = Airlie Beach, Whitsundays, in E Queensland) all merged with *frenatus*. Twenty-two subspecies currently recognized.

Subspecies and Distribution.

C. j. flammaxillaris (Blyth, 1845) – Myanmar, Thailand, Indochina (except N) and N Peninsular Malaysia (S to Penang and Kuantan); probably W to SE Bangladesh.
C. j. rhizophorae (Swinhoe, 1869) – S China (S Yunnan, Guanxi, Guangdong, Hainan I) and N Vietnam.
C. j. andamanicus (Hume, 1873) – Andaman Is.
C. j. proselius Oberholser, 1923 – N Nicobar Is (Car Nicobar).
C. j. blanfordi (Stuart Baker, 1921) – Katchal and Kondol (Nicobars).
C. j. klossi (Richmond, 1902) – Nicobar Is (except Car Nicobar, Katchal and Kondol).
C. j. ornatus Lesson, 1827 – C & S Malay Peninsula (S of Penang and Kuantan), Sumatra and most satellites, Borneo, Java, Bali and Lesser Sundas (except Sumba, Timor and some small islands), probably also Tanimbar Is.
C. j. polyclystus Oberholser, 1912 – Enggano I, off W Sumatra.
C. j. obscurior Ogilvie-Grant, 1894 – N Philippines (N Luzon).
C. j. jugularis (Linnaeus, 1766) – Philippine Is (except N Luzon, SW and Sulu Is).
C. j. aurora (Tweeddale, 1878) – SW Philippines (Calautit, Busuanga, Culion, Dumaran, Palawan, Ursula, Balabac, Lumbacan), including islands in N Sulu Sea (Agutaya, Cuyo, Cagayancillo).
C. j. woodi (Mearns, 1909) – Sulu Archipelago (Balukbaluk, Jolo, Dammaj, Simaluc, Siasi, Tawi-Tawi, Sanga Sanga, Bongao, Papahag, Simunul, Manuk Manka, Sitanki, Omapoy, Sibutu, Tumindao, Saluag, Tres Islas), in S Philippines.
C. j. plateni (A. W. H. Blasius, 1885) – Talaud Is, Sangihe I, Siau I, and Sulawesi (including Manadotua, Manterawu, Bangka, Togian Is and Salayar).
C. j. robustirostris (Mees, 1964) – Banggai Archipelago and Sula Is (off E Sulawesi).
C. j. infrenatus E. J. O. Hartert, 1903 – Butung, Hoga I and Tukangbesi Is, off SE Sulawesi.
C. j. teysmanni Büttikofer, 1893 – islands in Flores Sea (Tanahjampea, Kalao, Bonerate, Kalaotoa and Madu).
C. j. frenatus (S. Müller, 1843) – N Moluccas (Morotai, Halmahera, Ternate, Mare, Moti, Kayoa, Bacan, Obi and Gomumu, possibly also Bisa) E to New Guinea (except N coastal region), Aru Is, D'Entrecasteaux Archipelago and NE Australia (N & E Queensland).
C. j. buruensis E. J. O. Hartert, 1910 – Buru, in S Moluccas.
C. j. clementiae Lesson, 1827 – Boano, Seram, Ambon, Saparua, Nusa Laut and Watubela Is.
C. j. keiensis Stresemann, 1913 – Kai Is.
C. j. idenburgi Rand, 1940 – N New Guinea (R Mamberano system E to R Ramu drainage).
C. j. flavigastra (Gould, 1843) – Bismarck Archipelago and Solomon Is.



ers, white-tipped black tail, and deep yellow below, slightly paler on undertail-coverts; bare parts as male. Juvenile resembles female, but usually paler and browner. Races differ to varying degrees, sometimes considerably, in plumage: *obscurior* male is paler below than nominate, and usually has brown border between throat and breast; *aurora* male differs from nominate in having variably sized bright orange band or spot on breast; *woodi* differs from last in having centre of throat metallic purple-blue; *ornatus* male differs from nominate in having variable amount of purple-black gloss on forehead and is paler yellow below (also, birds on Singapore larger); *polyclystus* male resembles previous but is much larger and has longer bill, is much darker olive above and darker yellow on posterior underparts; *andamanicus* male is browner above than preceding races, lacks metallic colour on forehead, has blue-green tinge in metallic colour of breast, a rusty breastband, bright yellow pectoral tufts (duller on slightly larger and brighter yellow-bellied birds on Narcondam, which have breastband more ginger, as do those on Coco Is, in far N Andamans), female paler and duller; *proselius* has much brighter green upperparts and less bright underparts than last, centre of throat metallic purple, forecrown usually metallic purple-blue, throat and breast metallic purple-blue (little or no maroon or chestnut on breast), rich yellow belly, pectoral tufts more orange; *klossi* is larger and bigger-billed than last, male pectoral tufts less orange; *blanfordi* male differs from previous in having little gloss on bronze-purple centre of throat and breast, more blue (less purple) gloss on breastband, less gloss on crown, and brown on face and hindcrown; *flammaxillaris* male has upperparts, including side of head and forehead, greenish olive, brown wings with green edging on remiges, blackish tail with slight blue gloss, chin and throat glossed blue at side and purple in centre, upper breast glossed purple and bordered below by maroon band, lower breast and belly yellow, greyer flanks, pectoral tufts orange, female has slight bluish gloss on black tail; *rhizophorae* male differs from preceding race in having bluish gloss on forecrown (variable, often absent), broad sooty band below maroon breastband, rest of underparts greyish-white, more yellow on centre of belly, pectoral tufts yellow; *flavigaster* male is brighter and more yellow-green above than *ornatus*, throat to upper breast glossed purple, blackish tail with slight purple gloss, short line behind eye and moustachial stripe yellow, bright yellow below with orange-yellow pectoral tufts, female similar to male above and very bright yellow below, has yellow moustachial stripe; *frenatus* male differs from last in having more extensive metallic gloss on breast in most individuals, and has more obvious yellow moustachial stripe; *robustirostris* is similar to previous but longer-billed; *plateni* is also similar, but male duller above and lacks gloss on front of face, also has yellow supercilium, purple-blue gloss on black throat, yellow moustachial stripe; *infrenatus* male differs from last in being generally darker, and lacking superciliary and moustachial stripes; *clementiae* male is yellowish-olive above, with no face stripes, has purplish throat, black abdomen and yellow

pectoral tufts, female slightly paler than *frenatus*; *keiensis* male is somewhat similar to previous but golden-green above, has slight maroon margin to purplish throat, flanks yellowish-green, orange-yellow or yellow pectoral tufts, rest of underparts blackish with purple-maroon tinge; *buruensis* male differs from last mainly in being brighter green above and lacking maroon below; *idenburgi* male is dark olive-green above, and black, glossed blue-green, below; *teysmanni* male is brownish above, has dark purple or purple-green throat, green at sides and bordered below with dark chestnut or maroon band, rest of underparts black with purple gloss, pectoral tufts orange and yellow, female has greyish-yellow supercilium and is greyish-olive above and pale yellow to yellowish-white below. Voice. Much geographical variation. Songs include discordant jumble of twittering notes; musical “cheep, cheep, chee-weet”, and short melody ending in clear trill, “tswi-tswit-titititit, tswi-tswit-tswit-tswit-tswit, tuiit tuiit-tuiit, tuchi-tuchi-tuchi-tuchi”. Other vocalizations include a loud rising “tweet”, a long loud “tsip” sometimes mixed with higher-pitched rapid twitters, a thin “sweet-sweet”, a “twe-ez”; also thin, nasal, upslurred, occasionally wavering “sweet”, and repeated “chip” note; incessantly repeated “pease” given eight times on descending scale by courting male; long wheezy “ja-zyew, ja-zyew” series; loud, piercing, upslurred “weest” (Myanmar), said to be richer and more strident than similar calls of *C. asiaticus* and *Leptocoma sperata*; loud, sharp “tsip, tsip...”, irregular or in long series (Great Nicobar), and wheezy, insistent “jha-zyew, jha-zyew...” (Katchal, in C Nicobars); flight call short “chup-chup-chup”, or “trik trik trik” similar to call of flowerpecker (Dicaeidae); persistent “sweep” by female.

Habitat. Various forest types, including mangroves, at forest edge, in open country, scrub, coastal vegetation, agricultural land, plantations, parks and gardens; found in urban areas, as well as in rural ones. Generally in lowlands, but to 1700 m.

Food and Feeding. Insects, usually small ones, and spiders (Araneae), also nectar and small fruits. Forages singly, in pairs and in small groups; joins mixed-species flocks. Generally feeds at low levels. Hover-gleans for insects, and takes spiders while hovering in front of webs; nectar-robbs flowers.

Breeding. Breeds in all months except Oct and Dec (mostly Jan–Aug) in Borneo and Java, and in all months (chiefly Oct–Mar, when less rain) in Australia; elsewhere, laying recorded in Jan–Aug and Oct in Andamans and Jan and Mar in Nicobars, in Jan–Mar, Jun–Sept and Nov in Myanmar, Jan–May, Jul–Sept and Nov–Dec in Thailand, and calculated as Dec–Jul (nest-building seen Jan–May and Jul) in Malay Peninsula; lays May and Jun in Philippines, Jan and Feb (and fledglings Dec–Sept) in Sulawesi but probably breeds throughout year in S (peak Aug–Sept on Butung and Hoga), eggs in Sept (Seram) and fledglings in Nov (Buru) in Moluccas, and laying Mar–Jul (peak Apr–May) in Lesser Sundas (Flores) and Nov in S New Guinea; often multi-brooded. Nest, built entirely by female, a pendulous oval purse 30–60 cm long, with hooded side entrance, usually with dangling “beard”, constructed from grass, cotton, bark, cocoons, moss, lichens, leaf fragments, vegetable fibres and spider webs, lined with bark or feathers, normally 0.5–1.5 m (occasionally up to 10 m) above ground, may be placed in spiny bush or suspended from palm frond, creepers, cable or fence wire, or roof or other part of house. Clutch 1–3 eggs, matt or faintly glossed, very variable, grey-green or pale grey-white to pale brown, mottled with brown overall or at broad end, or speckled black; incubation by female, period 11–16 days; chicks tended by both parents, nesting period 13–16 days. Nests parasitized in Australia by Little Bronze-cuckoo (*Chrysococcyx minutillus*). Although clutch in Borneo normally 2 eggs, usually only one chick fledges; nest predators include monitor lizards (*Varanus*) and possibly rats (*Rattus*) and ground squirrels (Sciuridae).

Movements. Resident, with short local movements. Seasonal movements in N Queensland.

Status and Conservation. Not globally threatened. Generally common throughout range. Recent sight records (presumably of race *flammaxillaris*) from SE Bangladesh almost certainly valid, but corroboration required. Attempted colonization of Booby I, in Torres Strait, presumably from near-est occupied island, 24 km distant. Occurs in numerous protected areas.

Bibliography. Adhikarana (1994), Ali & Ripley (1974), Beehler *et al.* (1986), van Bemmell (1948), van Bemmell & Voous (1951), Bishop (1992), Blakers *et al.* (1984), Blasius (1897), Bruce (1986), Cheke & Mann (2001), Coates & Bishop (1997), David & Gosselin (2002a, 2002b), Eck (1976), Étchécopar & Hüe (1983), Evans *et al.* (2000), Frith, H.J. (1984), Garnett *et al.* (1991), Gilliard & LeCroy (1968), Grimmett *et al.* (1998), Higgins *et al.* (2006b), Holmes & Wood (1980), Hoogerwerf (1949, 1950), Indrawan *et al.* (2006), Jepson (1993a), Kennedy *et al.* (2000), Kratter, Steadman, Smith & Filardi (2001), Linsley (1995), Magsalay *et al.* (1989), Maher (1991, 1992), Mann (1996), Mayr & Diamond (2001), McGregor (1909), Medway & Wells (1976), Mees (1964a, 2006), Meise (1929), Mey (2000), Meyer de Schauensee (1984), Oates (1890b), Pizzey (1980), Pizzey & Knight (1997), Rand (1940a, 1951a, 1951b), Rand & Gilliard (1967), Rand & Rabor (1960), Rasmussen & Anderson (2005b), Rensch (1929, 1931a), Ripley (1959a), Ripley & Rabor (1961), Robson (2000b, 2003, 2004a), Sheldon *et al.* (2001), Smith & Filardi (2007), Smythies (1986), Smythies & Cranbrook (1981), Smythies & Davison (1999), Unnithan (1996), Watling (1983), Wells (2007), White & Bruce (1986).

96. Apricot-breasted Sunbird

Cinnyris buettikoferi

French: Souimanga de Sumba **German:** Sumbanektarvogel **Spanish:** Suimanga de Sumba
Other common names: Sumba (Island) Sunbird

Taxonomy. *Cinnyris buettikoferi* E. J. O. Hartert, 1896, Sumba Island, Lesser Sunda Islands.

Genus often subsumed in *Nectarinia*. Forms a superspecies with *C. jugularis*, and possibly conspecific; closely related also to *C. solaris*. Monotypic.

Distribution. Sumba, in C Lesser Sunda Is.



wee-chew, wee-chew-wee” (4–9 notes) repeated. Flight call sharp, high “chee” or “sip”.

Habitat. At forest edge, in secondary forest, cultivation and scrub; sea-level to at least 950 m.

Food and Feeding. No information on diet. Forages singly and in pairs, mostly in middle and upper storeys.

Breeding. No information.

Movements. None recorded.

Descriptive notes. 11 cm. Male has crown grey-brown, neck and back brown with strong olive tinge, remiges brown, edged green, tail blackish, slightly glossed, with brown tips; chin to upper breast iridescent purplish blue-green, orange breast patch, bright yellow pectoral tufts, rest of underparts yellow, white underwing-coverts; iris dark brown; bill black; legs blackish. Female differs from male in having whole underside yellow, paler on throat, with greenish-olive side of breast, and bill dark brown. Juvenile undescribed. **VOICE.** Song a long, sweet, high-pitched tinkling warble; another song consists of “wee-chew, wee-chew,

Status and Conservation. Not globally threatened. Restricted-range species: present in Sumba EBA. Very poorly known: considered very common.

Bibliography. Cheke & Mann (2001), Coates & Bishop (1997), Jones, Juhaeni *et al.* (1994), Jones, Linsley & Marsden (1995), Linsley *et al.* (1999), Rensch (1931b), White & Bruce (1986).

97. Flame-breasted Sunbird

Cinnyris solaris

French: Souimanga de Timor **German:** Sonnennektarvogel **Spanish:** Suimanga de Timor
Other common names: Timor/Sunda Sunbird

Taxonomy. *Nectarinia solaris* Temminck, 1825, Ambon; error = Timor.

Genus often subsumed in *Nectarinia*. Closely related to *C. jugularis* and *C. buettikoferi*. Described race *degener* (from Flores) considered inseparable from nominate. Birds on Atauro I (between Wetar and Timor) of uncertain racial identity, provisionally placed in nominate. Moreover, plumage variation clinal, male duldest in W of range (Sumbawa and Flores), grading through C (Lomblen and Alor) and becoming brighter in E (Semau and Timor), and most richly coloured on Wetar, where female also brightest. Race *exquisitus* rather poorly differentiated, could be considered to represent E end of cline, and species perhaps better treated as monotypic. Two subspecies tentatively recognized.

Subspecies and Distribution.

C. s. solaris (Temminck, 1825) – Lesser Sundas (Sumbawa, Komodo, Flores, Lomblen, Alor, Atauro, Timor, Semau, Roti).

C. s. exquisitus E. J. O. Hartert, 1904 – Wetar I.

Descriptive notes. 11.0 cm. Male nominate race has metallic blue-green forehead and crown, and from moustachial area and chin to upper breast, central throat purple, forming contrasting stripe; nape, ear-coverts and upperparts dull green to golden, upperwing and tail dark brown, former edged green, latter with slight bluish-black gloss, terminal third of outer tail feathers grey, tips of inner rectrices (T2 and T3) greyish; breast orange-red, pectoral tufts orange or deep yellow; abdomen orange or yellow, flanks more greenish-yellow, underwing-coverts whitish; iris blackish-brown;



bill and legs blackish. Female is greenish above, with yellow supercilium pronounced on some, lacking on others, wing brown, edged green, tail blackish with slight green gloss, terminal half of outer tail feathers white and large whitish tips on second feathers; throat and underparts sulphur-yellow to bright yellow, deeper on lower breast and belly. Juvenile resembles female, but greyer above and below, with yellow confined to side of neck, flanks and belly, and underwing-coverts yellowish-white. Race *exquisitus* male has orange-yellow pectoral tufts, heavier bill, female bright yellow below. **VOICE.** Song 1 second in duration, consists of 3–4 high-pitched, halting notes, up and down scale, with half-second interval between repetitions.

Habitat. Secondary forest, at forest edge, in woodland, scrub, plantations, *Eucalyptus alba* savanna, cultivation and gardens. Lowlands; occurs to at least 800 m on Atauro I.

Food and Feeding. No details of diet. Forages singly, in pairs and in small groups. Feeds at flowering *Tamarindus* trees.

Breeding. Laying in Mar–Aug (peak May) on Flores. Nest a rather untidy pendulous bag 14–15 × 6 cm, with entrance hole 5 cm from bottom, and lacking “tail”, constructed from various leaves and leaf fragments (some quite large) and plant fibres, suspended by a short broad connection from thorny twig. Clutch 1–2 eggs, purple-brown with darker markings (similar to those of *C. jugularis* but darker, and more purple-brown). No further information.

Movements. Nothing known.

Status and Conservation. Not globally threatened. Restricted-range species: present in Northern Nusa Tenggara EBA and in Timor and Wetar EBA. Varies from scarce to abundant depending on island.

Bibliography. Bishop (1992), Bruce (1986), Cheke & Mann (2001), Coates & Bishop (1997), Hartert (1904), Mayr (1944a), Mees (2006), Rensch (1929, 1931a), White & Bruce (1986).



PLATE 18

inches 2
 cm 5

98. Souimanga Sunbird

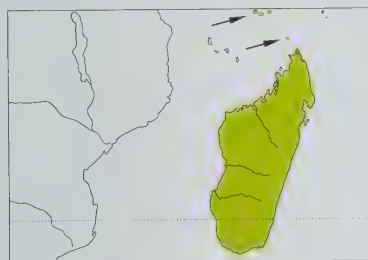
Cinnyris sovimanga

French: Souimanga malgache **German:** Malegassenektarvogel **Spanish:** Suimanga Malgache
Other common names: Madagascan Sunbird

Taxonomy. *Certhia sovimanga* J. F. Gmelin, 1788, Madagascar.
Genus often subsumed in *Nectarinia*. Species name sometimes spelled “*souimanga*”, but this appears to be an unjustified emendation. Forms a superspecies with *C. humbloti* and *C. comorensis*, and all three could perhaps be considered conspecific. Mitochondrial DNA work suggests that *C. comorensis* belongs in present species, which forms a clade with *C. humbloti*, *C. coquerellii* and *C. dussumieri*, and further suggestion is that this clade colonized Indian Ocean islands from continental Africa (at earliest 3·9 million years ago) initially through Comoros; sister-group appears to contain *C. bouvieri*, *C. talatala* and *C. venustus*. Geographical variation well marked. Race *apolis* intergrades with nominate in S Madagascar (Petriky region). Five subspecies recognized.

Subspecies and Distribution.

- C. s. aldabrensis* Ridgway, 1894 – Aldabra I.
- C. s. abbotti* Ridgway, 1894 – Assumption I, in Aldabra Is.
- C. s. buchenorum* J. G. Williams, 1953 – E Aldabra Is (Cosmoledo, Astove).
- C. s. sovimanga* (J. F. Gmelin, 1788) – Madagascar (except SW) and Is Glorieuses.
- C. s. apolis* E. J. O. Hartert, 1920 – SW Madagascar (E to Ankapoky).



Descriptive notes. 10–11 cm; male 5·5–8·5 g, female 5·5–7·6 g. Male nominate race breeding has crown to mantle, upper back and lesser upperwing-coverts glossed dark green, lower back and rump dark olive-grey, tail dark brown with slight dark green gloss, upperwing dark brown, remiges edged green; throat to upper breast glossed green with glossy blue lower border, dark brownish-red band of variable width below this, rest of breast sooty brown (birds on Is Glorieuses have slightly broader breastband than nominate and narrower dark area on abdomen); pectoral tufts yellow, belly variably yellow to off-whitish, often more yellowish.

low or creamy white in centre, rest of underparts mixed yellow and grey, sometimes greenish on flanks, with dark streaking on vent; iris brown; bill and legs black. Male non-breeding (eclipse plumage) variable, may have many metallic feathers on head and breast or almost completely lack metallic feathering, and has occasional scattered red feather on chest. Female is dark olive-brown above, with pale short supercilium from just in front of eye; throat to breast greyish with dark feather fringes (giving variable scaled effect), centre of belly yellow, rest of underparts dull yellow, greyer and indistinctly streaked on sides, whiter with more distinct dark brown streaks on undertail-coverts; bare parts as male. Juvenile is as female, but without scaling on throat, and with belly and flanks much greyer, lacking yellow. Races differ mainly in colour of lower breast and belly of male: *buchenorum* male has broader red breastband than nominate, and rest of underparts except pectoral tufts dark sooty brown (males on Astove have paler smoky olive-grey flanks and lower belly than those on Cosmoledo), rump glossy green, female much darker on throat and breast than nominate; *abbotti* male differs from previous in having brown underparts and greenish flanks; *aldabrensis* male has much broader red breastband than nominate, rest of underparts sooty brown, female darker than nominate; *apolis* male differs from nominate in having centre of belly creamy white with little yellow, breastband darker and redder, underparts below sooty band off-white, female is greyer, less olive, above and paler below. **Voice.** Apparent song of short warbling phrases, with or without harsher notes. Calls include loud chirps, e.g. “pit”, repeated up to four times; “teeee, teeteeteete”, first note plaintive and diminishing, second one frequently repeated; also “chissik”.

Habitat. Forests, including mangroves, spiny subdesert vegetation, secondary growth, plantations, gardens; lowlands to 2300 m.

Food and Feeding. Insects, including beetles (Coleoptera), Hymenoptera, bugs (Hemiptera) and Orthoptera; also spiders (Araneae) and other small arthropods; nematodes; nectar. Forages in pairs; outside breeding season often in small groups, and joins mixed-species flocks. Gleans items from leaves; hovers to take items from spider webs. Pierces flower buds.

Breeding. In Madagascar, breeds from start of rains (in Oct) until Mar in NW and Jan in SE (where also fledglings Sept–Nov), but begins Jul or Aug (towards end of rains) in E; Aug–Mar (also enlarged gonads in Jun) on Aldabra, juveniles in Apr on Cosmoledo, and nesting recorded Jan on Is Glorieuses. Small oval nest well camouflaged, with small porch over entrance one-third from top, constructed from plant down, dry leaves, feathers, hair, bark and lichens, lichens used also as decoration, suspended from building, from coral overhang, from exposed roots along road cutting, in bush or from outer branch of tree c. 0·5–2·5 m above ground, occasionally over water in mangroves. Clutch 1–3 eggs, usually 2, pale greyish-white to brownish-grey, speckled brownish-grey, especially at larger end; incubation period 14 days; chicks brooded and fed by female, no information on duration of nestling period; male occasionally feeds female on nest.

Movements. None recorded.

Status and Conservation. Not globally threatened. Abundant throughout almost whole of Madagascar. Apparently very numerous also on islands elsewhere in range.

Bibliography. Benson (1984), Benson & Penny (1971), Benson *et al.* (1975), Cheke & Mann (2001), David & Gosselin (2002b), Frith (1977), Goodman & Parillo (1997), Goodman & Putnam (1997), Goodman *et al.* (1997), Hartlaub (1877), Langrand (1990), Louette (1988), Milon (1949), Penny (1974), Prys-Jones & Diamond (1984), Roberts (1987), Sinclair & Langrand (1998), Warren *et al.* (2003), Williams (1953b).

99. Humblot’s Sunbird

Cinnyris humbloti

French: Souimanga de Humblot **Spanish:** Suimanga de Humblot
German: Schlichtmantel-Nektarvogel

Taxonomy. *Cinnyris humbloti* A. Milne-Edwards and Oustalet, 1885, Grand Comoro, Comoro Islands.

Genus often subsumed in *Nectarinia*. Forms a superspecies with *C. sovimanga* and *C. comorensis*, and all three could perhaps be considered conspecific. Mitochondrial DNA work suggests that these three form a clade with *C. coquerellii* and *C. dussumieri*, and further suggestion is that this clade colonized Indian Ocean islands from continental Africa (at earliest 3·9 million years ago) initially through Comoros; sister-group appears to contain *C. bouvieri*, *C. talatala* and *C. venustus*. Two subspecies recognized.

Subspecies and Distribution.

- C. h. humbloti* A. Milne-Edwards & Oustalet, 1885 – Grand Comoro, in Comoro Is.
- C. h. mohelicus* Stresemann & Grote, 1926 – Mohéli, in Comoro Is.



Descriptive notes. 11 cm; male 5·5–7 g, female 5·5–8 g. Male nominate race has crown, shoulder (often), and throat to upper breast glossed green, bordered by narrow glossy purple band; hindcrown has some glossy purple, upperparts golden-olive, with more golden wash on mantle; upperwing dark brown, edged green, tail blackish with slight green gloss, narrowly tipped grey; broad dull red band across breast, grading into yellow-olive belly and vent, pectoral tufts yellow, underwing-coverts yellowish-white; iris dark brown; bill black, legs black, soles grey. Female is olive-green above, with tail as male, otherwise

upperparts without gloss; throat to upper belly greyish, feathers with dark centres (giving scaled or speckled effect), rest of underparts yellowish with fine dark streaking, becoming unmarked buffy white on vent, some having golden wash on belly; no pectoral tufts; bare parts as male. Juvenile male is blackish above, more glossy on head and back, brown on lower breast to belly, becoming greyer and paler on flanks and towards vent. Race *mohelicus* is slightly smaller than nominate, male duller green above, lacking golden wash, has bronze-purple gloss on head and throat to breast, purple lower border of breast, more extensive glossy purple area on shoulder and larger grey tips on rectrices, female duller above than nominate, juvenile male resembles adult female but has a few metallic violet feathers on forehead and crown, maroon patches on side of chest and dark olive-green on side of belly. **Voice.** Song a jumbled series of chipping notes. Harsh scolds, “tsk, tsk”.

Habitat. Forest, scrub and gardens; sea-level to 790 m.

Food and Feeding. Insects and their larvae, spiders (Araneae), nectar and other plant material. Feeds by gleaning and hover-gleaning.

Breeding. Eggs and nestlings found in Sept, and food-carrying adults in Feb; birds with active gonads in Aug–Sept. Nest constructed from fine grass, with or without covering of moss or a few strands of *Usnea barbata* on outside, lined with soft silken pappus from asclepiads and a few feathers; average height 13 cm, maximum width 8 cm, side entrance (2 cm across) about equidistant from top and bottom, 2–5 m above ground and attached by moss to slender horizontal branch of *Philippia* bush or palm. Clutch 1 egg, rather pointed for a sunbird, whitish-grey or very faintly tinged blue or cream, finely spotted and speckled all over with pale yellow-brown on underlying pale lilac-grey (zone of concentration around top), all markings rather faint and grey underlying markings scarcely distinguishable. No other information.

Movements. Nothing recorded.

Status and Conservation. Not globally threatened. Restricted-range species: present in Comoro Islands EBA. Common within small global range.

Bibliography. Benson (1960, 1970), Cheke, A.S. & Diamond (1986), Cheke, R.A. & Mann (2001), Louette (1988), Sinclair & Langrand (1998), Warren *et al.* (2003).

100. Anjouan Sunbird

Cinnyris comorensis

French: Souimanga d’Anjouan **German:** Anjouannektarvogel **Spanish:** Suimanga de Anjuán

Taxonomy. *Cinnyris comorensis* W. K. H. Peters, 1864, Anjouan, Comoro Islands.

Genus often subsumed in *Nectarinia*. Forms a superspecies with *C. sovimanga* and *C. humbloti*, and all three could perhaps be considered conspecific. Mitochondrial DNA work suggests that these three form a clade with *C. coquerellii* and *C. dussumieri*, and further suggestion is that this clade colonized Indian Ocean islands from continental Africa (at earliest 3·9 million years ago) initially through Comoros; sister-group appears to contain *C. bouvieri*, *C. talatala* and *C. venustus*. Monotypic.

Distribution. Anjouan, in Comoro Is.



Descriptive notes. 10 cm; male 7·3–9 g, female 6·8–7·5 g. Male has crown to upper back, throat to upper breast, and lesser and median upperwing-coverts glossy blue-green, lower back, rump and tail blackish with slight dark blue gloss, upperwing blackish-brown; narrow, very dark maroon band across breast; pectoral tufts orange or vermillion with yellow feather bases; rest of underparts sooty brown; iris dark brown; bill blackish; legs black with grey soles. Female is greenish-olive above, with darker mottling on crown, tail blackish with slight blue gloss, distal half of outer rectrices greyish-white, next pair with large grey distal spots;

greyish on throat, becoming yellowish on lower breast and belly, dark feather centres giving mottled appearance to throat and breast and streaking on belly; undertail-coverts buffy white; bare parts as male. Juvenile is similar to female but lacks mottling, has centre of throat and upper breast darker (one specimen much browner above); presumed juvenile male as adult female above, but with sooty chin, dark grey-green throat and upper breast, dark yellow rest of underparts with indistinct dark grey-green streaking, olive-grey flanks, dark brown bill with pale flesh-coloured base. **Voice.** Song a variable jumbled series of notes. Calls include sharp “pit pit”; “tweedle-di-dii” by female near nest, answered with sharp chirp by male; rising plaintive chirp by female; “cheep”

from birds near nest; alarm "tswi" given about eight times, rising in pitch, male slightly deeper and less shrill; also "sweet tswee, tswee, tswee, tswee" by male.

Habitat. Forest and thickets, at 90–855 m.

Food and Feeding. Diet insects, spiders (Araneae) and plant material. Few other details available. **Breeding.** Juveniles seen in Sept and birds with active gonads in Sept–Oct. Nest constructed from very fine grass, covered on outside with coarser grass and tendrils, decorated with very fine strips of curly bark and a little black fern fibre, lined with very soft asclepiad pappus, suspended by numerous fine strips of bark c. 1 mm wide (woven into top of nest) from horizontal branch of acacia bush (*Acacia*) 2 m above ground. Clutch 1 egg, white, faintly tinged bluish or greenish, boldly but not very thickly freckled all over with dull brown on underlying grey. No other information available.

Movements. Nothing recorded.

Status and Conservation. Not globally threatened. Restricted-range species: present in Comoro Islands EBA. Common throughout the island.

Bibliography. Benson (1960, 1970), Cheke & Mann (2001), Hartlaub (1877), Louette (1988), Sinclair & Langrand (1998), Warren *et al.* (2003).

101. Mayotte Sunbird

Cinnyris coquerellii

French: Souimanga de Mayotte **German:** Mayottenektarvogel **Spanish:** Suimanga de Mayotte
Other common names: Mayotte Buff-breasted Sunbird

Taxonomy. *Nectarinia coquerellii* Hartlaub, 1860, no locality = Mayotte, Comoro Islands. Genus often subsumed in *Nectarinia*. This species has been thought to be part of the superspecies formed by *C. sovimanga*, *C. humbloti* and *C. comorensis*, but is quite distinct in plumage from all of these. Recent mitochondrial DNA work suggests that these three, present species and *C. dussumieri* form a clade, and further suggestion is that this clade colonized Indian Ocean islands from continental Africa (at earliest 3.9 million years ago) initially through Comoros; sister-group appears to contain *C. bouvieri*, *C. talatala* and *C. venustus*. Monotypic.

Distribution. Mayotte and nearby islets, in SE Comoros.



Descriptive notes. 10 cm; male 9 g, female 7 g. Male has crown, side of head, throat, back to rump, and lesser and median upperwing-coverts glossy dark green, with small amount of purple iridescence on uppertail-coverts and varying amounts on back; remiges and rectrices black, tinged glossy blue; purple band across upper breast and some purple on throat; pectoral tufts bright yellow, centre of breast orange-red, this colour extending into a point through lower breast to belly; rest of underparts yellow, more buff on vent; iris dark brown; bill and legs black. Female is grey-brown above, rump and uppertail-coverts

greenish, wings darker and browner, wing-coverts plain grey, tail glossy bluish-black; throat to breast pale grey with indistinct darker streaking, rest of underparts yellowish, brighter in centre of belly, whitish on vent, with lower flanks and undertail-coverts greyish-white, underwing-coverts white, axillaries pale yellow; bare parts as male. Juvenile undescribed. Voice. Variety of harsh chipping notes.

Habitat. Forest edge and in open areas; sea-level to 460 m.

Food and Feeding. Insects, including pupae and larvae, spiders (Araneae), and presumably nectar. Few other details.

Breeding. Nest-building observed in Oct and Nov and birds with active gonads also in Oct–Nov. Nest constructed from fine grass, thickly lined with white silken asclepiad pappus, strands of fine grass straggling untidily for c. 10 cm from bottom of nest, similar in size to those of *C. humbloti* and *C. comorensis* but top of entrance only 2 cm from top of nest; suspended 3 m above ground. Male with unossified skull and not yet in full breeding plumage had active testes, indicating possible breeding before full maturity reached. No other information.

Movements. Nothing recorded.

Status and Conservation. Not globally threatened. Restricted-range species: present in Comoro Islands EBA. Common within tiny global range.

Bibliography. Benson (1960, 1970), Cheke & Mann (2001), Hartlaub (1877), Louette (1988), Sinclair & Langrand (1998), Warren *et al.* (2003).

102. Seychelles Sunbird

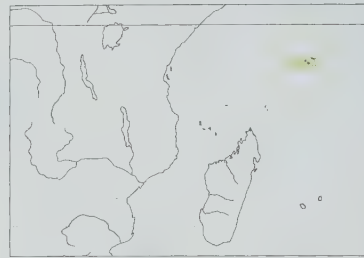
Cinnyris dussumieri

French: Souimanga des Seychelles **Spanish:** Suimanga de Seychelles
German: Seychellenektarvogel
Other common names: Seychelles Blue-headed Sunbird

Taxonomy. *Nectarinia dussumieri* Hartlaub, 1861, Seychelle Islands. Genus often subsumed in *Nectarinia*. Recent mitochondrial DNA studies indicate that this species belongs to a clade which includes also *C. sovimanga*, *C. humbloti*, *C. comorensis* and *C. coquerellii*, resulting from a colonization of Indian Ocean islands from continental Africa (at earliest 3.9 million years ago) initially through Comoros; sister-group appears to contain *C. bouvieri*, *C. talatala* and *C. venustus*. Was formerly thought perhaps to be close to *Chalcomitra balfouri*, another island species but currently placed in a different genus. Birds on Mahé having almost completely orange pectoral tufts described as a geographical race, *mahe*, but this possibly due to individual variation, and too few specimens available for examination. Treated as monotypic.

Distribution. Seychelle Islands, occurring on Aride, Silhouette, Cousin and Cousine, Praslin, La Digue, Mahé and Frégate.

Descriptive notes. 12 cm. Male is sooty-brown above, rectrices narrowly tipped white; throat to breast metallic darkish blue, sometimes a trace of maroon breastband; pectoral tufts (not gained until second moult) lemon-yellow, yellow-orange or bright orange-red; rest of underparts grey-brown, grading into whitish on vent and undertail-coverts; rectrices with broad white tips on underside; iris grey, brown, maroon or black; bill black; legs dark slate or black. Female differs from male in lacking gloss and pectoral tufts, and has paler feather tips on throat and upper breast (sometimes slight scaled effect), remiges have olive edging, tips of tail grey or white, and underwing-coverts brownish-white, with or without yellowish tinge. Juvenile is similar to female, but slightly



smaller-billed, and underparts sparsely speckled. Voice. Male song a high-pitched squeaky jumble of 6–20 or more notes, beginning as slow "dze-dze-dze-dze" and accelerating to "der-tseet-tseet-tsit-tsit-tsit" or "pse-pser-eu-eu-tsit", sometimes lasting for more than one minute, and may be preceded by rattling trill; also a rapid less squeaky trill; male also delivers complex trilling and throbbing "chee-chee-chee", also a harsh "chesooty-choo" when displaying; quiet repeated "tsuu" with varying rhythm by male. Female song, uttered occasionally, is quieter and less harsh than male's. Calls include repeated "pseeu" at 2-second intervals, "tsick-tsick", "tseet", and insect-like "tziit-tziit"; alarm "chirr"; short "tsuu" or "tsee" by nesting female.

Habitat. Found in almost all habitats, including man-made ones, from sea-level to 900 m.

Food and Feeding. Insects and their larvae, spiders (Araneae) and other arthropods; nectar; known to visit plants of following genera *Albizia*, *Allamanda*, *Averrhoa*, *Bougainvillea*, *Braunsia*, *Camelia*, *Caesalpinia*, *Canna*, *Carica*, *Casuarina*, *Catharanthus*, *Chrysobalanus*, *Cocos*, *Cordia*, *Costus*, *Datura*, *Eucalyptus*, *Eugenia*, *Euphorbia*, *Ficus*, *Gastonia*, *Gliricidia*, *Gossypium*, *Hibiscus*, *Kalanchoe*, *Lantana*, *Mangifera*, *Morinda*, *Musa*, *Nepenthes*, *Petrea*, *Phyllanthus*, *Quiscalis*, *Randia*, *Spathodea*, *Stachytarpheta*, *Tabebuia*, *Tecoma*, *Thespesia*, *Thevetia*, *Thunbergia* and *Turnera*. Forages singly and in pairs, also in mixed-specied parties, mostly at 6–10 m, sometimes down to ground. Techniques include gleaning, probing, hovering and flycatching; takes insects trapped in spider webs. Nectar-robots flowers. Drinks from standing water.

Breeding. Nests found in Sept–Oct and Dec–Jan, and nesting activity in all months except Apr–Jun; several broods. Monogamous or polygynous; sometimes co-operative breeder, young of earlier broods acting as helpers. Territory defended throughout year. Male courts female by singing from prominent perch, with head thrown back, chest feathers puffed, pectoral tufts exposed, while swaying from side to side. Male selects nest-site, but female does most or all of building work, which may take 6 days, nest pear-shaped or coconut-shaped, c. 15.5 × 8.5 cm, often with "tail" up to 30 cm long, entrance sheltered by porch half-way up, constructed from dead grass, some also with *Casuarina* needles, legume fruits, leaves and leaf skeletons, strips of bark or plant stems, strips of coconut fronds, spider webs, down, body feathers of birds (especially of seabirds), cotton, pieces of string, nylon, plastic and other domestic debris, moss and palm fibres, lichens, tendrils, fine roots, skink (Scincidae) skin, and lined with kapok, cotton wool or feathers, mostly downy feathers (obtained from ground, occasionally from air) and even from living chicks of White Tern (*Gygis alba*), suspended 1–20 m above ground from end of tree branch or twig; nest generally well concealed on Mahé and Silhouette, where Seychelles Kestrel (*Falco araea*) occurs. Clutch 1 egg, dirty white with brown spots; incubation by female, period 11–16 days; chicks fed mostly by female, also by any helpers present, nestling period averages 20 days on Aride. Most pairs rear one chick per year, sometimes two or three; rarely four, when male took over feeding of fledglings, allowing female to nest again quickly.

Movements. Resident; some inter-island movement, e.g. individuals found on Aride had been ringed on Cousin, a N movement of 20 km.

Status and Conservation. Not globally threatened. Restricted-range species: present in Granitic Seychelles EBA. Common on all of the wooded islands in the archipelago. Recently recolonized Aride.

Bibliography. Anderson (1994), Beckett (1996), Benson (1967, 1984), Cheke & Mann (2001), Cresswell *et al.* (1997), Delacour (1944), Diamond (1984), Gaymer *et al.* (1969), Gerlach (2001), Greig-Smith (1978, 1980, 1986), Hall & Moreau (1970), Hartlaub (1877), Lucking (1996), Oliver (1991), Owen & Bresson (1987), Penny (1974), Prys-Jones & Diamond (1984), Sinclair & Langrand (1998), Warren *et al.* (2003), Watson (1984), Williams (1953a).

103. Long-billed Green Sunbird

Cinnyris notatus

French: Souimanga angaladian **German:** Stahlnektarvogel **Spanish:** Suimanga Piquilargo
Other common names: Madagascar (Green) Sunbird, Violet-breasted/Violet-green/Noted Sunbird

Taxonomy. *Certhia notatus* Statius Müller, 1776, Madagascar.

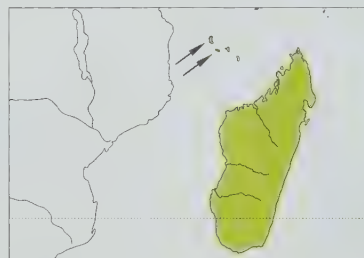
Genus often subsumed in *Nectarinia*. No obvious close relative, but has been thought perhaps to form a superspecies with *C. pembae*. Recent mitochondrial DNA studies indicate that it is close to *C. erythrocerus*, *Chalcomitra adelberti*, *Chalcomitra senegalensis* and *Nectarinia kilimensis*; these results furthermore point to an African origin via the Comoro Is, colonists spreading from there to Madagascar. Proposed race *nesophilus* (from Grand Comoro) is treated as a synonym of *moebii*. Three subspecies recognized.

Subspecies and Distribution.

C. n. moebii Reichenow, 1887 – Grand Comoro, in W Comoro Is.

C. n. voeltzkowi Reichenow, 1905 – Mohéli, in W Comoros.

C. n. notatus (Statius Müller, 1776) – Madagascar.



Descriptive notes. 14–15 cm; male 13.8–21.6 g, female 12–21 g. Male nominate race breeding has head to scapulars and back, and uppertail-coverts glossy green, lesser and median upperwing-coverts purple-blue and green, rump glossed green and blue; tail blackish with purple sheen and glossy green edges; upperwing mostly blackish-brown, some violet gloss at carpal joint; chin to breast glossy green, separated by glossy violet-blue band from black and blackish-brown of rest of underparts; iris dark brown; bill and legs black. Male non-breeding (eclipse plumage) is similar to female, but with some metallic feathers.

Female is brown above with olive tinge, with very narrow off-white supercilium, darker feather centres on head and nape (slight scaling effect) appearing as conspicuous longitudinal streaking, tail blackish with bluish sheen, whitish tips on some rectrices, whitish edges on outer feathers; greyish throat and breast, becoming more yellow on lower breast and belly, with heavy dark mottling and streaking, undertail-coverts dark brown with pale edges; bare parts as male. Juvenile is similar to female, but more olive and less brown above, and chin to chest much greyer and with much less obvious mottling. Races differ chiefly in colour of gloss of male: *moebii* male has much purple and

Bibliography. Ali (1932, 1969), Ali & Ripley (1974), Cheke & Mann (2001), Davidar (1985a), Khan (1977), Majumdar (1981b), Neelakantan (1975), Oates (1890a, 1890b), Rasmussen & Anderton (2005b), da Silva (1992).



PLATE 19

inches 2
cm 5

Genus *AETHOPYGA* Cabanis, 1851

105. Grey-hooded Sunbird

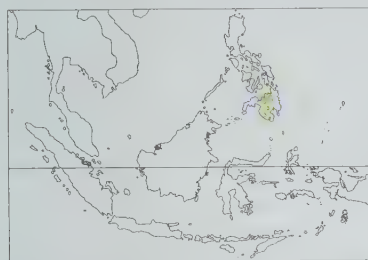
Aethopyga primigenia

French: Souimanga de Hachisuka **Spanish:** Suimanga de Hachisuka
German: Grauhauben-Nektarvogel
Other common names: Grey-headed/Hachisuka's Sunbird

Taxonomy. *Philippinia primigenius* Hachisuka, 1941, Galog, 4000 feet [c. 1220 m], Mount Apo, Mindanao, Philippines.
No obvious close relative. Two subspecies recognized.

Subspecies and Distribution.

A. p. primigenia (Hachisuka, 1941) – C Mindanao (Mt Kitanglad, Mt Apo, L Sebu, Mt Busa, Mt McKinley, Mt Lamut, Civolig, Dagawayan), in S Philippines.
A. p. diuatae Salomonsen, 1953 – Mt Hilong-Hilong, in NE Mindanao.



Descriptive notes. 10.8 cm. Male nominate race has iridescent bronze-green forehead and similar-coloured patch on ear-coverts; top of head and neck dark grey, back olive-green, rump bright yellow, tail and upperwing dark olive-brown, tail tipped white; chin and throat dark grey (one specimen with indistinct pale central streak ending in yellow breast spot), breast and centre of belly white, flanks and undertail-coverts yellow; iris deep reddish-brown to brick-red; bill blackish-brown; legs dark brown to dark olive-grey or black, soles pale. Female is similar to male, but lacks iridescence on forehead and ear-coverts. Juvenile not described. Race *diuatae* is greyer below than nominate, throat darker and male with indistinct pale grey-white central streak ending in yellow spot on breast (exhibited also by one male specimen of nominate), centre of belly greyer and with very indistinct darker grey streaks, and iridescence on forehead of male is more extensive. Voice. Repeated high-pitched “pink-pink-pink”, level or ascending, and may become “see-see-see...”; also “seek-seek” up to six times.

Habitat. Forest and forest edge; 1000–1700 m.
Food and Feeding. Often seen around banana flowers; no other information.
Breeding. Birds with active gonads in Nov–Feb. No other information.
Movements. No data.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species; present in Mindanao and the Eastern Visayas EBA. Common within its small range. Although its habitat appears not to be under any immediate threat, the species is considered at risk on account of its very small global range.

Bibliography. Anon. (2007f), Butchart & Stattersfield (2004), Cheke & Mann (2001), Collar, Andreev *et al.* (2001), Collar, Mallari & Tabaranza (1999), David & Gosselet (2002a), Dickinson *et al.* (1991), Kennedy *et al.* (2000), duPont (1971b), Rand (1950b), Ripley & Rabor (1961), Salomonsen (1953b), Stattersfield & Capper (2000).

106. Apo Sunbird

Aethopyga boltoni

French: Souimanga de Bolton **German:** Mindanaonektarvogel **Spanish:** Suimanga de Bolton
Other common names: Mount Apo Sunbird

Taxonomy. *Aethopyga boltoni* Mearns, 1905, Mount Apo, 6250 feet [c. 1900 m], Mindanao, Philippines.
Forms a superspecies with *A. linaraborae*. Three subspecies recognized.

Subspecies and Distribution.

A. b. malindangensis Rand & Rabor, 1957 – Mt Malindang, in W Mindanao (S Philippines).
A. b. boltoni Mearns, 1905 – Mt Kitanglad, Mt McKinley and Mt Apo, and presumably Mt Pasian, in C Mindanao.
A. b. tibolii Kennedy *et al.*, 1997 – Mt Busa and Mt Matutum, and presumably Mt Parker and L Sebu, in S Mindanao.



Descriptive notes. Male 12 cm, 4.9–9.2 g; female 10.8 cm, 6–8.5 g. Male nominate race has head dark grey, becoming olive-green on back and upperwing, forehead with metallic greyish-green fringes, rump light yellow, and graduated tail black with metallic green gloss, rectrices except central two tipped white; chin and throat light yellow, bordered dark grey at side, breast orange-yellow, bright orange pectoral tufts, belly olive-yellow; iris red; bill black; legs black, soles yellowish. Female has head olive-grey, paler than in male, nape to upper back olive, becoming greener on wing-coverts and lower back, and some yellow on

rump; remiges blackish, edged bright olive, graduated tail blackish with slight green sheen; chin whitish, throat to upper breast olive-grey with indistinct paler stripes, rest of breast more yellowish, with dull orange suffusion on lower breast, rest of underparts and pectoral tufts yellow, brighter on flanks, with some orange on centre of belly; underside of central three pairs of rectrices with large grey tips; bare parts as male. Juvenile of nominate race undescribed; for race *tibolii*, juvenile male paler than adult, less yellow on throat, lacking orange in breast and belly and pectoral tufts, juvenile female similar to adult but paler. Races differ chiefly in coloration of underside of male: *malindangensis* is generally brighter than nominate, male also has more extensive orange centre on

breast, more red on side of breast, brighter yellow flanks and abdomen, more iridescence on forehead and crown, female has more and brighter orange on lower breast and brighter yellow flanks and abdomen; *tibolii* is less richly coloured than nominate, lower breast and patch on belly orange-yellow (not orange) and pectoral tufts paler, female has edges of secondaries paler, chin and throat pale grey with fine white streaking, belly paler yellow. **Voice.** Song rapidly produced, rising, squeaky, high-pitched trill of c. 15 notes, or rapid even-pitched decelerating trill, or continuous “sip-sip-sip” or “clip-clip-clip”. Calls include series 2–3 seconds long of ascending snapping notes, repeated after short pause; rapid, continuous, metallic snapping “twit-twit-twit...”, which may change to whistled “whirr”; 1–6 bubbling “peep” notes, first ones separated, the rest rapid.

Habitat. Forest, generally above 1500 m, sometimes down to 1100 m.
Food and Feeding. Forages singly and in pairs; joins mixed-species flocks. No other information available.

Breeding. Nesting recorded in Jan–May and Jul, and birds with enlarged gonads in Mar–Apr. Nest a pendulous bag, 8 × 16 cm, with side entrance, made from loosely woven moss, and spider and insect cases, suspended c. 2.4 m above ground from small branch in tree or bush, or from tall grass, or on outside of clump of ferns. No other information.

Movements. Nothing recorded.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species; present in Mindanao and the Eastern Visayas EBA. Common within its range. Although its habitat appears to be secure, this species is considered to be potentially at risk because of its very small global range.

Bibliography. Anon. (2007f), Butchart & Stattersfield (2004), Cheke & Mann (2001), Collar, Andreev *et al.* (2001), Collar, Mallari & Tabaranza (1999), Dickinson *et al.* (1991), Harrop & Fisher (2007), Hornsbov (1996), Kennedy, Gonzales, Dickinson *et al.* (2000), Kennedy, Gonzales & Miranda (1997), McGregor (1909), duPont (1971b), Rand & Rabor (1957, 1960), Ripley & Rabor (1961), Stattersfield & Capper (2000).

107. Lina's Sunbird

Aethopyga linaraborae

French: Souimanga de Lina **German:** Linanektarvogel **Spanish:** Suimanga de Lina

Taxonomy. *Aethopyga linaraborae* Kennedy *et al.*, 1997, 1200 m, near peak of Mount Pasian, Davao del Norte Province, Mindanao, Philippines.
Forms a superspecies with *A. boltoni*. Monotypic.

Distribution. E Mindanao (Mt Pasian, Mt Puting Bato, Mt Mayo), in S Philippines.



Descriptive notes. Male 10.8 cm, 5.7–8.7 g; female 10.2 cm, 6–7 g. Male has forehead metallic emerald-green with hint of blue, ear patch metallic cobalt-blue, head otherwise blackish-grey, crown feathers edged metallic blue, back olive-green with clearly defined sulphur-yellow rump, uppertail-coverts deep metallic emerald-green; tail feathers blackish-grey, edged violet, all except central feathers with whitish-silver tips; lesser and median upperwing-coverts bright metallic emerald-green, greater coverts metallic ultramarine, remiges dark brown, edges of scapulars and secondaries cobalt-blue; chin to upper breast

sulphur-yellow, small orange flecks on upper breast and orange patch in centre of breast, pectoral tufts scarlet, lower breast and belly yellow, undertail-coverts sulphur-yellow, and wing-lining white (individual variation in brightness of yellow underparts and size of orange breast patch); iris dark brick-red to blood-red, skin around eye blackish-brown; bill black; legs dark brown to black, soles pale ochre-yellow. Female has more muted colours than male, and lacks metallic sheen on forehead, ear-coverts, uppertail-coverts and wing-coverts; head dark grey with trace of pale metallic emerald-green feather edges, and olive-green of back grades into olive-tinged sulphur-yellow at tail base; edges of tail feathers metallic cobalt-blue, wing-coverts olive-green, remiges edged orange olive-yellow; throat yellowish olive-green and breast to belly yellowish-olive, all with indistinct olive-yellow streaking, diffuse orange patch on centre of lower breast and belly; bare parts as male. Juvenile undescribed. **Voice.** Song a long series of high-pitched squeaky twittering notes with repeated sequences. Calls include high-pitched “sweet”, sometimes with upward inflection, repeated two to three times at 5-second intervals, or more frequently repeated at irregular intervals.

Habitat. Montane forest, from 1000 m upwards.
Food and Feeding. Forages singly and in pairs, and occurs also in mixed-species flocks. No other information.

Breeding. Birds with enlarged gonads in May. No other information.

Movements. No information.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species; present in Mindanao and the Eastern Visayas EBA. Common within its very small range. Considered to be potentially at risk mainly because of the tiny extent of its overall range.

Bibliography. Anon. (2007f), Butchart & Stattersfield (2004), Cheke & Mann (2001), Collar, Andreev *et al.* (2001), Collar, Mallari & Tabaranza (1999), Kennedy, Gonzales, Dickinson *et al.* (2000), Kennedy, Gonzales & Miranda (1997), Stattersfield & Capper (2000).

108. Flaming Sunbird

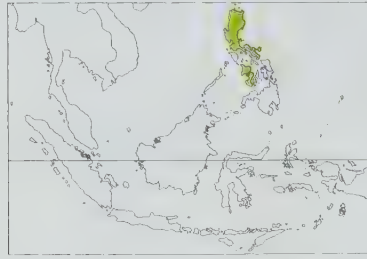
Aethopyga flammans

French: Souimanga flamboyant **Spanish:** Suimanga Llamanteante
German: Feuerbrust-Nektarvogel

Taxonomy. *Aethopyga flammans* Oustalet, 1876, Lagune, Luzon, Philippines.
Possibly part of the superspecies formed by *A. boltoni* and *A. linaraborae*. Race *decolor* possibly inseparable from nominate. Proposed race *excellens* (described from Manito, in Albay District of SE Luzon) considered unsustainable, and is synonymized with nominate. Four subspecies provisionally recognized.

Subspecies and Distribution.

A. f. decolor Parkes, 1963 – N Luzon, in N Philippines.
A. f. flagrans Oustalet, 1876 – C & S Luzon and Catanduanes.
A. f. guimarasensis (Steere, 1890) – Panay and Guimaras, in WC Philippines.
A. f. daphoenonota Parkes, 1963 – Negros, in SC Philippines.



Descriptive notes. 9.5 cm. Male nominate race has forehead and forecrown metallic blue-green, hindcrown, back and upperwing-coverts bright olive-yellow, washed orange or bronzy golden on mantle and scapulars, uppertail-coverts metallic blue-green, tail black, edged metallic green; remiges edged greenish; malar stripe to chin and upper throat dark metallic purple, lower throat and breast dull black, bright reddish-orange to scarlet spot or medial stripe on central breast, rest of abdomen yellow with orange patch on centre of lower breast and upper belly, paler yellowish-grey on flanks and vent, undertail-coverts whitish; iris dark

brown, bill blackish, legs dark brown, often paler and more fleshy coloured on soles. Female has head and upperparts olive-green, throat and underparts greyer, with yellowish patch on lower breast. Juvenile undescribed. Race *decolor* male differs from nominate in having yellow-olive upperparts, and breast stripe and patch on belly less red (one specimen identical to nominate in this character); *guimarasensis* male differs in having hindcrown to mantle blood-red or dark orange-red to maroon-chestnut, wing-coverts and edges greenish, and yellow on underparts much brighter, with less orange on belly; *daphoenonota* male has more extensive blood-red to dull maroon on mantle than previous, more extensive and deeper orange on underparts, and wing-coverts and edges orange, female also has orange edgings and is greener (and grey) above. **VOICE.** Short, high-pitched rising “tsweet”, repeated at intervals.

Habitat. Forest, forest edge and secondary growth; sea-level to 1350 m.

Food and Feeding. No information on diet. Forages singly, in pairs and in mixed-species flocks.

Breeding. Males with enlarged testes in Apr on Luzon. No other information.

Movements. Nothing recorded.

Status and Conservation. Not globally threatened. Uncommon. Occurs in Quezon National Park, on Luzon.

Bibliography. Cheke & Mann (2001), Dickinson *et al.* (1991), Goodman & Gonzales (1990), Kennedy *et al.* (2000), McGregor (1909), Parkes (1963), duPont (1971b), Rand (1951a).

109. Metallic-winged Sunbird

Aethopyga pulcherrima

French: Souimanga montagnard

Spanish: Suimanga Submontano

German: Glanzflügel-Nektarvogel

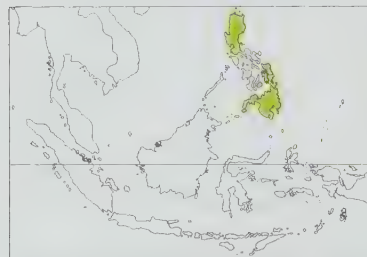
Other common names: Mountain Sunbird

Taxonomy. *Aethopyga pulcherrima* Sharpe, 1876, Basilan, Philippines.

No obvious close relatives, but has been suggested that this species forms a superspecies with *A. duyvenbodei*. Proposed race *dubia* (described from Dinagat) seems insufficiently distinct from nominate to be tenable. Three subspecies recognized.

Subspecies and Distribution.

A. p. jefferyi (Ogilvie-Grant, 1894) – N & C Luzon, in N Philippines.
A. p. pulcherrima Sharpe, 1876 – Samar, Biliran, Leyte, Dinagat, Siargao, Mindanao and Basilan.
A. p. decorosa (McGregor, 1907) – Bohol.



Descriptive notes. 9.6 cm; unsexed 4.4–7.5 g. Male nominate race has forehead and spot behind eye metallic purplish-green or steel-blue, crown to back olive-green, rump bright yellow, uppertail-coverts and upperwing-coverts metallic green; tail black, glossed metallic green, and remiges olive-green; chin and throat bright yellow, breast yellowish with small orange-red patch, belly greyish-yellow; iris blood-red; bill blackish; legs dark brown. Female differs from male in having entire upperside except rump olive-green, and throat and underparts dull olive-grey, with some yellowish especially on breast. Juvenile differs from female in having

rump and underparts paler yellow, iris yellowish-brown, bill brown, legs dark grey with soles ochraceous. Race *jefferyi* male differs from nominate in dark metallic blue forehead, bright yellow lower back concolorous with rump, and metallic green edging on remiges; *decorosa* male differs from previous in metallic purple-blue edging on remiges, metallic blue (not green) wing-coverts, uppertail-coverts and tail, has paler yellow rump, much paler underparts, and red breast patch very small or absent, female differs in having much lighter rump patch. **VOICE.** Song slow, consisting of well-spaced notes followed by long high-pitched trill, followed by a further series of slow spaced notes. Calls a repeated “squeak”, and repeated high-pitched “zeeep”; high-pitched “zip zip” which may accelerate into metallic trill; sharp “see”, or “see-see, tsik tsik”, becoming short rising trill.

Habitat. Forest, forest edge, secondary growth and plantain (*Musa*) plantations. Usually submontane to 1700 m; also in lowlands on Mindanao, and to 2000 m on Luzon.

Food and Feeding. No data on diet. Forages singly and in mixed flocks.

Breeding. Laying recorded in Apr–Jul, and birds with active gonads in Mar–May. Nest attached to climbing fern 2–4 m above ground. Clutch 3 eggs, dull pink, mottled pinkish-grey, spotted deep brown. No other information.

Movements. Nothing recorded.

Status and Conservation. Not globally threatened. Common to fairly common throughout range.

Bibliography. Cheke & Mann (2001), Dickinson *et al.* (1991), Goodman & Gonzales (1990), Kennedy *et al.* (2000), McGregor (1907, 1909), Ogilvie-Grant & Whitehead (1898), duPont (1971b), Rand & Rabor (1960).

110. Elegant Sunbird

Aethopyga duyvenbodei

French: Souimanga des Sangi

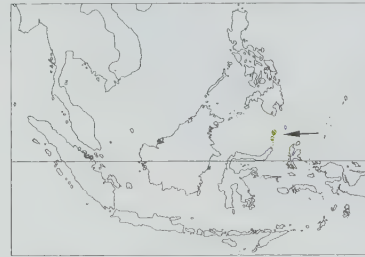
German: Sangihenektarvogel

Spanish: Suimanga Elegante

Other common names: Duyvenbode’s/Sangihe/Sanghir (Yellow-backed) Sunbird

Taxonomy. *Nectarinia duyvenbodei* Schlegel, 1871, Sanghir Island (= Sangihe), north of Sulawesi. No obvious close relatives, but has been suggested that this species may form a superspecies with *A. shelleyi*, *A. bella* and/or *A. pulcherrima*. Monotypic.

Distribution. Sangihe I; also one specimen from Siau.



Descriptive notes. 12 cm. Male has crown metallic green (sometimes appearing blue), nape side, neck and ear-coverts maroon-red, mantle and back dark olive-green, upperwing-coverts glossed greenish-blue, shoulder glossed blue, rump deep yellow, uppertail-coverts metallic purple; remiges blackish, metallic blue edging on inner secondaries, rounded tail blackish-brown with whitish edging and pale grey tips; forehead dull blackish, often with some dull yellow on lores, bright yellow eyering broken into upper and lower halves, underparts yellow, with richer, more orange tinge to central abdomen, dark green of mantle

extends as indistinct bar onto breast side, rest of underparts orange-yellow; iris black; bill black or blackish; legs blackish or reddish-pink. Female has lores olive; is dark golden-olive above, with indistinct scaling on forehead and crown, wings brownish, edged greenish, primaries noticeably darker, edged greenish-olive, and tail blackish, tipped grey; throat to upper breast greenish-yellow, narrow darkish olive band across lower throat separating it from breast, and rest of underparts bright yellow; bare parts as male. Juvenile is similar to female, but with pale pinky-brown bill and legs. **VOICE.** Male song a very short, high, insect-like trill; male also produces a high trill of chipping notes. Calls include high-pitched and rasping “treek” or “tseek”; also “tit”, given singly or up to four in rapid sequence; various squeaky notes.

Habitat. Remnant forest, bamboo, mixed plantations, secondary forest, scrub and tree-ferns; to 900 m.

Food and Feeding. Diet includes insects and nectar. Forages singly and in pairs, sometimes in small groups; joins mixed-species flocks. Insects are taken from vegetation or extracted from spider webs.

Breeding. Birds with enlarged gonads in May, recently vacated nest in Aug, juveniles observed in Aug–Sept, and singing and lek-like behaviour recorded in Nov–Dec; data suggest two breeding seasons. No other information.

Movements. Nothing recorded.

Status and Conservation. ENDANGERED. Restricted-range species: present in Sangihe and Talaud EBA. Uncommon to locally more common. Has fragmented population, and undergoing continuing decline owing to loss and degradation of habitat. Presence in Siau questionable; one specimen apparently taken there in 1866. On Sangihe, common in forest and plantations on Mt Sahengbalira in Aug 2004. Global population estimated as 2500–9999 individuals, in total range of c. 560 km², within which it has been recorded from Talawid Atas, Kedang, Mt Awu, Petta, Manganitu, Mt Sahendaruman, Mt Sahengbalira, Mt Palenti, Kentuhang, Ulung Peliang, Tabukan and Tahuna. Tiny remnant of primary forest surviving on Sangihe inadequately protected and continues to suffer from agricultural encroachment at lower fringes; forest on Mt Sahendaruman nominally conserved. Since 1995, fieldwork and conservation-awareness programmes have been conducted, and ideas developed for future land use, through agreements between interested parties. Proposals made to reclassify the 4 km² of “protection forest” on Mt Sahengbalira as a wildlife reserve, and some forest in Kentuhang valley is protected as watershed for a hydro-electric scheme. Other proposals include establishment of permanent presence of forestry staff on Sangihe I.

Bibliography. Anon. (2007), Bishop (1992), Butchart & Stattersfield (2004), Cheke & Mann (2001), Coates & Bishop (1997), Collar, Andreev *et al.* (2001), Collar, Crosby & Stattersfield (1994), Riley (1997), Riley *et al.* (1999), Stattersfield & Capper (2000), White & Bruce (1986).

111. Lovely Sunbird

Aethopyga shelleyi

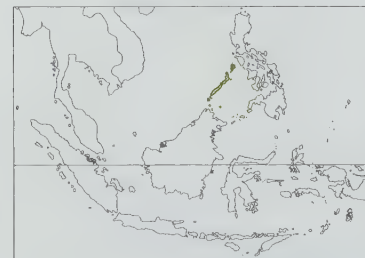
French: Souimanga de Palawan **German:** Goldkehl-Nektarvogel **Spanish:** Suimanga Filipino

Other common names: Palawan/Shelley’s(!) Sunbird

Taxonomy. *Aethopyga shelleyi* Sharpe, 1876, Palawan, Philippines.

Forms a superspecies with *A. bella*, previously treated as conspecific; has been suggested that *A. duyvenbodei* may be part of this superspecies. Monotypic.

Distribution. Busuanga, Culion, Palawan and Balabac, in W Philippine Is.



Descriptive notes. Male 10.5 cm, female 8.4 cm. Male has crown metallic purple and green, side of head, hindneck and upper back dark red, lower back and rump bright yellow, uppertail-coverts and graduated tail metallic blue-green, upperwing yellowish-green; chin and throat yellow with red margin, blue-green malar stripe, breast yellow with red streaking, belly pale grey; iris black; bill and legs dark brown. Female has dull olive-green upperparts, greyer on head; narrow eyering whitish, throat and breast pale greyish-yellow, yellower on centre of abdomen, whiter on rest of underparts. Juvenile similar to female, but much

greyer below, with buffy centre of breast and belly. **VOICE.** Seesawing “zuep-zip” for several seconds.

Habitat. Forest, forest edge and cultivation, often around flowering and fruiting trees; sea-level to 2000 m.

Food and Feeding. Feeds on small insects and their larvae, and nectar. Forages singly and in pairs; joins mixed-species flocks.

Breeding. Laying recorded in Feb. No further information.

Movements. Nothing recorded.

Status and Conservation. Not globally threatened. Locally common. Occurs in St Paul Subterranean River National Park, on Palawan.

Bibliography. Cheke & Mann (2001), Dickinson *et al.* (1991), Kennedy *et al.* (2000), Mann (2002), McGregor (1909), Ogilvie-Grant & Whitehead (1898), duPont (1971b), Zimmer (1918).

112. Handsome Sunbird

Aethopyga bella

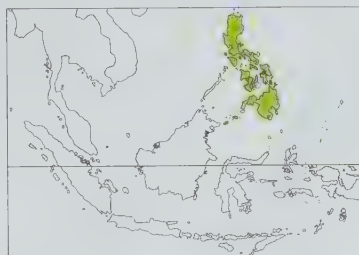
French: Souimanga oreillard **German:** Philippinennektarvogel **Spanish:** Suimanga Hermoso
Other common names: Lovely(!)/Shelley's(!) Sunbird

Taxonomy. *Aethopyga bella* Tweeddale, 1877, Surigao, north Mindanao, Philippines. Forms a superspecies with *A. shelleyi*, previously treated as conspecific; it has been suggested that *A. duyvenbodei* may be part of this superspecies. Race *minuta* not well differentiated, and validity has been questioned. Six subspecies recognized.

Subspecies and Distribution.

A. b. flavipectus Ogilvie-Grant, 1894 – N Luzon, in N Philippines.
A. b. minuta Bourns & Worcester, 1894 – S & C Luzon, Polillo Is, Mindoro and Marinduque.
A. b. rubrinota McGregor, 1905 – Lubang.
A. b. bonita Bourns & Worcester, 1894 – Panay, Masbate, Ticao, Negros and Cebu.
A. b. bella Tweeddale, 1877 – Samar, Leyte, Dinagat, Siargao and Mindanao, in E & S Philippines.
A. b. arolasi Bourns & Worcester, 1894 – Sulu Archipelago (Jolo and Tawi-Tawi).

Descriptive notes. Male 9.1 cm, 3.9–5.3 g; female 8.3 cm, 3.1–4.2 g. Male nominate race has crown to rear of eye metallic green, rest of crown and nape unglossed dark green, side of head and upper back dark red, glossy purple spot on cheek; lower back and rump bright yellow, uppertail-coverts and graduated tail metallic blue-green, upperwing yellowish-green; chin and throat yellow (with or without variable amounts of red or orange), blue-green malar stripe, breast yellow with red streaks, abdomen and undertail-coverts pale grey to yellow; iris black; bill with upper mandible blackish, lower mandible dark brown, legs dark brown. Female is olive-green above, duller on head, with yellow rump; white eyering, pale underparts with yellowish-olive tinge, especially on throat and breast. Juvenile is as female, but much greyer below, with buffy centre of breast and belly. Race *arolasi* is larger than nominate, male has heavier orange-red streaking on breast and



belly, and yellower abdomen and undertail-coverts, female has less yellow on rump; *minuta* male is similar to previous but smaller, and throat is pure yellow with no red or orange; *flavipectus* male has little or no red on breast, and only forecrown is glossed green; rest of crown and nape unglossed dark green; *rubrinota* male differs from last in having slightly lighter yellow on breast, and has slight bluish cast in forehead; *bonita* male is darker yellow on lower back and rump than nominate, breast more heavily streaked red. **Voice.** Rapid “sit-sit-sit-tee-tee-tee-tee”, last notes at lower pitch; also “tsit-tit-tit-it”.

Habitat. Thickets, cultivation, forest and forest edge; sea-level to 2000 m.

Food and Feeding. Feeds on small insects and their larvae, and nectar. Forages singly and in pairs; joins mixed-species flocks.

Breeding. Breeding recorded in Jan, Jun–Jul and Sept. One nest (nominate race) a long bag-shaped pocket with loose dangling “tail” of dead leaves, side entrance roofed over, suspended from bramble (*Rubus*) in old clearing some distance from forest. Clutch 3 eggs, pale pinkish-white, heavily marked with irregular zone of dull red towards large end, scattered spots and blotches of same colour over rest of shell, and underlying brown markings. No other information.

Movements. Nothing recorded.

Status and Conservation. Not globally threatened. Locally common throughout most of Philippines.

Bibliography. Cheke & Mann (2001), Dickinson *et al.* (1991), Kennedy *et al.* (2000), Mann (2002), McGregor (1905b, 1909), Ogilvie-Grant & Whitehead (1898), duPont (1971b), Rand & Rabor (1960), Ripley & Rabor (1958), Tweeddale (1877b).



ssp gouldiae

113

ssp isolata

ssp annamensis

ssp dabryii

ssp nipalensis

ssp horsfieldi

ssp ezrai

114

ssp angkanensis

ssp karenensis

ssp australis

ssp christinae

116

ssp latouchii

115

ssp sokolovi

ssp wrayi

117

ssp saturata

ssp johnsi

ssp petersi

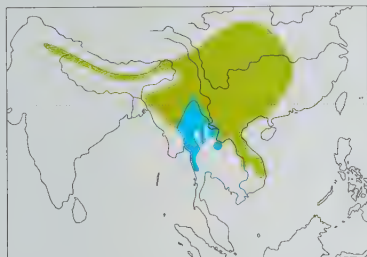
PLATE 20

inches 3
cm 8

Aethopyga gouldiae

Taxonomy. *Cinnyris gouldiae* Vigors, 1831, Himalayas = Simla–Almora District, north India. Additional proposed races are *trochiloidea* (described from Blue Mountain, in Lushai Hills of NE India) and *melitae* (Mt Victoria, in W Myanmar), both subsumed in *isolata*, and *harrietae* (Phu Kobo, near Xiangkhouang, in Laos) and *bangsi* (Hongsurkou, in Hubei, in C China), which are synonymized with *dabryi*. Four subspecies recognized.

A. g. annamensis Robinson & Kloss, 1919 – S Laos and SC Vietnam.



Bibliography. Ali & Ripley (1974), Cheke & Mann (2001), Échécopar & Hüs (1983), Fleming & Traylor (1968), Fleming *et al.* (1976), Gaston (1989), Gretton (1990), Grimmett *et al.* (1998), Inskip & Inskip (1985), King *et al.* (1975), McClure (1998), Melville & Round (1984), Meyer de Schauensee (1940), Oates (1890a), Rasmussen & Anderson (2005b), Ripley (1953), Robson (1988, 2000b), Traylor (1967), Vuilleumier (1993).

Aethopyga nipalensis

Taxonomy. *Cinnyris nipalensis* Hodgson, 1837, Chandragiri Pass, central Nepal. Race *horsfieldi* intergrades with nominate in W Nepal. In India, proposed race *griseiceps* (from Ghoom, near Darjeeling) considered inseparable from nominate and *ripleyi* (from Mawryngkneng, in Khasi Hills) synonymized with *koelzi*. Nine subspecies recognized.

A. n. koelzi Ripley, 1948 – Bhutan and NE India (Arunachal Pradesh, Meghalaya and Nagaland S to Chittagong Hills) E to S China (S Xizang E to C Sichuan and NW Yunnan) and N Vietnam.

Bibliography. Ali & Ripley (1974), Birand & Pawar (2004), Cheke & Mann (2001), Ètchécopar & Hùc (1983), Fleming (1968), Fleming *et al.* (1976), Grinnett *et al.* (1998), Inskip & Inskip (1985), King *et al.* (1975), Melville & Round (1984), Meyer de Schauensee (1984), Rand & Fleming (1957), Rasmussen & Anderton (2005b), Ripley (1953, 1961a), Robson (2000a, 2000b), Smythies (1986), Stepanyan (1985b), Wells (2007).

Aethopyga eximia



iris brown, bill black; legs black or brownish-black. Female is dull olive above, greyer on head,

dark olive-green below, greyish on throat, with white underwing-coverts, pectoral tufts and flanks; tail much shorter than male's, and rounded. Juvenile is as female but more brownish, particularly below, and darker grey on throat. **Voice.** Clear "tee-tee-tee-leet" with variations.

Habitat. Forest, forest edge, clearings, and alpine scrub above tree-line; 1200–3000 m.

Food and Feeding. Diet thought to include nectar and small arthropods. Forages singly, in pairs and in small groups; mostly in lower and middle storeys. Often around flowering trees and vines; recorded around mistletoes (Loranthaceae).

Breeding. Laying in Jan, Mar–Jun, Nov and Dec. Nest a pouch of moss and other materials, suspended high up in forest tree. Eggs greyish-white with small dark brown spots and clouds, markings forming heavy cap. No other information.

Movements. Nothing recorded.

Status and Conservation. Not globally threatened. Restricted-range species; present in Java and Bali Forests IBA. Common, particularly above 2400 m. Occurs in Gunung Gede-Pangrango National Park.

Bibliography. Cheke & Mann (2001), Hebbekers & Hoogerwerf (1967), Hoogerwerf (1949, 1950), MacKinnon & Phillips (1993).

116. Fork-tailed Sunbird

Aethopyga christinae

French: Souimanga de Christine **German:** Hainannektarvogel **Spanish:** Suimanga de Christina

Taxonomy. *Aethopyga christinae* Swinhoe, 1869, Hainan Island, south China.

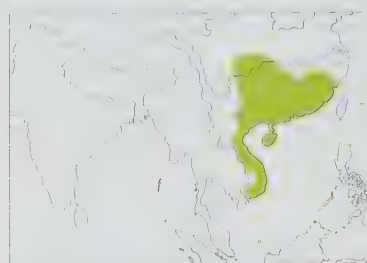
This species and *A. eximia* have in the past been placed together in a separate genus, *Urodrepanis*, but no evidence that they are particularly closely related. Three subspecies recognized.

Subspecies and Distribution.

A. c. latouchii Slater, 1891 – SE China (E Sichuan E to Fujian, S to Guangxi and Guangdong), N Vietnam and C Laos.

A. c. christinae Swinhoe, 1869 – Hainan I.

A. c. sokolovi Stepanyan, 1985 – S Vietnam.



of belly; iris brown or dark brown; bill black or reddish-brown; legs brown. Female has crown dull brownish or blackish with greyish-olive edging (giving sealy appearance), upperparts olive-green, chin, throat and breast light yellowish-green, rest of underparts greenish-yellow; bare parts as male. Juvenile is as female, but greyer above and on throat and upper breast; young male develops longer tail and yellow rump before acquiring iridescence. Race *latouchii* male has back yellowish-olive (as wing), chin to breast maroon-crimson; *sokolovi* male is similar to previous, but has darker olive back, blackish side of head tinged reddish, yellow area on upperparts larger and darker, breast, belly and undertail-coverts olive-green to green. **Voice.** Song an accelerating "pe-et, pe-et, pit, pit". Calls "twisk", singly or repeated up to five times; also "chip-chip", developing into slightly descending trill of 5–8 notes.

Habitat. Forest and forest edge, occasionally gardens; generally on lower hills, up to 1400 m.

Food and Feeding. Few data. Diet seeds, and presumably nectar and small arthropods. Visits flowering bushes and trees.

Breeding. Laying from Apr onwards in China. Nest pear-shaped, constructed from mosses, grasses, plant fibres, sometimes decorated with lichens, and suspended from leaves on a branch. Clutch 2–4 eggs, greenish-grey, with purplish markings tinged reddish-brown, with dusky dots. No other information.

Movements. In China, moves into S Guangdong and C Fujian in winter months.

Status and Conservation. Not globally threatened. Common in China; fairly common within somewhat limited range in SE Asia. Occurs in Cue Phuong National Park, in Vietnam.

Bibliography. Caldwell & Caldwell (1931), Cheke & Mann (2001), Corlett (1998), Étiéopcar & Hûe (1983), King *et al.* (1975), Lei Jinyu & Liu Yang (2006), Liu Yang & Lei Jinyu (2005), Meyer de Schauensee (1984), Prinzing, Lübben & Schuchmann (1989), Prinzing, Schäfer & Schuchmann (1992), Robson (1994a, 2000a, 2000b), Stepanyan (1985a).

117. Black-throated Sunbird

Aethopyga saturata

French: Souimanga sombre **German:** Schwarzkehl-Nektarvogel **Spanish:** Suimanga Gorjinegro
Other common names: Hodgson's/Black-breasted Sunbird

Taxonomy. *Cinnyris saturata* Hodgson, 1836, Nepal.

Geographical variation extremely well marked in some cases, isolated race *wrayi* perhaps approaching species level. Birds in Cambodia (except SW) of uncertain racial identity. Proposed race *ariel*,

described from near Nokrek (in Garo Hills), in NE India, considered inseparable from *assamensis*. Ten subspecies recognized.

Subspecies and Distribution.

A. s. saturata (Hodgson, 1836) – Himalayas from N India (Garhwal and Mussoorie) E to Nepal, Bhutan and S China (SE Xizang).

A. s. assamensis (McClelland, 1839) – NE India, N Myanmar and S China (W Yunnan).

A. s. petersi Deignan, 1948 – E Myanmar, extreme N Thailand, N Laos, N Vietnam and SE China (SE Yunnan, W Guangxi).

A. s. galenae Deignan, 1948 – NW Thailand.

A. s. sanguinipictus Walden, 1875 – SE Myanmar.

A. s. anomala Richmond, 1900 – S Thailand (S to Trang).

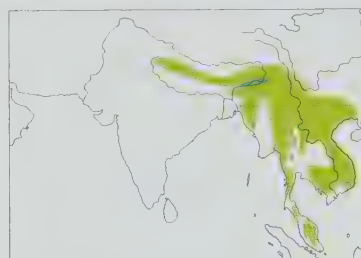
A. s. wrayi Sharpe, 1887 – Malay Peninsula S of Trang.

A. s. ochra Deignan, 1948 – S Laos and C Vietnam.

A. s. cambodiana Delacour, 1948 – SW Cambodia.

A. s. johnsi Robinson & Kloss, 1919 – S Vietnam.

Also N & E Cambodia (race as yet undetermined).



Descriptive notes. Male 14–15 cm, 5.5–6.5 g; female 10 cm, 5.5 g. Male with elongated central tail feathers. Male nominate race has crown and nape metallic violet-purple, side of neck and back crimson-brown or maroon, variably narrow yellow band on lower back (sometimes absent), uppertail-coverts metallic purple-blue; uppertail metallic purple-blue, upperwing blackish-brown; lores, face and throat to upper breast blackish, broad metallic purple or blue malar stripe, lower breast unglossed blackish, rest of underparts pale greyish-olive to greenish-grey; iris brown; bill brownish-black to black; legs dark horn-brown to dark

brown. Female is olive-green above, with crown grey, yellow band on lower back, tail graduated and with greyish-white tips; greyish-olive below, except for whitish flanks. Juvenile is similar to female, but tail not so graduated, and white tips not so distinct; male later developing dark maroon on mantle, wings, tail and breast. Race *assamensis* male is richer in colour than nominate, with a little more yellow on lower back, belly dull olive-green and grey, female entirely greenish below with little or no yellow tinge; *petersi* male has glossy blue crown and moustachial stripe, unglossed black chin to breast, sulphur-yellow lower breast streaked scarlet, belly, flanks and vent olive-yellow; *galenae* male has mixed scarlet and yellow breast, greenish-grey lower breast, belly and flanks, differs from previous in sulphur-yellow breast patch being more extensive distally and less clearly separated from olivaceous yellow (rather than greyish olive-green) of rest of underparts, female in having lower underparts yellowish (rather than greyish olive-green); *sanguinipictus* male differs from preceding race in having entire throat except centre metallic blue-violet, fewer red streaks on chest; *cambodiana* male differs from last in having darker red on back; *anomala* male has no yellow on lower back/rump, has throat to upper breast dull smoky black with glossy purple border, lower breast to vent greyish, with dull yellowish band across breast; *johnsi* male has breast entirely scarlet with narrow yellow streaks, belly, vent and flanks olive-green or greyish-green, female has entire underparts greenish with little or no yellow tinge; *wrayi* male has very little yellow on rump, breast sooty black with feathers tipped yellowish, belly, flanks and vent greyish olive-green, only few red streaks on breast; *ochra* male has more extensive yellow on underparts than last, female below entirely greenish with little or no yellow tinge. **Voice.** Song a twittering containing series of sharp, high-pitched "swi", "tis" and "tsi" notes with rapid metallic trills, e.g. "swi, it, it, it, it, it" or "swi, i, i, i, i, i". Calls include high-pitched, repeated, rather thin "tit, tit-tit" or "tiss-it", and "tu-ti-tee-tee".

Habitat. Primary forest, heavily disturbed forest and regenerating secondary forest, dense jungle edge, scrub, secondary growth, gardens and along shady streams. At 820–2200 m; down to 305 m in winter.

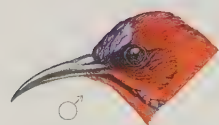
Food and Feeding. Nectar, including that from *Aeschynanthus*, *Rhododendron* and *Lantana*, and perhaps pollen; also arthropods. Forages singly and in pairs, from canopy down to understorey, sometimes on ground. Nectar-robbs flowers.

Breeding. Laying in Jan–Mar in India, Feb–May and Sept in Nepal, Apr in Myanmar; in Malay Peninsula, laying calculated as Feb–Apr and Jun, but nest-building observed in mid-Mar, May and Sept, nestlings found Feb and Mar and fledglings in late Apr; birds with enlarged gonads in Apr in Thailand. Nest, apparently built by female alone, is pear-shaped, entrance hole one-third from top and with porch 2–3 cm (or without porch), made from felted vegetable down or dry grass, moss (especially on upper half), lichens, rootlets, fibre from fern rhizomes, and cobwebs, decorated externally with wood chips and bamboo leaves, lined with soft seed down, attached to thin branch of bush or creepers or to tips of tree-fern fronds up to 4 m above ground. Clutch 1–3 eggs, white, with inky black, inky brown or muddy brown speckles, spots and blotches. No further information.

Movements. Mostly resident. Known to make some seasonal altitudinal movements in higher parts of range.

Status and Conservation. Not globally threatened. Fairly common to common in India, Nepal and Bhutan; uncommon in Thailand; common to uncommon in Malay Peninsula. Status in Bangladesh uncertain; may have occurred in past, but now extirpated. Nominative race possibly occurs in NE Pakistan (Murree Hills). Occurs in several protected areas, such as Namdapha National Park, in India, and Kaeng Krachan National Park, in Thailand.

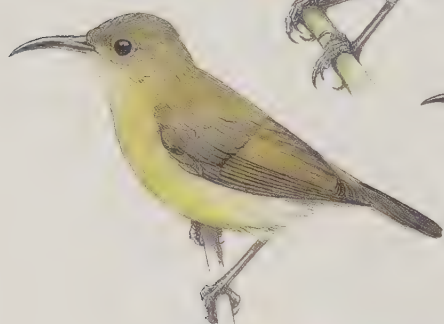
Bibliography. Ali & Ripley (1974), Birand & Pawar (2004), Cheke & Mann (2001), Edgar (1933), Étiéopcar & Hûe (1983), Fleming *et al.* (1976), Glenister (1951), Grimmett *et al.* (1998), Inskipp & Inskipp (1985), King *et al.* (1975), McClure (1998), Medway & Wells (1976), Melville & Round (1984), Meyer de Schauensee (1984), Rand & Fleming (1957), Rasmussen & Anderton (2005b), Robson (2000b), Smythies (1986), Wells (2007).



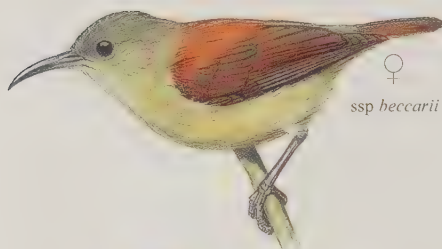
♂
ssp nicobarica



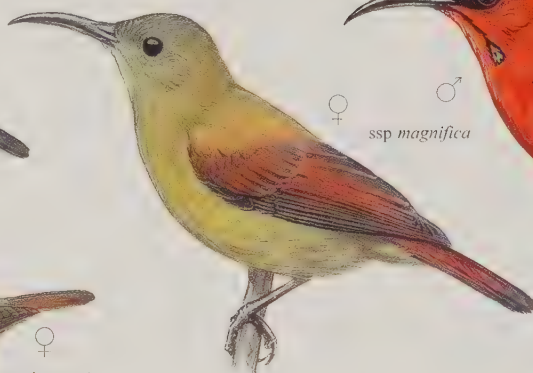
♂
ssp siparaja



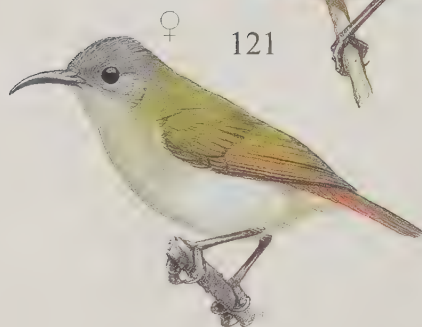
♀
ssp heccarii



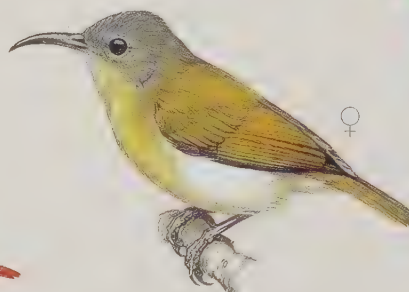
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ssp magnifica



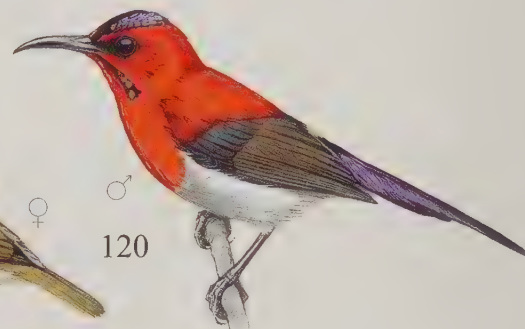
♂
ssp ignicauda



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ssp flavoventris



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ssp heccarii



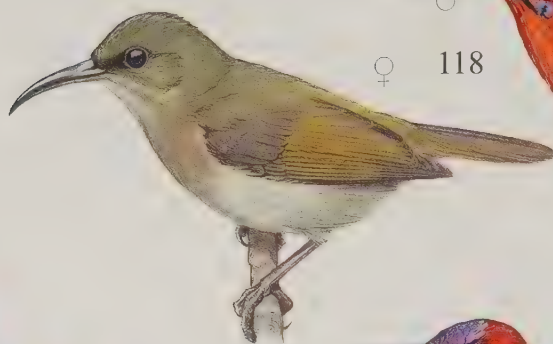
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ssp flavescens



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ssp heccarii



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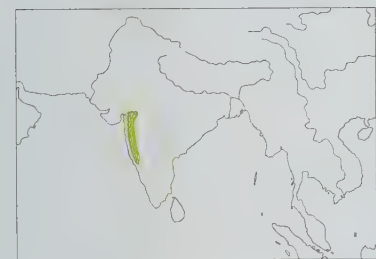
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118. Vigors's Sunbird

Aethopyga vigorsii

French: Souimanga de Vigors **German:** Vigorsnektarvogel **Spanish:** Suimanga de Vigors
Other common names: (Vigors's) Yellow-backed Sunbird, Western Crimson Sunbird

Taxonomy. *Cinnyris vigorsii* Sykes, 1832, Western Ghats, Deccan, India. Forms a superspecies with *A. siparaja*, and often treated as conspecific. Proposed race *concolor* (described from W Deccan) appears to be undiagnosable. Monotypic.
Distribution. NW Maharashtra (W Satpuras) and Western Ghats (from R Narmada S at least to Goa area), in W India.



Descriptive notes. Male 15 cm, 7.9 g; female 10 cm, 7.7 g. Has heavy, strongly curved bill. Male has forehead to centre of crown metallic blue-green, metallic violet or blue cheek spot; nape to mantle and shoulders dark, dull crimson-red, back blackish, patch on lower back pale yellow; uppertail-coverts and elongated narrow central tail feathers blackish-brown, edged metallic blue, outer rectrices tipped dark grey, edges of other tail feathers metallic green; upperwing blackish-brown; throat to breast scarlet with obvious yellow streaks. Metallic violet or blue malar streak, breast bordered below by thin blackish band which extends

downwards to form narrow black patch; rest of underparts grey, underwing-coverts and axillaries white; iris red-brown to crimson; bill blackish, dark brown below; legs dark brown to blackish. Female has crown, nape and mantle greyish-olive, back olive, brightening to olive-yellow on rump and uppertail-coverts; tail black, outer webs tipped olive, inner webs tipped white, central feathers olive, wing dark brown, edged olive; chin whitish-grey, throat to breast olive-grey, rest of underparts grey, some individuals with chin to breast dull orange-scarlet; bare parts as male. Juvenile male is occasionally like adult female, but with dull scarlet throat and breast (possibly a transitional stage, rather than a discrete plumage); juvenile female as adult but greyer below. **VOICE.** Sharp, harsh "chi-wee"; also "shwing!", said to be richer, more strident and more slurred than similar call of *A. siparaja*.

Habitat. Evergreen and moist-deciduous forest, and forest edge, particularly around flowering trees and shrubs, foothills, to 1000 m.

Food and Feeding. Nectar; presumably also small insects, and spiders (Araneae). Forages mostly in small groups, generally in upper levels but often lower.

Breeding. Season Jun–Oct. Nest purse-like, with porch, ornamented with scraps of bark, paper and caterpillar frass, and attached to twig over stream, or suspended from bush or exposed roots along earth cuttings in hilly country. Clutch 1–3 eggs, white or cream, with brown or reddish-brown speckling, occasionally almost completely covered with brown suffusion of varying intensity. No other information.

Movements. Not recorded.

Status and Conservation. Not assessed. Restricted-range species: present in Western Ghats EBA. Common. Range possibly extends farther S, as reported from Nilgiris and presence suspected elsewhere in Kerala, but confirmation required.

Bibliography. Ali (1932, 1969), Ali & Ripley (1974), Cheke & Mann (2001), Mann (2002), Mukherjee (1981), Oates (1890a, 1890b), Rasmussen & Anderton (2005b).

119. Crimson Sunbird

Aethopyga siparaja

French: Souimanga siparaja **German:** Karmesinnektarvogel **Spanish:** Suimanga Siparaja
Other common names: Eastern Crimson Sunbird, Yellow-backed/Goulpourah/Scarlet-throated/Scarlet-breasted Sunbird

Taxonomy. *Certhia siparaja* Raffles, 1822, Sumatra.

Forms a superspecies with *A. vigorsii*, and often treated as conspecific. Geographical variation sometimes well marked; some distinctive races, e.g. *seheriae* and *magnifica*, perhaps merit separation at species level. Conversely, poorly differentiated *heliogona* may be better synonymized with nominate; also *labecula* with *seheriae*, and these two intergrade in N West Bengal and Bhutan. Nominative race intergrades with *transgensis* on W coast of Malay Peninsula. Many additional races described, all considered insufficiently distinct to warrant recognition: thus, off W Sumatra, *tinoptila* (from Pulo Siemat, near Simeulue I), *heliophilica* (Pulo Bangkaru, in Banyak Is), *niasensis* (Nias I), *melanetra* (Pulo Lasia), *siberu* (Siberut I) and *photina* (North Pagai I) are included in nominate, as also is *ochropyrrha* (Pulo Rittan, in Anamba Is); *mussooriensis* (Mussoorie, N India), *miles* (Nepal), *andersoni* (Sawaddy, E of Bhamo, in N Myanmar) and *viridicauda* (Tengyueh, in Yunnan, in S China) all subsumed in *seheriae*; *terglanei* (Bangladesh) included in *labecula*, and *heliotis* (Dome I, in Mergui Archipelago) synonymized with *cara*; and *marinduquensis* (Barrio Canat, Boac, Marinduque), formerly erroneously treated as a race of *Leptocoma sperata*, is merged with *magnifica*. In addition, there may be a further undescribed race in Bangladesh. Fifteen subspecies recognized.

Subspecies and Distribution.

A. s. seheriae (Tickell, 1833) – Himalayan foothills in India from W Himachal Pradesh (Kangra) E to Sikkim and Bhutan, S to N West Bengal, E Bihar, E Madhya Pradesh and Orissa (possibly N Andhra Pradesh), and W Bangladesh.
A. s. labecula (Horsfield, 1840) – Bhutan, NE India (N West Bengal, Assam, Arunachal Pradesh, Meghalaya, Nagaland, Manipur) and Bangladesh S to Chittagong Hills, E to Myanmar (except S), S China (S Yunnan), NW Laos and NW Vietnam.
A. s. cara Hume, 1874 – S Myanmar and Thailand.
A. s. nicobarica Hume, 1873 – S Nicobar Is (Great and Little Nicobars, Kondal I, Meroe I).
A. s. tonkinensis E. J. O. Hartert, 1917 – NE Vietnam and S China (SE Yunnan E to W Guangdong).
A. s. owstoni Rothschild, 1910 – Naozhou I (SW Guangdong), in S China.
A. s. mangini Delacour & Jabouille, 1924 – SE Thailand and C & S Indochina.
A. s. insularis Delacour & Jabouille, 1928 – Phu Quoc I, off S Cambodia.

A. s. transgensis Meyer de Schauensee, 1946 – S Thailand and N Malay Peninsula.

A. s. siparaja (Raffles, 1822) – Malay Peninsula (S of Narathiwat), Anamba Is (E of Peninsular Malaysia), Sumatra (except Aceh) and satellite islands, and Borneo and associated small islands (except Natunas).

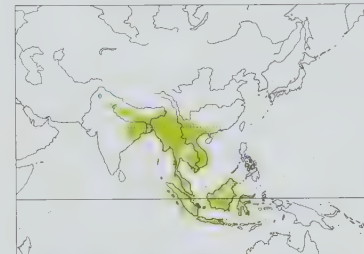
A. s. natunae Chasen, 1935 – Natuna Is.

A. s. heliogona Oberholser, 1923 – Java.

A. s. magnifica Sharpe, 1876 – WC Philippine Is (Marinduque, Tablas, Sibuyan, Panay, Negros, Cebu).

A. s. flavostriata (Wallace, 1865) – N Sulawesi.

A. s. beccarii Salvadori, 1875 – C, S & SE Sulawesi, Kabaena, Muna and Butung.



Descriptive notes. Male 11.7–15 cm, 4.8–9 g; female 10 cm, 5–6.9 g. Male nominate race has forehead to centre of crown glossed purple-green, hindcrown and side of head to back and lesser upperwing-coverts crimson, rump yellow, uppertail-coverts and tail black (uppertail-coverts sometimes glossed green), elongated central rectrices metallic purple; upperwing feathers (except lesser coverts) dark brown, edged olive; chin and throat to breast scarlet, metallic purple-blue moustachial streak, underparts olive-grey; iris dark brown; upper mandible dark brown, black at base, lower mandible horn-brown; legs dark brown.

Differs from *A. vigorsii* mainly in smaller bill, paler general appearance. Female is greyish-olive on crown, nape and mantle, back olive, rump and uppertail-coverts olive-yellow; tail black, edged olive on base of outer webs, outer webs tipped pale grey, central rectrices olive, wings dark brown, edged ochraceous olive; throat light grey, sometimes with some dull red, breast olive-grey, rest of underparts light olive, some yellowish streaking on upper belly, undertail-coverts yellow, and long flank feathers yellowish-white; bare parts as male. Immature male is like adult female, but has scarlet chin, centre of throat and breast, mantle and shoulders, and yellow patch on back and uppertail-coverts; juvenile female greyer and less yellow than adult. Race *natunae* male has paler grey underparts than nominate; *heliogona* is very similar to nominate, but male has some orange mixed with yellow of rump patch, and belly paler grey; *flavostriata* male differs from nominate in having much more pronounced yellow streaking on scarlet throat, metallic blue forehead, moustachial stripes and tail, extensive red margins on upperwing, broad yellow rump patch and dusky belly, female has olive back with slight carmine feather tipping; *magnifica* is larger than previous and has stronger bill, male has metallic purplish gloss on black forehead and tail, crown dark red, rump bright orange-yellow, belly to undertail-coverts black, female dark olive-green head, back and rump, varying amounts of red on scapulars, back and wings, black tail edged red, underparts grey-green; *beccarii* resembles nominate, but female has red back; *seheriae* has longer and more curved bill than nominate, male differs from it in having forehead to centre of crown glossy emerald-green, back brighter crimson, olive lower back with concealed golden-yellow patch, uppertail-coverts and narrow central rectrices glossy green, latter considerably more lengthened than in nominate, rest of rectrices black, outer pair tipped dark grey, much more extensive red below, lower underparts light yellowish-olive to olive-grey, female differs from nominate in having much longer central rectrices; *labecula* of both sexes is darker and richer above and below than previous; *cara* male has green gloss on crown; *nicobarica* male differs from last two in having crown and tail violet-purple, nape dark red, lower mantle blackish, throat to breast orange-red, rest of underparts olive-grey, and central tail feathers not elongated; *tonkinensis* male has more extensive yellow on rump and back than nominate, lacks green on uppertail-coverts, has central rectrices moderately elongated and not markedly narrowed; *owstoni* male has brown nape, dark crimson throat with blackish (not yellowish) feather bases, olive-green abdomen; *mangini* male differs from nominate in having purple gloss on crown; *insularis* male differs from nominate in having belly, lower breast and flanks paler grey; *transgensis* male differs from nominate in having lower breast and belly more olive, becoming yellowish in centre, and wing edged also more olive. **VOICE.** Song, often in flight, a loud sharp or chirping trill; described also as very high-pitched, dry, metallic, hissing, clipped "psip-psip, psip-psip" (first notes much lower and louder) given in rapid short series, quickly repeated for long periods with or without pauses. Calls include a metallic, clicking "zit-tit", a soft "siesiep-siesiep", and a quickly upslurred "shwip!"; short segments of song may sometimes be used as calls.

Habitat. Various forest types, including mangroves, heavily disturbed and regenerating secondary forests, forest edge, also parkland, secondary growth and scrub in open country, coastal vegetation, coconut groves, plantations and gardens, particularly around flowering and fruiting trees; usually avoids closed-canopy forest. Mainly in foothills to 1200 m, occasionally to 2000 m, lower during winter months; recorded to 1500 m in Nepal, 1690 m in Bhutan; sea-level to 1190 m in Borneo, 50–1500 m in Sulawesi, and sea-level to 1000 m in Philippines.

Food and Feeding. Insects, spiders (Araneae) and nectar. Forages in pairs and singly, also in family parties, usually low down but occasionally in canopy. Nectar taken from e.g. *Malvaviscus arboreus*; robs flowers of nectar by piercing corolla bases.

Breeding. Season Feb–Oct in Indian Subcontinent; laying recorded in Jan–Feb and Apr–Jun in Myanmar, calculated as Mar, Jun and early Jul in Malay Peninsula, recorded in Apr in Sumatra and Borneo, in all months except Aug, Oct and Nov in W Java, and Feb–Jun (nestlings in May) in Philippines; nestlings in Sept in Sulawesi. Nest a concealed, attenuated, pear-shaped bag, side entrance usually with porch, woven from fine grass, palm fronds, vegetable down, rootlets, moss and cobwebs, decorated with oddments such as cobwebs or bark, or clothed with rootlets on outside, attached to tendrils or palm fronds 0.15–2 m above ground, sometimes under overhanging bank. Clutch 1–3 eggs, matt or slightly glossed, highly variable, pinkish, with sparse spots and fine lines of dark reddish-brown and clouded light reddish-brown (chiefly at blunt end or densely and uniformly spotted), or pale salmon-pink with dark red blotches and speckles, or white to cream, speckled brown to reddish-brown, or greenish-white and covered with greenish-grey speckles; no information on incubation and nesting periods. Nests parasitized by Asian Emerald Cuckoo (*Chrysococcyx maculatus*) in India; observed to feed juvenile of non-parasitic Yellow-billed Malkoha (*Phaenicocorypha calyculata*) in Sulawesi.

Movements. Seasonal altitudinal movements in Himalayas. Sight record from Pakistan (Islamabad) in winter months.

Status and Conservation. Not globally threatened. Generally common throughout wide range; uncommon to rare on Butung (off SE Sulawesi). Occurs in many protected areas, such as Chitwan National Park, in Nepal, Dibru-Saikhowa National Park, in India, Cuc Phuong National Park, in Vietnam, Way Kambas National Park, in Sumatra, and several reserves in Borneo.

Bibliography. Ali & Ripley (1974), van Balen (1993), Birand & Pawar (2004), Blasius (1897), Cheke & Mann (2001), Coates & Bishop (1997), Dickinson *et al.* (1991), Étiénope & Hùe (1983), Fleming *et al.* (1976), Hellebrekers & Hoogerwerf (1967), Hoogerwerf (1949), Inskipp & Inskipp (1985), Kennedy *et al.* (2000), King *et al.* (1975), MacKinnon & Phillips (1993), Mann (1996, 2002), van Marle & Voous (1988), McGregor (1909), Medway & Wells (1976), Mees (1986), Mey (2000), Nash & Nash (1985), Oates (1890b), Ogilvie-Grant & Whitehead (1898), duPont (1971a, 1971b), Prinzing & Jackel (1986), Prinzing *et al.* (1989), Rand & Fleming (1957), Rasmussen & Anderton (2005b), Robson (2000b), Rozendaal & Dekker (1989), Smythies (1960, 1986), Smythies & Cranbrook (1981), Vyas (2002), Wells (2007), White & Bruce (1986).

120. Javan Sunbird

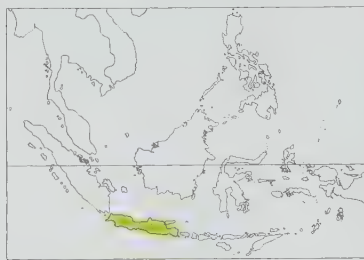
Aethopyga mystacalis

French: Souimanga écarlate **German:** Scharlachnektarvogel **Spanish:** Suimanga de Java
Other common names: Violet-tailed (!)/Scarlet Sunbird

Taxonomy. *Nectarinia mystacalis* Temminck, 1822, Java.

Forms a superspecies with *A. temminckii*, previously considered conspecific. Monotypic.

Distribution. Java.



Descriptive notes. Male 12 cm, female 9 cm. Male has bright crimson head to breast and back, except for iridescent purple crown and malar stripe, yellow streaking on breast; rump yellow, uppertail-coverts and long graduated tail dark iridescent purple, lesser and median upperwing-coverts crimson, remiges and remaining coverts blackish; belly grey, flanks whitish; iris dark brown; bill and legs brown. Female has grey head, paler on throat; rest of plumage olive, paler below, with flanks whitish; bare parts as male. Juvenile is similar to female, but greyer. **VOICE.** Soft but ringing "tseep-tseep, cheet-cheet".

Habitat. Hill dipterocarp forest, lower montane forest and secondary forest, and forest edge; usually at 800–1985 m, once at 2300 m, but occasionally down to near sea-level.

Food and Feeding. Little information. Diet thought to comprise nectar and small arthropods. Forages in pairs in upper levels of forest.

Breeding. Breeding in almost all months; laying recorded in Jan, Mar–Jun and Oct. Nest pendulous, said to be similar to those of other sunbirds, otherwise undescribed. Eggs unglossed or slightly glossed, white or greyish-white with few greyish-brown spots. No other information.

Movements. Nothing recorded.

Status and Conservation. Not assessed. Restricted-range species: present in Java and Bali Forests EBA. Not uncommon.

Bibliography. van Balen (1992, 1993), Cheke & Mann (2001), Hoogerwerf (1949, 1950), Hoogerwerf & Rengers Hora Stecama (1938), MacKinnon (1988), MacKinnon & Phillips (1993), Mees (1986).

121. Temminck's Sunbird

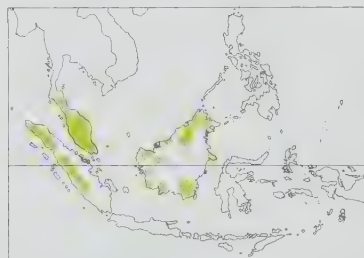
Aethopyga temminckii

French: Souimanga de Temminck **Spanish:** Suimanga de Temminck
German: Temmincknektarvogel
Other common names: Scarlet Sunbird

Taxonomy. *Nectarinia temminckii* S. Müller, 1843, Mount Singalang, 1600 feet [c. 490 m], 0°24' S, 100°20' E, Sumatra.

Forms a superspecies with *A. mystacalis*, previously treated as conspecific. Birds from Mt Dulit, in NW Borneo, described as a geographical race, *peretti*, but this considered unsustainable. Monotypic.

Distribution. S peninsular Thailand, Peninsular Malaysia, Sumatra and Borneo.



Descriptive notes. Male 13 cm, 4.6–6.1 g; female 10 cm, 5 g. Male has lateral crownstriae that meet in a patch on central nape, and moustachial stripe, glossed purple and violet; lores blackish, rest of head to back, upperwing-coverts and breast scarlet; rump yellow, lower rump brownish with purple gloss, uppertail-coverts glossed purple and violet; tail blackish-brown with scarlet edging, elongated central feathers mostly scarlet with dark centres; remiges dark brown with golden-olive edging; underparts below breast grey, with centre of belly yellowish, flanks whitish; iris brown; bill and legs black to dull brown. Female has head grey, with narrow white eyering; hindneck and rest of upperparts olive-green; tail sooty olive edged warm golden-olive to coppery red on outer webs; lesser and median upperwing-coverts and tertials as back, greater coverts olive-green with sooty brown inner webs, remiges sooty brown with bright olive fringes, often becoming more bronzy or coppery red on primaries; underparts whitish grey clearly tinged grey olive on chin to breast, and olive-green on sides of breast, rear underparts slightly tinged creamy yellow, especially on vent and undertail-coverts; bare parts as male. Juvenile is similar to female, but greyer below. **VOICE.** Soft "cheet-cheet"; rhythmic "tit-ti tit-it tit-it tit-it...".

Habitat. Lowland and hill dipterocarp forests, lower montane forest and peatswamp-forest; generally submontane, but recorded from near sea-level to 1985 m.

Food and Feeding. Nectar, including from mistletoes (Loranthaceae), and small arthropods. Forages singly and, sometimes, in pairs; occasionally joins mixed-species flocks. Very active, mostly in canopy, but exploits all levels of forest.

Breeding. Laying recorded in Feb and fledglings found in early May and early Aug in Malay Peninsula; lays in Oct in NW Borneo (Sarawak). Nest egg-shaped, 12.5 × 6 cm, entrance hole with small porch one-third down from top, made of dry grass and vegetable down, also lined with down, with a few decorations of paper, bark and other plant material, suspended by pointed apex (forming attachment) from small twig. Clutch 3 eggs, undescribed. No other information.

Movements. None known.

Status and Conservation. Not assessed. Generally uncommon. Listed as "Vulnerable" in Malay Peninsula. Occurs in Kinabalu Park, in Borneo.

Bibliography. Cheke & Mann (2001), Gauthier (1994), Holmes (1996), MacKinnon & Phillips (1993), Medway & Wells (1976), Mees (1986), Robson (2000a, 2000b), Smythies (1957, 1960), Smythies & Cranbrook (1981), Wells (2007).

122. Fire-tailed Sunbird

Aethopyga ignicauda

French: Souimanga queue-de-feu **Spanish:** Suimanga Colafuego
German: Feuerschwanz-Nektarvogel

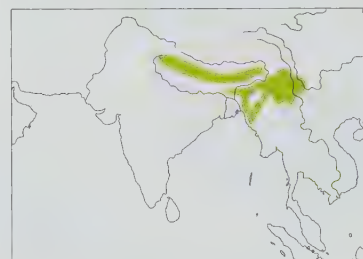
Taxonomy. *Cimyrus ignicauda* Hodgson, 1837, Nepal.

Proposed race *exultans*, described from S China (Salween Divide, in W Yunnan), considered inseparable from nominate. Two subspecies recognized.

Subspecies and Distribution.

A. i. ignicauda (Hodgson, 1837) – N & NE India (from Rajaji National Park and Garhwal E in Himalayas to Arunachal Pradesh, also Meghalaya E to Nagaland and S to Manipur and Chittagongs), Nepal, Bhutan, NE Bangladesh (Sylhet), S China (S Xizang, and W Sichuan S to C Yunnan) and N Myanmar.

A. i. flavescens Stuart Baker, 1921 – NE India (Lushai Hills, in E Mizoram) and adjacent W Myanmar (Chin Hills).



Descriptive notes. Male 15–20 cm, 7.5–9 g; female 8.5–11 cm. Distinctive sunbird with bill only slightly decurved, male with striking plumage tail streamers. Male nominate race has metallic purple-blue crown, blackish side of face, scarlet hindneck and upperparts, yellow patch on lower back; tail, including greatly elongated central rectrices, also scarlet, upperwing olive; throat metallic purple-blue, underparts yellow, washed orange or scarlet on breast, and greyer towards vent; iris dark brown; bill and legs blackish-brown. Male possibly has a non-breeding (eclipse) plumage, but this not confirmed. Female has grey head,

olive upperparts, yellow on rump, olive uppertail-coverts and tail with variable orange wash, upperwing as male; chin to breast olive-grey, yellow lower breast and belly, becoming whitish on vent, flanks olive; may have some orange on breast; bare parts as male. Juvenile is like female, but greyer on head, and tail duller olive, young male brighter yellow below and often with some red on throat and breast; first-winter male as smaller adult female, but tail longer, more yellow below, has yellow patch on back, orange-red on rump, uppertail-coverts and tail, sometimes red or orange on underparts. Race *flavescens* male is shorter-billed than nominate, tends to have slightly smaller iridescent cap, shorter tail and much less scarlet in yellow of breast, female paler and brighter olive above than nominate, with more and brighter yellow on rump, more red on tail, brighter yellow on throat and breast (but no orange). **VOICE.** Song a series of descending very thin, high-pitched, well-separated notes. Calls include high-pitched repeated "dzdzdzdzdzdzdzdz"; high sharp "tsitsitsitsi...tsi...tsi...tsi", last 2 notes slower; rapid staccato twittering.

Habitat. Coniferous and oak forest, particularly with rhododendron (*Rhododendron*) understorey, also juniper (*Juniperus*) scrub above tree-line; 3000–4880 m in summer, and 610–2900 m in winter. In NE Myanmar found in broadleaf lower montane and upper montane evergreen forest, often along edges.

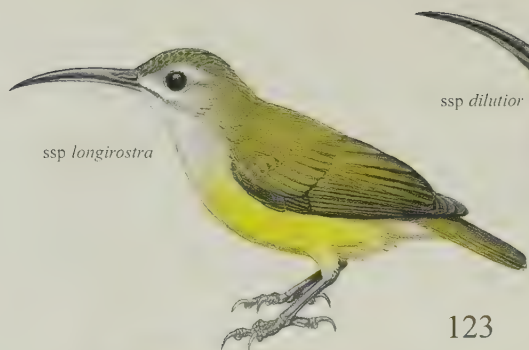
Food and Feeding. Nectar, small insects, and spiders (Araneae). Forages singly and in pairs; outside breeding season also in groups, and joins mixed-species flocks. Catches insects in air.

Breeding. Laying in Apr–Jun in India and nest-building in May in Nepal. Nest built mostly by female, with little, if any, assistance from male; oval, 14 × 7 cm, with small entrance near top, constructed from moss, rootlets, cobweb and papery bark and lined with vegetable down, fine grass and feathers, or fine seed down from fallen pods of simul tree (*Bombax malabarica*), held together with spider webs, scraps of moss and long shreds of grass, or constructed from lichen, and may be decorated with moss and caterpillar frass; suspended from branch of dwarf bamboo or bush within 2 m of ground, or attached by grass and moss to a bracken (*Pteridium*) frond. Clutch 2–3 eggs, pale violet-white covered with purplish speckles, or brick-red with darker brick-red freckles, or white with tiny brown blotches forming broad ring at large end. No other information.

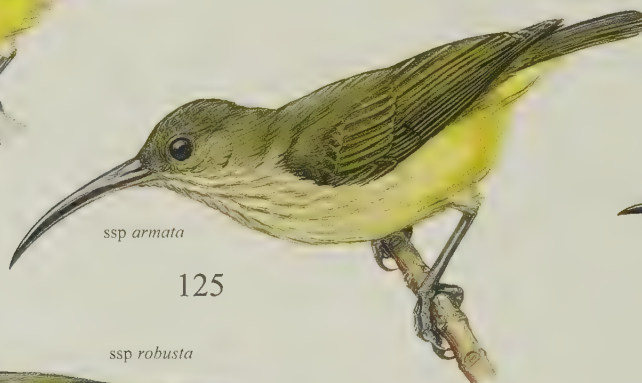
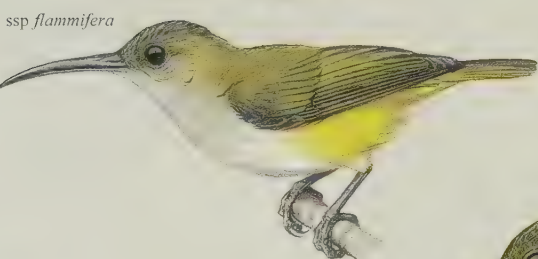
Movements. Seasonal altitudinal movements in Himalayas. Some 3000 birds seen moving N on a Nov morning along Gaoligongshan ridge in W Yunnan, China. Recorded as a vagrant (presumably race *flavescens*) in C Myanmar and once in NW Thailand.

Status and Conservation. Not globally threatened. Widespread and fairly common in India, Nepal and Bhutan; considered very common in Myanmar above tree-line (3900 m) in Adung valley. Probably extirpated from Bangladesh.

Bibliography. Ali & Ripley (1974), Cheke & Mann (2001), Étiénope & Hùe (1983), Fleming *et al.* (1976), Grimmett *et al.* (1998), Inskipp & Inskipp (1985), Inskipp *et al.* (2000), Landmann *et al.* (1991), Meyer de Schauensee (1984), Rand & Fleming (1957), Rasmussen & Anderton (2005b), Robson (2000b), Singh (2000), Smythies (1986), Sultana & Khan (2000).



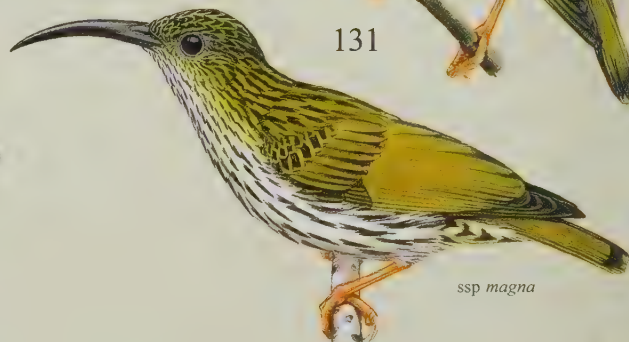
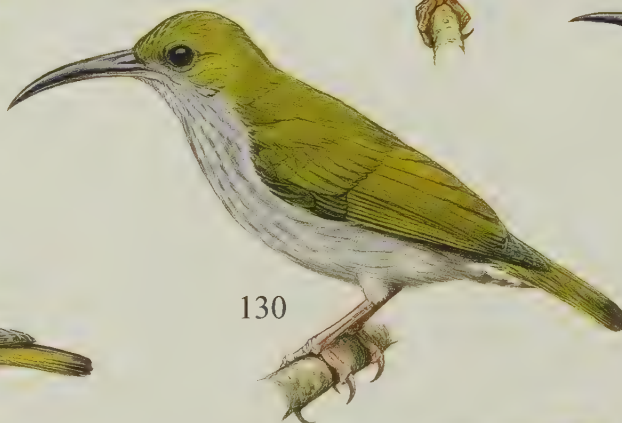
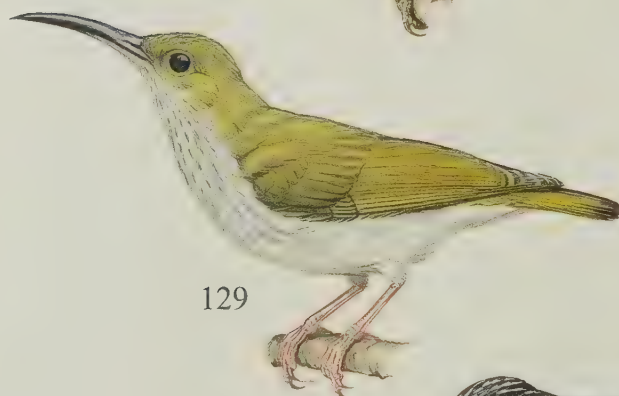
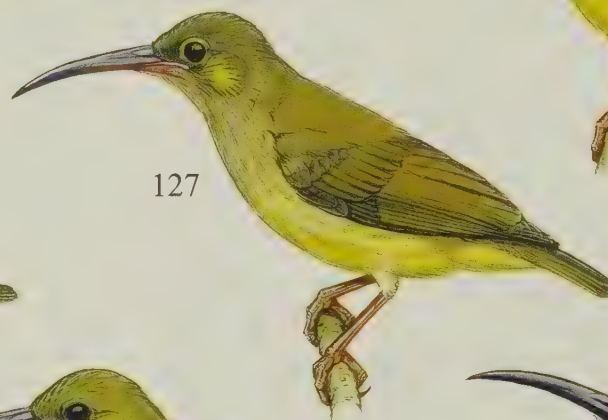
ssp dilutior



ssp robusta



128



ssp magna



PLATE 22

inches 3
cm 8

Genus *ARACHNOTHERA* Temminck, 1826

123. Little Spiderhunter

Arachnothera longirostra

French: Petit Arachnothère **German:** Weißkehl-Spinnenjäger **Spanish:** Arañero Chico

Taxonomy. *Certhia longirostra* Latham, 1790, Tippera District, Bangladesh. Additional proposed races, all considered insufficiently distinct, are *vantyni* (from Jagalbed, Bombay, in W India), subsumed in nominate, and *antelia* (Trang, in S Thailand), *heliocrita* (Selitar, near Singapore), *melanchima* (upper R Siak, in E Sumatra), *hypochra* (North Pagai I), and *exochra* (South Pagai I), all synonymized with *cinireicollis*. For race *cinireicollis*, original spelling often altered to “*cinireicollis*”, but this is an unjustified emendation. Thirteen subspecies recognized.

Subspecies and Distribution.

A. l. longirostra (Latham, 1790) – SW, CE & NE India (Western Ghats from Goa region S to W Tamil Nadu and Kerala; E Orissa and N Eastern Ghats; Darjeeling; Arunachal Pradesh S to Meghalaya and Manipur), E Nepal, Bhutan, Bangladesh, Myanmar E to S China (W Yunnan) and W Thailand (S to Isthmus of Kra)

A. l. sordida La Touche, 1921 – extreme S China (S & SE Yunnan, extreme NW Guangxi), NE Thailand and N Indochina.

A. l. pallida Delacour, 1932 – SE Thailand and C & S Indochina.

A. l. cinireicollis (Vieillot, 1819) – Malay Peninsula (S of Isthmus of Kra) S to and Sumatra and satellite islands (except Banyak Is and Nias I).

A. l. zarhina Oberholser, 1912 – Banyak Is, off W Sumatra.

A. l. niasensis van Oort, 1910 – Nias I, off W Sumatra.

A. l. rothschildi van Oort, 1910 – N Natuna Is.

A. l. atita Oberholser, 1932 – S Natuna Is.

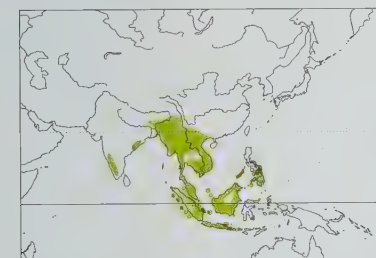
A. l. buettikoferi van Oort, 1910 – Borneo.

A. l. prillwitzii E. J. O. Hartert, 1901 – Java (including Madura I) and Bali.

A. l. dilutior Sharpe, 1876 – Palawan, in W Philippine Is.

A. l. flammifera Tweeddale, 1878 – E & S Philippines (Samar, Biliran, Leyte, Bohol, Dinagat, Mindanao).

A. l. randi Salomonsen, 1953 – Basilan (off W Mindanao).



Descriptive notes. 13.3–16 cm; male 10.3–16.1 g, female 8.8–14 g. Male nominate race has very long, stout, gently decurved bill; plumage olive above, crown feathers dark-centred, side of head grey, lores white, short blackish submoustachial streak; upperwing-coverts olive, remiges dusky-brown with olive edges, tail dark brown, fringed olive and narrowly tipped whitish; throat and breast greyish-white, breast tinged yellow, rest of underparts bright yellow, usually whiter on undertail-coverts, pectoral tufts orange; iris brown to dark brown; bill horn-brown, greyer on gonyes and at base of lower mandible, or black above and pale grey below; legs black, blackish-grey or bluish-grey. Female is similar to male but smaller, has whiter throat, paler base of lower mandible, and lacks pectoral tufts. Juvenile is similar to female but browner, with bright olive fringes on wing feathers, and paler bill and feet. Race *sordida* is similar to nominate, but has dull whitish-grey lores, much shorter bill; *pallida* has much shorter bill than nominate, olive-green of upperparts paler and greyer, very white throat, underparts very pale yellow; *cinireicollis* is very long-billed, has bluish tinge in the grey on side of head, neck and throat, black at corner of mouth, with upperwing and tail greenish-brown, breast to vent yellow, white undertail-coverts; *zarhina* has much longer bill than previous, but shorter wing, and much duller upper surface; *niasensis* also has longer bill and wing, and very pale yellow underparts; *rothschildi* is yellow below (like *cinireicollis*), but bill and often also wing shorter; *atita* differs from last in having longer bill, and yellow of underparts deeper, brighter and more golden; *buettikoferi* is browner and less olive than nominate, has paler pectoral tufts; *prillwitzii* has brighter yellow underparts than nominate, and more orange pectoral tufts; *dilutior* differs from nominate in being more olive-brown on crown, with brown lores, more olive-green above, flanks washed sulphur-yellow, pectoral tufts dull orange, underparts ashy white; *flammifera* differs from preceding race in having faint orange-green wash above, flanks, belly and undertail-coverts yellow, pectoral tufts bright orange; *randi* is similar to last, but bill much longer. **VOICE.** Much geographical variation. Songs include “which-which”, twice per second for c. 2 minutes, continuous “tee-chu”, first note rising, second falling, and squeaky “chew-chew-chew-chew” whistle; in S India described as continuous, syncopated, strident, metallic “clink-clink-clink”, each note an upstroke, and in NE India as simple, metronomic, metallic upstroke “clink-clink...”, recalling Common Tailorbird (*Orthotomus sutorius*), or more varied “wink-link-wink-wink-link-link-wink”, irregular and with more noticeable pitch differences; in Malay Peninsula “tee tay” and “ti tee-tee-tah”, stressed on first syllable. Antiphonal singing occurs, presumably by pair-members. In flight, sharp “weechoo” or “cheek-cheek-cheek”; high-pitched “tik-ti-ti-ti”, first note higher, repeated continuously; harsh metallic “cheet” or “chee-chee”; repeated “chee-chee-chee” or “chip-chee-chee” or “chip-chip”; loud, harsh “sheep” repeated up to 25 times; loud “jit-jit”, increasing in rate and intensity.

Habitat. Understorey of various types of forest, including mangroves, regenerating secondary forest, disturbed and heavily logged forests, forest edge, also coastal vegetation, secondary growth, plantations, gardens and cultivation, particularly around plantains (*Musa*) and gingers (*Zingiberaceae*). Generally below 600 m; up to 1500 m in S India, 75–305 m in Nepal, to 2100 m in China, 1680 m in Peninsular Malaysia, and 2000 or 2200 m in Sumatra, Java and Bali; sea-level to 1400 m in Borneo, and sea-level to 1000 m in Philippines.

Food and Feeding. Nectar, insects, and spiders (Araneae). Forages singly and in pairs, mostly in lower levels of vegetation. Takes insects from spider webs, and from pools of water in vegetation. Nectar-robbing recorded. Pollinates and takes nectar from durian trees (*Durio*); pollinates *Strelitzia nicotai*, also *Musa* species with either erect or pendulous inflorescences.

Breeding. Laying in India in Dec–Aug (chiefly Jan–May) in SW and Jan–Nov (chiefly May–Aug) in Assam; probably Mar–Sept in Nepal, Jan in Thailand, calculated as Dec–May (once early Oct) in Malay Peninsula, May–Jun and probably Aug in Sumatra, in all months except Nov in Java; in Malay Peninsula, egg-laying calculated as Dec–May (once early Oct), nest-building observed mid-Aug, nestlings found in Apr and Oct, and juveniles in all months (most in May–Jun, fewest Sept–Dec); in Borneo, oviduct eggs/active gonads in Jan, Mar–Apr, Jul and Sept–Dec, food-carrying adults (Sabah) in May and Nov and juveniles in Jul–Aug; active gonads in May and Jun in Philippines. Nest a compact cup 10 cm deep, with semi-circular entrance hole on one side (some nests have two entrances), constructed from leaf skeletons, soft grass and vegetable down neatly felted together, lined with fine grass, and attached by rim to underside of banana leaf by cobwebs or vegetable cotton passed through leaf and knotted on upper surface, or made from rootlets, dead leaves, plant fibres and cobwebs in tunnel created by the sewing-up of ginger and plantain leaves; sometimes placed under *Khydia* leaf, or in elephant grass, or under giant creeper or large dock (*Rumex*) leaf or on castor-oil plant (*Ricinus communis*); can be as little as 0.5–2.5 m above ground; nest described also as trough-like, closed at one end to form cup, with entrance tunnel pointing downwards. Clutch 2 or 3 eggs, dull white or creamy with zone of heavy red-brown or purple-brown spotting, or with very few spots, or unglossed pinkish-white to salmon-pink with sparse reddish speckles all over and sharply defined ring of red-brown spots around broad end; no information on incubation and nestling periods. Nests parasitized by Violet Cuckoo (*Chrysococcyx xanthorhynchus*), Asian Emerald Cuckoo (*Chrysococcyx maculatus*), Common Cuckoo (*Cuculus canorus*), Large Hawk-cuckoo (*Cuculus sparveroides*) and Hodgson’s Hawk-cuckoo (*Cuculus fugax*).

Movements. Altitudinal movements recorded on Mt Mulu, in NW Borneo (Sarawak); movements of up to 6 km recorded in Peninsular Malaysia. Thought to undertake local movements in Nilgiri Hills, in SW India. Nomadic in some areas.

Status and Conservation. Not globally threatened. Locally common in India in Western Ghats and NE; very scarce and local in SE Nepal, where recorded also in C; rare in Bhutan; locally common in Bangladesh; common in Tenasserim, but rare elsewhere in Myanmar, generally common in Thailand except E, locally common in S Laos, and common in Peninsular Malaysia; not uncommon in Sumatra; common in Borneo; uncommon in Philippines. Occurs in numerous protected areas, examples of which are Kaeng Krachan National Park and Khao Pra Bang Wildlife Sanctuary, in Thailand, Cat Tien National Park, in Vietnam, Way Kambas National Park, in Sumatra, Gunung Gede-Pangrango National Park, in Java and Bali, Danum Valley Conservation Area, in Borneo, and St Paul Subterranean River National Park, in W Philippines.

Bibliography. Ali (1969), Ali & Ripley (1974), Andrew (1985), Birand & Pawar (2004), Cheke & Mann (2001), Échécopar & Hùe (1983), Evans *et al.* (2000), Fleming & Traylor (1964), Fleming *et al.* (1976), Gauthier (1994), Grimmett *et al.* (1998), Hellebrekers & Hoogerwerf (1967), Holmes (1996), Hoogerwerf (1949, 1950), Inskipp & Inskipp (1985), Kennedy *et al.* (2000), Khan (1977), Lee Kwok Shing *et al.* (2006), Liu Aizhong *et al.* (2002), Mann (1996), van Marle & Voous (1988), McClure (1998), McGregor (1909), Medway & Wells (1976), Nash & Nash (1988), Rajathurai (1996), Rand & Rabor (1960), Rasmussen & Anderton (2005b), Robson (2000b), Salomonsen (1953b), Sheldon *et al.* (2001), Smythies (1960, 1986), Smythies & Cranbrook (1981), Smythies & Davison (1999), Thompson (1966), Wells (2007), Wells *et al.* (1978), Yumoto (2000), Zimmer (1918).

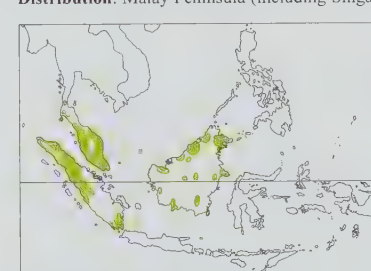
124. Thick-billed Spiderhunter

Arachnothera crassirostris

French: Arachnothère à bec épais **Spanish:** Arañero Picogordo
German: Dickschnabel-Spinnenjäger

Taxonomy. *Arachnocestra crassirostris* Reichenbach, 1853, no locality = Sumatra. Proposed geographical race *temminckii*, described from Malay Archipelago, considered inadequately differentiated from birds elsewhere in species’ range. Monotypic.

Distribution. Malay Peninsula (including Singapore), Sumatra and Borneo.



Descriptive notes. 16–17 cm; 15.5–16.4 g. Male is dark olive-brown above, with large yellow patch around eye bordered olive below, and dark olive stripe through eye; flight-feathers with greenish-yellow edging, and tail with greyish-yellow tips and edging on outer feathers; chin to breast greyish-yellow, pectoral tufts yellowish-orange, rest of underparts greenish yellow, becoming yellow on undertail-coverts and flanks; iris brown or dark brown; bill black, horn at base; legs blackish, soles orange. Female is like male but lacks pectoral tufts. Juvenile is thought to be similar to female, but browner and with paler bill. **VOICE.** Hard, nasal “chit chit, chissie-chissie”, also “tch-tch”, also “chek-chek-chek” and variants; captured individual held in hand uttered a wheezing rattle.

Habitat. Various types of forest, once mangroves, also plantations, secondary growth, gardens, and among bananas (*Musa*) and wild gingers (*Zingiberaceae*); sea-level to 1350 m.

Food and Feeding. Insects, including butterflies (Lepidoptera) and termite alates (Isoptera); nectar, including that from mistletoes (*Loranthaceae*), *Eugenia* and *Hibiscus*. Forages mostly singly and in all storeys, often low down.

Breeding. Laying in late Apr, nestlings early Jun and dependent juvenile early May in Malay Peninsula; males with enlarged testes in Jan in N Borneo (Sabah). Nest not certainly described, apparently like a smaller version of that of *A. robusta*. Clutch 2 eggs, ovate, unglossed white, with small black dots and long fine scrawls in zone around broad end. No other information.

Movements. Nothing recorded.

Status and Conservation. Not globally threatened. Uncommon in Malay Peninsula and Borneo, and rare in Sumatra. Recently rediscovered in Singapore. Occurs in Khao Pra Bang Wildlife Sanctuary, in Thailand, and Taman Negara National Park, in Peninsular Malaysia; rare in Danum Valley Conservation Area, in Borneo.

Bibliography. Cheke & Mann (2001), Gretton (1990), Holmes (1996), Hornskov (1987), MacKinnon & Phillipps (1993), Mann (1996, 2008), van Marle & Voous (1988), Medway & Wells (1976), Robinson (1928), Robinson &

Kloss (1923), Robson (2000b), Sheldon *et al.* (2001), Smythies (1957, 1960), Smythies & Cranbrook (1981), Wells (2007).

125. Long-billed Spiderhunter

Arachnothera robusta

French: Arachnothère à long bec

Spanish: Arañero Piquilargo

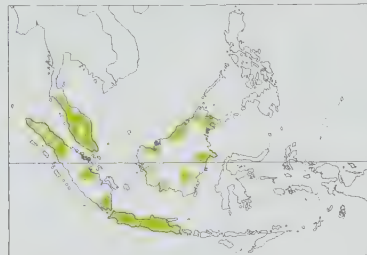
German: Langschnabel-Spinnenjäger

Taxonomy. *Arachnothera robusta* S. Müller and Schlegel, 1845. Indrapura, western Sumatra. Proposed race *uraygialis*, described from Malay Archipelago, synonymized with nominate. Two subspecies recognized.

Subspecies and Distribution.

A. r. robusta S. Müller & Schlegel, 1845 – S Thailand (from Trang, once Kaeng Krachan National Park) and Peninsular Malaysia, Sumatra and Borneo.

A. r. armata S. Müller & Schlegel, 1845 – Java.



Descriptive notes. 21–22 cm. Male has very long bill. Male nominate race is olive above, slight dark scaling on crown, remiges edged yellowish, tail blackish-brown, outer two feather pairs tipped white; dull olive-yellow below, brighter yellow on belly and undertail-coverts, streaked olive on throat and breast, orange-yellow pectoral tufts; underwing-coverts pale yellow; iris brown; bill black; legs blackish-olive. Female is similar to male but smaller, and lacks pectoral tufts. Juvenile is inadequately described, probably lacks dark crown markings and also, apparently, dark streaking. Race *armata* is much smaller than nominate.

normally with slightly different streaking pattern. **Voice.** Song a rising “choi, choi, choi, choi...”. Flight call high-pitched “chit-chit, chit-chit”; harsh “chuu-luut chuu-luut” from high perch.

Habitat. Various forest types, including dipterocarp, heath forest, peatswamp-forest and coniferous forest, also plantations, forest edge, secondary growth and gardens; sea-level to 1520 m in Malay Peninsula, to 1700 m in Sumatra and to 1000 m in Borneo.

Food and Feeding. Diet includes caterpillars and other soft insects, mantids, also spiders (Araneae); also small flowers and fruits of creepers, and nectar, including from mistletoes (Loranthaceae). Forages singly, usually in canopy. Pollinates and takes nectar from durian trees (*Durio*).

Breeding. Season Feb–Jun/Jul in Malay Peninsula; laying recorded Sept in Sumatra (Jambi) and Jan, Apr–Aug and Dec in Java; in Borneo, laying May, Jun and Dec in NW (Sarawak), nesting in Mar and active gonads in Jun in N (Sabah), and young in Sept in S (Kalimantan Tengah). Nest bottle-shaped or trough-shaped with cup at end, up to 43 cm long including entrance tunnel (c. 22.5 cm long), entrance hole 11.5 cm wide, with chamber 10 × 65 cm, made from felted grass stems and other plant materials, woven together and held against underside of banana leaf by cobweb slings, knotted on surface of leaf, or built by sewing together the edges of a banana leaf to form tube, with entrance tunnel opening towards tip of leaf (or occasionally attached to epiphyte or creeper), 2–5 m above ground. Clutch 2 eggs, matt white or faintly glossed, with zone of black spots and lines around broadest part. No other information.

Movements. No information.

Status and Conservation. Not globally threatened. Rare in Thailand and Sumatra; fairly common in Peninsular Malaysia; scarce in Borneo; locally common at sea-level in Java, but generally rare.

Bibliography. Cheke & Mann (2001), Leliebregers & Hoogerwerf (1967), Holmes (1996), Hoogerwerf (1949, 1950), MacKinnon & Phillips (1993), Mann (2008), van Marle & Voous (1988), McClure (1998), Medway & Wells (1976), Robson (2000b), Sheldon *et al.* (2001), Smythies & Davison (1999), Wells (2007), Wilkinson *et al.* (1991), Yumoto (2000).

126. Spectacled Spiderhunter

Arachnothera flavigaster

French: Arachnothère à lunettes

German: Brillenspinnenjäger

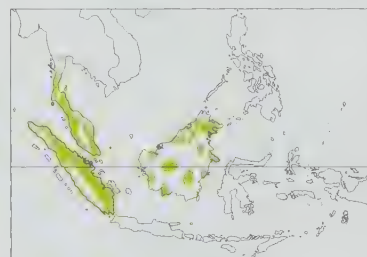
Spanish: Arañero de Anteojos

Other common names: Greater Yellow-eared/Large Spiderhunter

Taxonomy. *Anthreptes flavigaster* Eyton, 1839, “Malaya”.

Proposed race *simillima* (from Malacca, in SW Malay Peninsula) considered inseparable from birds elsewhere in species’ range. Monotypic.

Distribution. S Thailand, Peninsular Malaysia, Sumatra and Borneo.



Descriptive notes. 21–22 cm; three adult males 44.4–49 g, one female 38.4 g. Has long, thick, curved bill. Plumage is mostly olive, more greenish above, and more yellow on flanks and belly, edges of remiges brighter olive-green, with yellow or bronzy tinge; large yellow ear patch, and broad yellow eyering; iris brown; bill blackish, reddish at base of lower mandible; legs yellowish-brown. Sexes similar. Juvenile undescribed. **Voice.** High-pitched “chit-chit”; from perch or in flight an explosive “tak”, “cha-tak”, “cha-ta-tak” and variants.

Habitat. Lowland dipterocarp forest, peatswamp-forest and secondary forest, forest

edge, clearings, plantations, cultivation and gardens; often around bananas (*Musa*) and gingers (Zingiberaceae). Sea-level to 300 m, perhaps to 1100 m, in Malay Peninsula; to 1500 m in Sumatra, and to 1600 m, possibly 1800 m, in Borneo.

Food and Feeding. Insects, spiders (Araneae), pollen, fruit and nectar. Forages singly, occasionally in pairs; sometimes in small groups at fruit. Usually in middle to upper storeys of vegetation. Recorded nectar sources include, among others, coconut, *Erythrina*, *Eugenia*, *Firmiana fulgens*, *Spathodea* and *Jacaranda*. Hovers in front of flowers; probes fruits. Pollinates and takes nectar from durian trees (*Durio*).

Breeding. In Malay Peninsula, nest-building in Feb, copulation seen mid-Apr, laying calculated as Mar, Jun, Sept and Nov; laying in Apr (and birds with enlarged testes Jul–Aug) in Borneo. Nest circular or with spout, of compacted plant fibre and lined with seed pappus, one nest 90 mm wide,

77 mm deep, egg-chamber 77 mm in diameter and 50 mm deep, sewn on to underside of coconut or other palm frond by silk or placed between large rubber tree leaves sewn together, 5.5–13 m above ground. Clutch 2 eggs, almost unglossed, dull greenish-grey with dark grey to brownish flecks, markings denser at broad end. No other information.

Movements. None recorded.

Status and Conservation. Not globally threatened. Locally common to uncommon in Malay Peninsula, where has possibly increased in S; extirpated from Singapore main island. Not uncommon in Sumatra; uncommon to rare in Borneo. Possible former presence in extreme S Vietnam requires further investigation. Occurs in Taman Negara National Park, in Peninsular Malaysia; rare in Danum Valley Conservation Area, in Borneo.

Bibliography. Cheke & Mann (2001), King *et al.* (1975), MacKinnon & Phillips (1993), Mann (1996, 2008), van Marle & Voous (1988), Medway & Wells (1976), Robson (2000b, 2002a), Sheldon *et al.* (2001), Wells (2007), Yumoto (2000).

127. Yellow-eared Spiderhunter

Arachnothera chrysogenys

French: Arachnothère à joues jaunes

Spanish: Arañero Carigualdo

German: Gelbwangen-Spinnenjäger

Other common names: Lesser Yellow-eared Spiderhunter

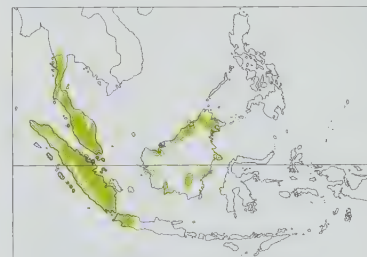
Taxonomy. *Nectarinia chrysogenys* Temminck, 1826, Bantam District, Java.

Additional proposed races are *astilpna* (described from Bokpyin, in Tenasserim), *intensiflava* (Kossoom, Tenasserim), *copha* (Tapanuli Bay, in NW Sumatra), *pleoxantha* (Mt Lembu, on Nias I) and *isoepga* (Pagai Is, off W Sumatra), all considered inseparable from nominate. Two subspecies recognized.

Subspecies and Distribution.

A. c. chrysogenys (Temminck, 1826) – Extreme S Myanmar (S Tenasserim), S Thailand, Peninsular Malaysia, Singapore, Riau and Lingga Archipelagos, Sumatra and most satellites, W Borneo and W Java.

A. c. harrissoni Deignan, 1957 – E Borneo.



Descriptive notes. 17–18 cm; 22–23.5 g. Male nominate race has head and upperparts olive-green, suffused golden on mantle, becoming brighter on rump, with large yellow cheek patch and narrow yellow filoplume eyering, much narrower on lower half; edges of remiges bright yellow or golden-bronze; throat to breast yellowish-green with indistinct greenish streaks, becoming brighter yellow on belly, lower flanks and undertail-coverts; pectoral tufts grey; iris brown; bill blackish with fleshy-pink base to lower mandible and often a long central orange to yellow line along cutting edges, becoming pale grey on gape; legs dull

fleshy-brown to pale brown. Female is similar to male but lacks pectoral tufts. Juvenile resembles adult, but lacks streaking and dark feather bases. Race *harrissoni* differs from nominate in almost completely lacking golden suffusion on mantle, which is nearly concolorous with crown, and has exposed parts of closed wing lighter and duller. **Voice.** Rough “chit”; flight call high-pitched “twit-twit-twit-tee-ee”, last note protracted.

Habitat. Various forest types, including peatswamp-forest, mangroves and secondary forest, forest edge, also plantations and gardens; sea-level to 1400 m, but to 2010 m in Peninsular Malaysia.

Food and Feeding. Insects, spiders (Araneae); nectar, pollen and small fruits. Forages singly, sometimes in pairs, and occasionally in small groups, mostly in canopy. Recorded nectar sources include gingers (Zingiberaceae), *Firmiana fulgens*, *Eugenia* and *Erythrina*, among others; pollinates and takes nectar from durian trees (*Durio*).

Breeding. Laying in Jan, Apr and May in Malay Peninsula, May–Jun in S Sumatra (Lampung) and Dec in Java; in Borneo, laying in Feb–Mar in N (Brunei) and Sept in NW (Sarawak), juveniles in Jun in S (SW Kalimantan), also birds with active gonads in May, Jul and Aug in Sabah. Nest basket-shaped, 39 × 13 cm, with or without long entrance tunnel, made from reddish-brown fibres from rotting leaf bases, with inner cup of finer material, sewn to underside of palm frond or banana leaf 1.5–20 m above ground. Clutch 2 eggs, white, ringed with fine black lines at broader end, or dirty greyish-white and flecked heavily (especially at broader end) with sepia and grey-brown. No other information.

Movements. None recorded. May cross water to and from Singapore.

Status and Conservation. Not globally threatened. Common to fairly common in S Myanmar and Malay Peninsula; rare in Singapore; local and uncommon in Sumatra; rare in Java and very scarce in Borneo. Occurs in Khao Pra Bang Wildlife Sanctuary, in Thailand, and Danum Valley Conservation Area, in Borneo.

Bibliography. Cheke & Mann (2001), Deignan (1957), Gibson-Hill (1950a), Harrison (1968b), Holmes (1996), MacKinnon & Phillips (1993), Mann (1996, 2008), van Marle & Voous (1988), Medway & Wells (1976), Mitra & Sheldon (1993), Nash & Nash (1988), Robson (1995, 1999a, 1999b, 2000a, 2000b, 2001, 2002b), Sheldon *et al.* (2001), Smythies (1957, 1960), Smythies & Cranbrook (1981), Smythies & Davison (1999), Wells (2007), Yumoto (2000).

128. Naked-faced Spiderhunter

Arachnothera clarae

French: Arachnothère à face nue

Spanish: Arañero Caricalvo

German: Nacktwangen-Spinnenjäger

Other common names: Bare-faced/Philippine Spiderhunter

Taxonomy. *Arachnothera clarae* A. W. H. Blasius, 1890, Davao, Mindanao, Philippines.

Birds on Basilan, currently included in race *malindangensis*, possibly belong to an as yet undescribed race. Four subspecies currently recognized.

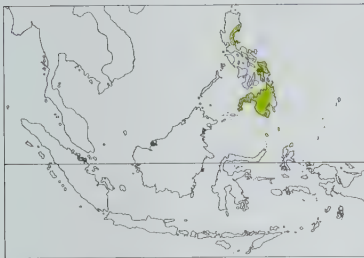
Subspecies and Distribution.

A. c. luzonensis Alcasid & Gonzales, 1968 – EC & S Luzon (Sierra Madre Mts and Mt Isarog), in N Philippine Is.

A. c. philippinensis (Steere, 1890) – Samar, Biliran and Leyte, in EC Philippines.

A. c. malindangensis Rand & Rabor, 1957 – N & W Mindanao (including Mt Malindang) and Basilan, in S Philippines.

A. c. clarae A. W. H. Blasius, 1890 – C Mindanao (Davao).



Descriptive notes. 17.2 cm; 27.5–34.8 g. Very long-billed. Nominata race has lores and area around eye dark grey, bare skin in front of eye dark grey, naked submoustachial patch pinkish; rest of head and upperparts olive-green, edges of remiges olive-yellow to golden-olive; throat to breast brownish-grey with dark feather centres (giving indistinct streaking), rest of underparts greenish, paler, more yellowish, on belly and lower flanks; no pectoral tufts; iris dark brown to black; bill blackish, yellow gape; legs yellowish-brown to dark brown. Sexes similar. Juvenile undescribed. Race *luzonensis* differs from nominate in having

burnt-orange edging of remiges, and grey breast; *philippinensis* has pink naked skin on forehead, underparts greener than nominate; *malindangensis* is lighter olive-green above, has golden edges of remiges, and olive-grey underparts (darker and duller green above and greyer, less greenish, below than preceding race). Voice. Loud, raspy “serp-rp-rp-rp-rp-rp”, repeated a varying number of times, up to 15 per minute; very high, insect-like “seee”, also low, harsh croaking “crrr”; rapid insect-like “trrrrik”; and various rapid trills, rising, falling or evenly pitched.

Habitat. Forest, forest edge and scrub and clearings, particularly around plantains (*Musa*); to 1400 m. **Food and Feeding.** No information on diet; presumably includes nectar and small arthropods. Observed singly and in pairs.

Breeding. Birds with active gonads in Jan–May. No further information.

Movements. Nothing recorded.

Status and Conservation. Not globally threatened. Uncommon.

Bibliography. Alcasid & Gonzales (1968), Cheke & Mann (2001), Dickinson *et al.* (1991), Kennedy *et al.* (2000), McGregor (1909), duPont (1971b), Rand & Rabor (1957, 1960), Ripley & Rabor (1961).

129. Grey-breasted Spiderhunter *Arachnothera modesta*

French: Arachnothère modeste **German:** Graubrust-Spinnenjäger **Spanish:** Arañero Modesto

Taxonomy. *Antheptes modesta* Eyton, 1839, Peninsular Malaysia.

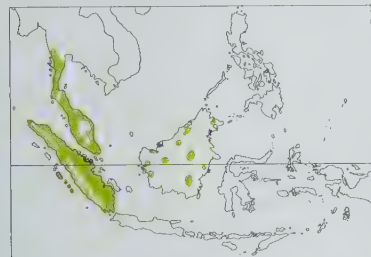
Sometimes considered to form a superspecies with *A. affinis*; the two overlap in range in Borneo, but are segregated by altitude. Present species and nominate race of latter have been treated as conspecific (with race *everetti* of *A. affinis* then treated as a separate species). Geographical variation not well marked; *caena* intergrades with nominate in S Myanmar (Tenasserim) and S Thailand and could perhaps be merged with it. Proposed race *heliophilus* (described from Loh Sidoh Bay, in NW Sumatra) considered indistinguishable from *concolor*. Three subspecies recognized.

Subspecies and Distribution.

A. m. caena Deignan, 1956 – extreme S Myanmar (S Tenasserim) and SW Thailand.

A. m. modesta (Eyton, 1839) – Malay Peninsula and Borneo.

A. m. concolor Snelleman, 1887 – Sumatra, including Mentawai Is.



Descriptive notes. 17–18 cm; male 20.5–24.9 g, female 20.1–25.5 g. Nominata race is golden olive-green above, crown with sooty-brown feather centres; remiges blackish-brown, edged yellowish-green, and tail green with blackish-brown tips, all except central feathers with white subterminal spots (visible from below) that become smaller and duller towards central tail; throat and underparts olive-grey to buffish (darker on some), chin to upper breast with variable narrow brown streaking; iris brown; longish bill medium brown to blackish-brown, paler lower mandible; legs flesh-coloured to brown. Sexes similar.

Juvenile lacks streaking. Race *caena* is paler, less streaked and more yellowish below than nominate, and has upperparts more golden or yellow-green; *concolor* is darker green above than nominate, and some are less streaked below. Voice. Song a continuous “tee-chu”, first note rising and second falling, similar to that of *A. longirostris*. Short rapid chatter.

Habitat. Dipterocarp forest, peat swamp-forest, secondary and dry coastal forests, forest edge, coastal scrub, banana (*Musa*) plantations, orchards and coconut groves; sea-level to 1200 m.

Food and Feeding. Spiders (Araneae), also insects, including crickets (Orthoptera) and ants (Formicidae); nectar. Forages singly and in pairs, in all storeys of forest, often at low to middle levels.

Breeding. Eggs recorded in late Apr and juveniles May–Aug in Peninsular Malaysia; laying in Feb in Borneo. Nest a shallow cup of wood bast placed inside layer of leaf skeletons, latter felted with cobweb to form asymmetrical basket, placed against trunk of palm or, more usually, on underside of large leaf (e.g. of banana) and attached by cobweb slings, 1.5–2.5 m above ground; one nest was supported by two leaves stapled together with twigs. Clutch 2 eggs, smooth and glossy, unevenly coloured olive-brown, with darker brown ring around broadest part; no information on incubation and nestling periods. Nests sometimes parasitized by Plaintive Cuckoo (*Cacomantis merulinus*) in Borneo.

Movements. No information.

Status and Conservation. Not globally threatened. Rare in Myanmar; common in Thailand and Malay Peninsula; common in Sumatra; uncommon in Borneo. Probably extinct in Singapore, where last confirmed record in 1940s, although reported there in 1981. Occurs in several protected areas, e.g. Khao Pra Bang Wildlife Sanctuary, in Thailand, and Taman Negara National Park, in Peninsular Malaysia.

Bibliography. Cheke & Mann (2001), Davison (2000), Gibson-Hill (1949), MacKinnon & Phillips (1993), Mann (1996, 2008), van Marle & Voous (1988), Medway & Wells (1976), Nash & Nash (1985), Robson (2000b), Smythies (1960), Smythies & Cranbrook (1981), Smythies & Davison (1999), Wells (2007).

130. Streaky-breasted Spiderhunter *Arachnothera affinis*

French: Arachnothère à poitrine grise **Spanish:** Arañero Pechiestriado
German: Strichelbrust-Spinnenjäger

Other common names: Bornean/Everett’s/Kinabalu Spiderhunter (*everetti*)

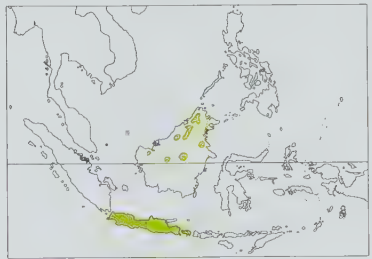
Taxonomy. *Cinnyris affinis* Horsfield, 1821, Java.

Sometimes considered to form a superspecies with *A. modesta*; the two overlap in range in Borneo, but are segregated by altitude. Nominata race of present species previously treated as conspecific with *A. modesta*; *everetti* then regarded as a separate, montane species, but evidence of occurrence of nominate as a mountain form in Java and Bali suggests that the two are conspecific, separated from lowland taxa (now combined in *A. modesta*). Proposed race *pars*, described from R Birang (N Kalimantan), in Borneo, considered to be inseparable from *everetti*. Two subspecies currently recognized.

Subspecies and Distribution.

A. a. everetti (Sharpe, 1893) – N & C Borneo.

A. a. affinis (Horsfield, 1821) – Java and Bali.



Descriptive notes. 21 cm. Nominata race is golden-green above, with dark scaling on crown; remiges and rectrices blackish-brown, edged green, central rectrices with much green (except at tips) and all except central pair with white subterminal spots (visible from below) that become smaller and duller towards central tail, tips brown; grey with slight yellow tinge below, heavily streaked brown from chin to belly, some streaking on flanks, undertail-coverts whitish with dark barring; iris hazel, chocolate-brown, dark brown or green; bill black or blackish-brown, paler lower mandible; legs flesh-coloured, pale brown or brownish-pink. Sexes similar. Juvenile differs from adult in lacking streaking below, and has more buffy subterminal tail spots. Race *everetti* is on average somewhat larger than nominate, also more green, less golden, above, lacks yellow tinge below, has ventral streaking grey-brown, darker brown tips on tail. Voice. Song “chee-wee-dee-weet...tee-ree, chee chee-chur”. Variety of piercing, ringing and raucous calls.

Habitat. Hill dipterocarp forest and lower montane forest, forest edge and around plantains (*Musa*); generally 900–1600 m, occasionally down to 305 m.

Food and Feeding. No specific information; diet presumably small arthropods and nectar. Forages singly, occasionally in pairs, mostly in higher levels of forest.

Breeding. Laying recorded in Feb and Mar in N Borneo and in Apr–May and Oct–Dec in Java. Nest (presumed of this species) a cup constructed from a bright brown silky substance from fern fronds, and plant down, and covered with small flower and plant stems stuck together with spider web, suspended by spider web from underside of large leaf. Clutch 1–2 eggs, smooth and glossy, liver-coloured with darker cap, or greenish-white or deep olive-brown and almost completely covered with dark brownish shade, with very pale (hardly visible) grey mottling largely concentrated at blunt end, forming faded cap of olive-greyish, occasionally a very few well-defined dark blackish-sepia scribbles or thread-like markings. No other information.

Movements. Nothing recorded.

Status and Conservation. Not globally threatened. Uncommon in Borneo; commoner in Java and Bali. Occurs at Poring Hot Springs, in Kinabalu Park, in Borneo.

Bibliography. Cheke & Mann (2001), Davison (2000), Hellebrekers & Hoogerwerf (1967), Hoogerwerf (1949, 1950), MacKinnon & Phillips (1993), Mann (2008), Smythies (1957, 1960), Smythies & Cranbrook (1981), Smythies & Davison (1999).

131. Streaked Spiderhunter *Arachnothera magna*

French: Grand Arachnothère **German:** Strichelspinnenjäger **Spanish:** Arañero Estriado

Taxonomy. *Cinnyris magna* Hodgson, 1836, Nepal.

Geographical variation mostly not well marked; race *pagodarum* perhaps not diagnosable and could be subsumed within *musarum*. Race *aurata* intergrades with *musarum* in S Myanmar (Karen Hills). Five subspecies recognized.

Subspecies and Distribution.

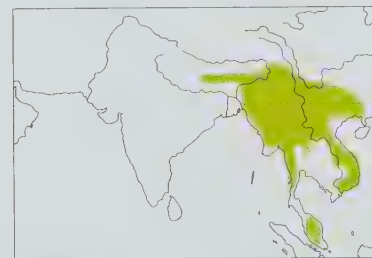
A. m. magna (Hodgson, 1836) – Nepal, Sikkim, Bhutan, E Bangladesh and NE India E to S China (SE Xizang E to W, S & SE Yunnan, SW Guizhou and W Guangxi) and N Myanmar.

A. m. aurata Blyth, 1855 – C & E Myanmar.

A. m. musarum Deignan, 1956 – SE Myanmar, N Thailand, Laos and N Vietnam (W Tonkin).

A. m. pagodarum Deignan, 1956 – W Myanmar, W Thailand and S Malay Peninsula.

A. m. remota Riley, 1940 – SC & S Vietnam.



Descriptive notes. 17–20.5 cm; male 28–34.5 g, female 23–9 g. Nominata race is golden yellowish-olive with black streaking above, tail tipped buff and with blackish subterminal band; below, very pale yellowish-white with bold black shaft streaks, undertail-coverts yellow or olive-yellow with bold blackish chevrons; iris brown; bill blackish-brown; legs chrome-yellow to orange with pale claws. Sexes similar. Juvenile is more buffy and greyish (less golden-green) above and less yellow below than adult. Race *aurata* is slightly smaller than nominate, has golden rump and uppertail-coverts, dusky olive undertail-coverts broadly tipped yellowish-white; *musarum* has less golden suffusion above than nominate, only faintly washed yellow below, ventral streaking broad and bold; *pagodarum* is duller, greener and less golden than previous, with streaking above less clear; *remota* is more green and less golden than nominate, with smaller black feather centres on head and back, deeper yellow on bend of wing and undertail-coverts, rest of underparts tend to be more yellowish. Voice. Song begins as soft “vijivitte vij”, then accelerating and becoming monotonous. Calls include sharp, metallic chirruping “chirirrik” or “chiruk, chirik”, also “chisikik” and “chee-chee-chee...”; also repeated “chittit, chittititit”; annoyance call soft “ug-ug-ug”; feeding call persistent “chip”; in flight repeated “kak-tik”, and loud musical trill.

Habitat. Various types of forest, including heavily disturbed and secondary forests, also forest edge, bamboo, scrub, thickets and gardens. In Nepal generally to 450 m, but recorded to 2135 m; in

India 600–2200 m, lower in winter; down to 500 m in N Vietnam, to 150 m in Cambodia; 800 m to at least 1890 m in Malay Peninsula.

Food and Feeding. Nectar, particularly of bananas (*Musa*); insects, and spiders (Araneae). Forages singly, sometimes in pairs; sometimes joins mixed-species parties. Forages frequently in canopy, also at lower levels. Seen to remove spiders from their webs.

Breeding. Laying recorded in Mar–Jul in India and Apr and Jul–Aug in Myanmar; nest-building late Feb, Mar and Sept, eggs and nestlings Mar and Apr and fledgling early May in Peninsular Malaysia; males with enlarged testes in Mar in Vietnam (S Annam). Nest a neat inverted dome or oblong, with one or two entrances (but no tunnel), constructed from leaf skeletons joined together with cobwebs, lined with grass and leaf skeletons, sewn by vegetable down and cobwebs to underside of broad leaf, usually of banana but also on underside of leaf of giant creeper, large ginger (Zingiberaceae), teak (*Tectona*), thorny creeper, or huge dock (*Rumex*) leaf; 0.5–2 m above ground. Clutch 2–3 eggs, brown to olive-brown, darker at broader end; no information on incubation and nestling periods. Nests parasitized by Large Hawk-cuckoo (*Cuculus sparverioideus*), Indian Cuckoo (*Cuculus micropterus*), Common Cuckoo (*Cuculus canorus*) and Asian Lesser Cuckoo (*Cuculus poliocephalus*).

Movements. Seasonal altitudinal movements in N parts of range. At least 22 birds seen moving along a ridge on a Nov morning in W Yunnan, China, and others lower down two days later. A night-flying individual, recorded once in Peninsular Malaysia, thought to be due to disturbance of a roosting bird.

Status and Conservation. Not globally threatened. Locally common in NE Indian Subcontinent, and frequent in parts of Bhutan; common in much of SE Asian range, but locally not uncommon to very rare in Myanmar; common in Malay Peninsula, locally common in S China. Occurs in several protected areas throughout range.

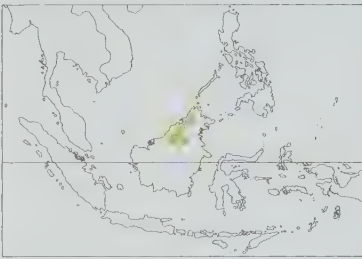
Bibliography. Ali & Ripley (1974), Birand & Pawar (2004), Cheke & Mann (2001), Étchécopar & Hüe (1983), Fleming & Traylor (1964), Fleming *et al.* (1976), Hodgson (1836), Inskipp & Inskipp (1985), Medway & Nisbet (1968), Medway & Wells (1976), Oates (1890a), Rasmussen & Anderton (2005b), Robson (2000a, 2000b), Smythies (1986), Wells (2007).

132. Whitehead’s Spiderhunter
Arachnothera juliae

French: Arachnothère de Whitehead **Spanish:** Arañero de Whitehead
German: Bergspinnenjäger

Taxonomy. *Arachnothera juliae* Sharpe, 1887, Mount Kinabalu, north Borneo. Very distinctive species with no obvious close relatives. Monotypic.

Distribution. Borneo: in Sarawak (Mt Dulit, Mt Kalulong, Mt Murud, Mt Selidang, Usun Apau Plateau, Kelabit Uplands and Mt Mulu), Sabah (Mt Kinabalu, Mt Trus Madi and Crocker Range) and Kalimantan Timur (upper R Bahau and Mt Lanjut).



Descriptive notes. Male 16.5–18 cm, female 15.5–16.5 cm. Plumage is mainly brown, crown streaked buffy white, neck and back narrowly streaked white, rump plain bright yellow; throat with small brownish-white streaks, rest of underparts broadly streaked white, except for unmarked bright orange-yellow undertail-coverts; iris brown; bill and legs black. Sexes similar. Juvenile undescribed. **VOICE.** High-pitched squeaking song. Calls include repeated loud shrieking in flight or when perched, and prolonged twittering; wheezy 2-note call, first note rising and second falling; “teeh-teeh-wee”, last note rising; “tee-tee-swee-ee”, third note rising and last falling; also “see-wee see-wee” and “swee-eee-eee”.

Habitat. Hill dipterocarp forest and montane forest, and forest edge; 930–3000 m.

Food and Feeding. Small arthropods, berries and nectar. Forages singly and in pairs, and occasionally in groups of up to five individuals; sometimes associates with mixed-species flocks. Feeds mostly in canopy, but also comes lower at forest edge; forages within foliage, especially among clumps of epiphytes on higher branches. Observed to probe rhododendron (*Rhododendron*) flowers for food.

Breeding. Active nest in canopy in Mar, and males with active testes in Jun and Nov. No other information.

Movements. Nothing recorded.

Status and Conservation. Not globally threatened. Formerly considered Near-threatened. Restricted-range species: present in Bornean Mountains EBA. Locally common. Possibly occurs on other mountains in Borneo. Present in the Rafflesia Forest Reserve, in the Crocker Range, and in Kinabalu Park (both in Sabah).

Bibliography. Babbington (1992), van Balen (1997), Cheke & Mann (2001), Collar *et al.* (1994), Davison (1992), MacKinnon & Phillips (1993), Mann (2008), Sheldon *et al.* (2001), Smythies (1957, 1960), Smythies & Cranbrook (1981).

Class AVES
Order PASSERIFORMES
Suborder OSCINES
Family MELANOCHARITIDAE
(BERRYPECKERS AND LONGBILLS)



- Small passerines, mostly rather dull-coloured, morphologically variable, two quite short-tailed and stubby-billed, three longer-tailed and with rather slender, straight bill, one with long straight bill, and four with short tail and proportionately long, decurved bill.
- 7.3–15 cm.



- New Guinea.
- Forest.
- 4 genera, 10 species, 32 taxa.
- No species threatened; none extinct since 1600.

Systematics

All of the berrypeckers and longbills are confined to New Guinea and its islands, and must presumably have originated there. They have not radiated out into adjoining areas away from the New Guinea continental plates. The members of what is currently recognized as the family Melanocharitidae have at different times been classified variously as flowerpeckers (Dicaeidae), honeyeaters (Meliphagidae) or sunbirds (Nectariniidae). Because of their morphological similarities with the flowerpeckers and the sunbirds, there were problems with their classification that lasted for more than a century. In the later decades of the twentieth century, C. G. Sibley and various co-workers were the first to reveal that the berrypeckers and longbills are, in fact, very basal within the oscine passerines, and associated with various “corvid” groups.

In two 1990 publications, Sibley and J. E. Ahlquist and Sibley and B. L. Monroe created a new family, Melanocharitidae, in which they placed six berrypeckers in the genus *Melanocharis*, together with the four longbills in the genera *Oedistoma* and *Toxorhamphus*. In the resurrected Paramythiidae they included the Crested Berrypecker (*Paramythia montium*) and the Tit Berrypecker (*Oreocharis arfaki*), these two species being known also as “painted berrypeckers”. Both families are closely allied to the sunbirds and the flowerpeckers. In his 1994–1996 CD ROM project, however, Sibley admitted that re-examination of the data obtained from DNA–DNA hybridization called into question the allocation of the Crested Berrypecker and the Tit Berrypecker and led to ongoing genetic studies, with the situation still not fully resolved at present. This is a fascinating time of massive flux within the classification of birds, as new techniques, data and discoveries continually emerge and cause earlier proposed definitions to be revised.

In their work *Phylogeny and Classification of Birds*, Sibley and Ahlquist divided the oscines into two monophyletic clades, to which they applied the respective names “parvorder Corvida” and “parvorder Passerida”. DNA–DNA hybridization, however, is a rather coarse and imprecise phylogenetic method in comparison with the newer one of DNA-sequencing, which has revealed that these authors’ Corvida is, in fact, paraphyletic. Although the monophyly of Passerida has been basically corroborated, F. K. Barker and colleagues, in 2002, showed that Corvida was not a clade as such but, rather, a grade, and that Corvida as a taxonomic group does not really exist. Three more

clades form a polytomy with Corvoidea and Passerida: these are the New Zealand wattlebirds (Callaeidae), the cnemophiline satinbirds, and the Melanocharitidae. Current research holds that berrypeckers, satinbirds and wattlebirds are closely related at the base of the “core Corvoidea”, all being sister to the Passerida, but the precise relationships remain unclear, as the results differ depending on which genes have been studied.

Barker and colleagues reconstructed the “parvorder Corvida” as a basal paraphyletic grade within the oscine passerines and found strong evidence that several family-level taxa, including Alaudidae, Irenidae and Melanocharitidae, were misplaced in the hybridization results. They postulate that the oscine passerines arose on the Australian continental plate while it was isolated by oceanic barriers, and that a major northern radiation of oscines, the “parvorder Passerida”, originated following dispersal from the south.

Berrypeckers and the two satinbird genera *Cnemophilus* and *Loboparadisea*, the last two classified as birds-of-paradise (Paradisaeidae) but perhaps better separated as the family Cnemophilidae, have sometimes been grouped with the ancient New Zealand wattlebirds. The association of one of the wattlebirds, the Saddleback (*Philesturnus carunculatus*), with the berrypeckers and the cnemophilines, however, received low statistical support, and the systematic position of the wattlebirds is currently best regarded as unresolved.

Earlier, in 1993, L. Christidis and colleagues had investigated the affinities of the aberrant genera *Toxorhamphus*, *Oedistoma*, *Timeliopsis* and *Epthianura*, all conventionally associated with the honeyeaters in the family Meliphagidae. The analyses corroborated results obtained in studies using DNA–DNA hybridization, which suggested that *Toxorhamphus* and *Oedistoma* are not honeyeaters but are, in fact, related to the *Melanocharis* berrypeckers and the *Dicaeum* flowerpeckers. The Dwarf Longbill (*Oedistoma iliolophus*) was found to be more closely allied to *Melanocharis* than to *Toxorhamphus*, which is consistent with its generic separation from the latter, and contrary to groupings interpreted from DNA–DNA hybridization data. *Timeliopsis* was identified as a typical honeyeater, despite the atypical form of its tongue. The genus *Epthianura* was likewise aligned with the honeyeaters but, contrary to analysis by means of DNA–DNA hybridization, only as a sister-group of the core honeyeater assemblage.

Recognition of the genus *Oedistoma* has not been universal, and many authors list all four longbill species in *Toxorhamphus*,

As currently composed, *Melanocharitidae* contains ten species divided into four genera. Given the phenotypic diversity within the family, however, it is likely to be subdivided in future revisions. Even the genus *Melanocharis* itself, containing five species, may be split into two groups. One of these contains two small, fairly short-tailed and stubby-billed species, including the **Black Berrypecker**. The male of this species, pictured here, is indeed largely black with white pectoral tufts. These are sometimes hidden under the wing, but can be revealed as two conspicuous spots, presumably with an important signal function.

[*Melanocharis nigra*
unicolor,
near Brown River,
SE New Guinea.

Photo: Brian J. Coates]



notwithstanding the facts that the former was described almost 40 years before *Toxorhamphus*, and that the Pygmy Longbill (*Oedistoma pygmaeum*) has long been recognized as being significantly different from the others. Furthermore, although currently placed in the same genus, the two *Oedistoma* longbills are very different from each other, with rather distinct foraging methods (see Food and Feeding), and they may well be better separated generically.

The Spotted Berrypecker (*Rhamphocharis crassirostris*) is placed in a monotypic genus, but this is sometimes merged with *Melanocharis*. This species, however, exhibits striking morphological and plumage distinctions and some behavioural traits which make this merger seem premature, especially as details of its breeding biology are unknown and its vocalizations poorly known. Genetic information is currently lacking.

It seems probable that the family Melanocharitidae as currently defined is polyphyletic. Such diverse groupings as are presently included within it are likely to have quite distinct evolutionary histories, despite the fact that they are at present united in one family. The longbills, in particular, appear very distinct and would repay further study, as would the poorly known Spotted Berrypecker. In the near future, as the results of further research are published and the evolutionary history of the various species becomes better known, it may be expected that the species composition of the family and its genus-level constituents will change.

What seems likely to be a new taxon belonging to this family has recently been discovered, evidently by accident. Since 1985, a specimen from the Eastern Highlands of New Guinea, and bearing superficial similarities to a longbill, had been contained in a jar of pickled *Toxorhamphus* and *Oedistoma* specimens, where it remained unnoticed. It was only after molecular analyses of the jar's contents had been carried out that it became clear that the specimen in question was different from the others. It appears to exhibit some morphological differences, too. Further information on this unexpected discovery will be published in due course.

Morphological Aspects

As currently constituted, the family comprises ten very diverse species divided among four genera, which reflect differences in morphology and feeding habits. The five primarily frugivorous *Melanocharis* can be further divided into two small, quite short-

tailed and stubby-billed species and three longer-tailed ones. The first two, the Black (*Melanocharis nigra*) and Obscure Berrypeckers (*Melanocharis arfakiana*), can be separated by the colour of the pectoral tufts, which are white in the case of the former and yellow in the latter. These tufts are usually quite conspicuous in the field, where they may serve some kind of visual signal function; they also suggest a curious convergence with the pectoral tufts of sunbirds and flowerpeckers.

The three longer-tailed *Melanocharis* are the Fan-tailed (*Melanocharis versteri*), Mid-mountain (*Melanocharis longicauda*) and Streaked Berrypeckers (*Melanocharis striativentris*), all of which have varying amounts of white in the tail. This white ranges from being almost totally concealed, as is so with the



Three species of *Melanocharis* berrypecker form a distinct group because of their relatively long tails. Males in two of these taxa are basically glossy black above and sooty grey below. Pectoral tuft colour provides a useful clue to species identification in this duo, those of the **Mid-mountain Berrypecker** being pale yellow. Another distinctive trait is the extent of white in the tail, which in this case is mainly confined to the outer rectrices. Like the pectoral tufts, white tail flashes probably function as signals in the dark forest understorey.

[*Melanocharis longicauda*
capitata,
Ubaigubi,
EC New Guinea.
Photo: William S. Peckover]



A fifth member of *Melanocharis*, the **Streaked Berrypecker**, differs from other members of the long-tailed trio because it is sexually monomorphic. The male is a non-descript brown bird, just like the female. The white tail patch is reduced and almost entirely concealed, as is the pale pectoral tuft. An absence of distinctive features would render this species easily overlooked, were it not for a tell-tale buff eyering and a streaked impression imparted by the whitish or yellowish edging to the ventral plumage. The bills of long-tailed *Melanocharis* berrypeckers are rather slender, straight and dark, although that of the Streaked Berrypecker has a yellowish gape line, even in the male.

[*Melanocharis striativentris striativentris*, Ubaigubi, EC New Guinea. Photo: William S. Peckover]

Streaked Berrypecker, to being very obvious, as on the male Fan-tailed Berrypecker, and it may, again, have some signal function in the dimly lit forest undergrowth. All three species have a rather slender, straight dark bill. As with the two short-tailed members of the genus, the pectoral tufts can be used as a means of distinguishing the Mid-mountain Berrypecker, on which they are pale yellow, from the really quite similar Fan-tailed Berrypecker, which has white or yellowish-white tufts. Two subspecies of the Black Berrypecker, the nominate race and *pallida*, are also similar to the Mid-mountain Berrypecker in both male and female plumages, but they are much shorter-tailed.

Among passerines, the Fan-tailed and Streaked Berrypeckers are unusual in that the female is larger than the male in both length and weight. Females of these two species weigh 16–20 g, as opposed to 12–15 g for males, although the males appear longer-tailed. The females of all five *Melanocharis* are nondescript in plumage and not particularly distinctive, with colour combinations of drab olive, grey and yellowish. The Streaked Berrypecker lacks a distinct male plumage, both sexes being female-like. Otherwise, the males are basically dark and glossy above and greyish below, characters shared to some extent by the male Spotted Berrypecker and which may have led to its being placed by some authors in the genus *Melanocharis*. Male Fan-tailed Berrypeckers have a marked bright bluish iridescence on the crown and shoulders, which can be very striking when seen in sunlight. The male Mid-mountain Berrypecker also has a bluish gloss on the crown and mantle, but this seems much less vividly iridescent than is the case with its congener.

Although sometimes united with the other berrypeckers in the genus *Melanocharis*, the Spotted Berrypecker is somewhat different from them. Its noticeably long straight bill and the striking spotted plumage of the female and immature are very distinctive, as are some of its foraging habits (see Food and Feeding).

With the long decurved bill a most striking feature, the four longbills comprise a morphologically very distinct subgroup, for many years classified with the honeyeaters (see Systematics).

They forage for arthropods, and feed extensively from flowers, with nectar a significant part of their diet. In terms of bill structure and habits, they seem to exhibit a convergence with such other families as the honeyeaters and the sunbirds. All four longbills are similar in plumage to female *Melanocharis* berrypeckers, having olive, yellow and grey colours, but they are somewhat brighter yellow than are the latter.

Habitat

All members of this family are endemic New Guinea forest-dwellers. They range from the lowlands up to the tree-line. The Black Berrypecker and the Yellow-bellied Longbill (*Toxorhamphus novaeguineae*) occur on some of the West Papuan Islands and in the Aru Islands, as well as on the Geelvink Bay island of Yapen. The Dwarf Longbill is likewise found on Yapen, and is present also in the D'Entrecasteaux Archipelago, where it lives on the islands of Normanby, Fergusson and Goodenough, with the Pygmy Longbill present on the last two and also on Waigeo and Misool, in the West Papuan Islands.

Berrypeckers and longbills utilize most types of forest, ranging from riparian forest in the lowlands to monsoon forest, hill forest, vine thickets, and the various types of montane forest, avoiding only the open eucalypt (*Eucalyptus*) savanna habitats of the Trans-Fly. One species, the Fan-tailed Berrypecker, will even visit tree-fern savanna at very high altitudes. They occur along the edges of forest, as well as in the interior, and most species seem to tolerate some degree of disturbance, so long as good forest remains nearby. Although they sometimes forage out into clearings and may visit native gardens, large-scale logging, an increasing problem in New Guinea, would be disastrous for them.

One interesting example of the possible use of distinctly different habitat strata by the two sexes of the Black Berrypecker was noted by H. L. Bell. In his studies at Brown River, near Port Moresby, Bell recorded that males of this species ascended higher



The **Fan-tailed Berrypecker** is unusual for a passerine in that the female is longer and heavier than the male.

In terms of plumage, however, the direction of sexual dimorphism is normal for the genus *Melanocharis*, with smartly clad black-and-grey males easily distinguished from drab greenish females.

Both sexes have a conspicuous fan-shaped tail with large flashes of white. This overall pattern often leads to this species being misidentified as the almost mythical Papuan Whipbird (*Androphobus viridis*), especially when birds are foraging on the ground, or moving low through dark understorey.

[*Melanocharis versteri virago*,
Huon Peninsula,
NE New Guinea.
Photos: William S.
Peckover]



Sometimes placed in the genus *Melanocharis*, the **Spotted Berrypecker** is unique in several respects. The distinctively speckled plumage of females and immatures, shown here, is not found in any other member of the family. The rather long and straightish bill is also unusual, as is the habit of foraging in groups of up to 12 individuals at flowering trees. These divergent traits, along with the paucity of information about its song and breeding biology, suggest that the Spotted Berrypecker should probably be retained in a monotypic genus until its taxonomic relationships are clarified.

[*Rhamphocharis crassirostris piperata*, Saruwaged Range, Huon Peninsula, New Guinea. Photo: William S. Peckover/VIREO]

into the canopy than did females. A similar situation may apply also to this species' congeners, but this requires further investigation. Indeed, the ecological mechanisms of niche-partitioning in the genus *Melanocharis* offer a fruitful field of study.

Melanocharitid species that occur in the lowlands are the Yellow-bellied Longbill, the Pygmy and Dwarf Longbills and the Black Berrypecker. There is a guild of avian species that inhabit hill forest grading into lower montane formations, from about 600 m to 1900 m, and this includes the Obscure Berrypecker, which ascends to 1100 m, and the Mid-mountain Berrypecker, Streaked Berrypecker and Slaty-chinned Longbill (*Toxorhamphus poliopterus*), the Dwarf and Pygmy Longbills and the Black Berrypecker also ranging up into the lower hills. The higher-altitude species are the Spotted and Mid-mountain Berrypeckers, with the Fan-tailed Berrypecker at the highest elevations of all, up to the tree-line at about 3680 m.

General Habits

The *Melanocharis* berrypeckers tend to be fairly active but unobtrusive inhabitants of the lower and middle levels of the New Guinea forests, where they forage in trees, shrubs and vines for, primarily, small fruits (see Food and Feeding). They move rapidly from one feeding place to another, and seem to associate loosely with mixed-species flocks, rather than being core members of these. Some species have been reported in small groups of three or four individuals, presumably family parties. The Obscure Berrypecker is a more arboreal member of the family, resembling a flowerpecker in its habits, but male Black Berrypeckers, too, do ascend into the canopy of flowering trees, as does the Spotted Berrypecker, which has an unusually long bill and a slightly more honeyeater-like feeding strategy. The two small *Melanocharis* species, namely the Obscure and Black Berrypeckers, could be mistaken for flowerpeckers, while the Fan-tailed Berrypecker, especially if foraging low in the understorey or on the ground, is sometimes misidentified as the rare and almost unknown Papuan Whipbird (*Androphobus viridis*).

Longbills are rather different from the berrypeckers in their behaviour. The two *Toxorhamphus* species spend much of their time in feeding from flowers and are much more nectarivorous

and insectivorous than are berrypeckers, having an almost sunbird-like role within the forest and replacing each other altitudinally. The other two longbills, in the genus *Oedistoma*, are segregated clearly by habitat and feeding niche, the Dwarf Longbill in the understorey and middle levels and the Pygmy Longbill mainly in the upper levels to the canopy.

Relatively little else is known of the behaviour of the members of this family. Drinking and bathing have been reported for the Black Berrypecker, but neither activity has as yet been confirmed for any of the other berrypeckers or for the longbills. The Dwarf Longbill has been observed at forest pools, but it is uncertain whether it was drinking, bathing or, perhaps, merely foraging.

It may be that the diet of these birds provides sufficient in terms of the daily water requirements. The roosting behaviour remains unrecorded for all the species.

Melanocharitids appear to be primarily sedentary, with some suggestion of local movements or wandering recorded for the Mid-mountain Berrypecker and, perhaps, the Yellow-bellied Longbill. The degree of territoriality is little known.

Voice

None of the berrypeckers and longbills is remarkable for the beauty of its vocalizations, but most are quite poorly known and much remains to be learned about them. The berrypeckers are, on the whole, not particularly vocal birds. They do sing, but whether or not the females, as well as the males, do so is uncertain. The Obscure, Black and Mid-mountain Berrypeckers utter a similar but specifically distinct high-pitched rapid swizzling series, and their vocalizations may be related to the holding of breeding or feeding territories, as they are noted as singing from the same site over protracted periods of time. Moreover, Black and Obscure Berrypeckers respond well to playback of taped recordings, which again suggests territoriality. The Black Berrypecker is the best-known member of the family and seems to have several song types, with some degree of variation according to locality and/or subspecies. One of its calls is similar to that of the Green-backed Gerygone (*Gerygone chloronota*).

Apart from berrypeckers, the family Melanocharitidae contains four species of longbill. Their plumage is generally dull olive, in common with females of several berrypeckers, but their decurved bills are highly distinctive. Two common longbill species are placed in the genus *Oedistoma*. They are ecologically segregated by habitat, with the **Dwarf Longbill** occurring in the lower and middle storeys of evergreen forest. Although this is one of the most abundant of New Guinea passerines, the only vocalizations reported are scolds and flight calls. Indeed, the apparent lack of territorial song in both *Oedistoma* species suggests that they may be only weakly territorial.

[*Oedistoma iliolophus flavum*,
near Brown River,
SE New Guinea.
Photo: Brian J. Coates]



The voices of the Black and Mid-mountain Berrypeckers are sibilant and rather buzzy, and are similar in quality but again specifically distinct. One song of the former is a “whit-ee-chee whit-ee-chee whit-ee-chee” series, which may rise in volume after a quiet start. This species also emits a wheezy drawn-out note, which is often given in flight and closely resembles the call of the Variable Dwarf-kingfisher (*Ceyx lepidus*). A rather striking feature of the family is that many of its members have voices that are similar to those of other, unrelated species such as the aforementioned kingfisher, the Garnet Robin (*Eugerygone rubra*), gerygones, honeyeaters and jewel-babblers (*Ptilorrhoa*), or in some cases resemble those of the more closely related flowerpeckers. Mimicry, however, has not been noted for any of the family, despite the oddly plastic nature of some songs and calls, which resemble those of other species but seemingly without being copies.

Of the remaining two *Melanocharis* species, the Fan-tailed Berrypecker appears to have a somewhat different voice. One of its calls has been likened to the high-pitched call of a jewel-babbler, and a song of one of its subspecies is reminiscent of the reeling song of the Garnet Robin. In general, however, this species remains poorly known. Even less is known about the Streaked Berrypecker, but it is said to have a scratchy trisyllabic series, harsher than that of its congeners, and a distinctive loud “seep” call repeated every few seconds. Although in a different genus, the Spotted Berrypecker reportedly has a voice similar to that of the *Melanocharis* group, albeit rather insect-like, and with one call resembling that of the Red-collared Myzomela (*Myzomela rosenbergii*). It is not known what significance the calls of these three species may have with regard to the possible maintenance of feeding or breeding territories.

Compared with the berrypeckers, the four longbill species are much more vocal. The two *Toxorhamphus* longbills have distinct and frequently given songs, which may well play a part in territorial maintenance and advertising. They respond well to playback, too, which supports this notion. The songs of this species pair are quite similar to one another but specifically distinct, and are characteristic sounds of the New Guinea forests, where these birds are heard far more often than they are seen. The two species are similar also in the buzzy, rather flowerpecker-like notes that they utter. In addition, the Slaty-chinned Longbill has a song

not unlike one of the songs delivered by the Scrub White-eared Honeyeater (*Meliphaga albonotata*).

Finally, in the genus *Oedistoma*, the Dwarf Longbill is unusual in that it appears not to have any song as such, giving only scolding anxious-sounding “twik” notes and a sharp, dry flight call. It is one of the commonest birds of lowland and hill forests in New Guinea, and it seems strange that no song has yet been noted for it. This situation would repay further study. It may be that the Dwarf Longbill’s song has simply been overlooked or be very similar to that of another species, and, as the longbill is so active, it is hard to watch it for very long. The same applies to its congener, the Pygmy Longbill, another common species of lowland

Once treated as meliphagid honeyeaters, longbills also superficially resemble some spiderhunters or sunbirds (Nectariniidae). They are very distinct both in terms of morphology and behaviour, and it is possible that they warrant separation at the family level. Unlike their relatives in *Oedistoma*, the *Toxorhamphus* longbills have loud songs which are amongst the most familiar and distinctive sounds of New Guinea forests. For this reason, the **Yellow-bellied Longbill** is heard far more often than it is seen, and is suspected to be strongly territorial.

[*Toxorhamphus novaeguineae*
novaeguineae,
Prince Alexander Mts,
N New Guinea.

Photo: William S. Peckover]





The **Slaty-chinned Longbill** forms a species pair with the Yellow-bellied Longbill (*Toxorhamphus novaeguineae*). It is generally restricted to the montane zone, ascending in forested regions just as far as the lower boundary of mossy elfin forest, which it tends to avoid. It occurs down to around 1000 m, but can be found much lower where the Yellow-bellied Longbill is absent, as around Port Moresby. Indeed, these taxa often replace each other altitudinally with only limited overlap, a distributional pattern suggestive of competitive exclusion between ecologically similar species.

[*Toxorhamphus poliopterus poliopterus*, Heroana, EC New Guinea. Photo: William S. Peckover]

and hill forests. Likewise, no vocalization yet reported for this melanocharitid qualifies as a song; the only utterances reported are quiet musical chattering and a constant quiet clicking "chit chit" series, which seems to be a contact note for the flocks. It is perhaps possible, therefore, that the two *Oedistoma* species do not sing as such.

Food and Feeding

The berrypeckers are aptly named. Although detailed dietary studies are as yet lacking for the Melanocharitidae, it is evident that berries and small fruits form a significant proportion of their food. Arthropods are also important items in the diet, these being obtained mainly by gleaning from foliage. Some members of the family, such as the Black and Obscure Berrypeckers and the longbills, also use hovering as a means of capturing arthropods, and Black Berrypeckers have been seen to take spiders (Araneae) and trapped insects from spider webs.

Although generally foraging solitarily or as pairs, the *Melanocharis* berrypeckers may occasionally join mixed-species flocks. They seem rarely, however, to be an integral part of such feeding parties, keeping somewhat on the periphery. They are very active birds, seldom perching for long unless feeding on berries. Nevertheless, the Obscure Berrypecker has been observed as sitting motionless, perched up in the middle stratum of the forest, in the manner of a flycatcher of the petroicid genus *Microeca*. This species' feeding habits, involving much arboreal foraging, seem perhaps more akin to those of the flowerpeckers than to those of the rest of the Melanocharitidae.

Quite how the Mid-mountain Berrypecker is ecologically segregated from the Black Berrypecker or the Fan-tailed Berrypecker where it overlaps with either of these congeners is uncertain, although in general they seem to be largely separated by altitude. In addition, the Fan-tailed Berrypecker is quite regularly observed to forage very low down or on the ground, far more so than are any of its congeners, which seem rarely to descend that low. It is possible that the somewhat patchily distrib-

uted Mid-mountain Berrypecker is competitively excluded from some sites by the sympatric Streaked and Fan-tailed Berrypeckers, but again the details of niche-partitioning are almost unknown.

Field studies have suggested that the sexes of the Black Berrypecker may differ somewhat in their preferred foraging methods, the males often ascending into the canopy to exploit fruiting or flowering trees and the females keeping more to the middle storey and lower levels of the forest. This apparent difference in foraging habits may apply also to the other two *Melanocharis* species that exhibit distinct sexual plumage dimorphism, the Fan-tailed and Mid-mountain Berrypeckers, but it is poorly known and requires further investigation.

The Spotted Berrypecker, in the monotypic genus *Rhamphocharis*, is unusual within the family in being the only species reported to form flocks, up to twelve individuals having been noted together at flowering trees. Whether nectar is a feature of its diet or whether it is attracted instead by insects that gather at the flowering trees is not known. The diet of this melanocharitid seems to consist of berries and small fruits, such as figs (*Ficus*), and arthropods, but it is a poorly known species, rather honeyeater-like in its habits and with an unusually long straight bill. Further study of its behaviour could prove enlightening.

The two *Toxorhamphus* longbills form a neat species pair, replacing each other altitudinally, but they have similar feeding strategies, moving continually and sometimes joining mixed-species feeding flocks with monarch-flycatchers (Monarchidae) and gerygones. It is likely that competition between them has an influence on whether or not they are present at a given place, the Slaty-chinned Longbill occurring at much lower levels than normal when the Yellow-bellied Longbill is absent. The former species comes down to about 300 m in the hinterland of Port Moresby, where the latter is absent, but hill or montane forest is a preferred habitat over much of the range and may determine altitudinal limits elsewhere. Both species are insectivorous and also nectarivorous, as the shape of the bill would suggest, although details of the diet are poorly known. They occupy a rather sunbird-type niche within the forest, with forest-interior inhabitants of the family Nectariniidae being absent in New Guinea.



Berrypeckers and longbills inhabit the lower and middle strata of New Guinea forests, moving restlessly, rarely staying long in one location, and often associating only loosely with multi-species foraging parties. Partly because of their unobtrusive nature, very little is known about their behaviour and ecology. Their roosting, bathing and breeding behaviour is almost unknown, their seasonal or altitudinal movements are obscure, and even the extent to which they defend territories is unclear. To date, the only species which has been reported drinking and bathing is the **Black Berrypecker** (a female is pictured here). It is likely that similar activity will be reported in other species of berrypecker and longbill.

[*Melanocharis nigra unicolor*,
near Brown River,
SE New Guinea.
Photos: Brian J. Coates]

Although currently treated in the same genus, the two *Oedistoma* longbills are very different from each other in several respects, including foraging methods. The Dwarf Longbill is a very active forager in the understorey and shrub layer, also occupying, as do the two *Toxorhamphus* longbills, a niche approximating to that of a forest sunbird; it is frequently seen to probe at flowers of trees, shrubs, vines and gingers (Zingiberaceae), presumably taking nectar. It will also take arthropods by gleaning and hover-gleaning, and it has, in common with the Black Berrypecker, been seen to raid spider webs. It will sometimes associate loosely with mixed-species feeding flocks, but its very active behaviour seems to preclude it from spending much time at any one site. The Dwarf Longbill has been recorded at forest pools, but it is not known whether it was foraging at this level.

Conversely, the Pygmy Longbill is a much more arboreal species, keeping in the middle and canopy layers and rarely descending lower. It is thus largely segregated by foraging height from its congener and from the *Toxorhamphus* species. The rather short but decurved bill suggests that nectar is a significant part of its diet, and it is often seen to feed from flowers in the canopy. In addition, it takes arthropods by gleaning and while hovering, but the dietary details are largely unknown. The Pygmy Longbill is often seen in small groups of from four to, sometimes, as many as ten individuals. It occurs at flowering trees with other nectarivorous species, such as honeyeaters and lorikeets (Psittacidae), and sometimes joins mixed foraging flocks with Black-fronted White-eyes (*Zosterops minor*), Hooded Pitohuis (*Pitohui dichrous*) and Green-backed Gerygones.

Breeding

Breeding records for the Melanocharitidae are extremely few, this aspect of the life of these species being either very little known or virtually unknown. Very little information is available on nests and clutch size, and there are no data on fledging and incubation periods. The extent to which the members of this family are territorial during nesting is uncertain, but their vocalizations (see Voice) do suggest clearly that some species, at least, maintain breeding territories.

Nests have been found more or less throughout the year, with no distinct temporal pattern, and with records from both wet and dry seasons, as is typical of many tropical passerines. It may well be the case that the female alone constructs the nest, although this has been noted so far only for the Black Berrypecker. Both sexes of this species feed the young, but such details are lacking for the rest of the family. Both the Streaked Berrypecker and the Black Berrypecker are known to lay two eggs; nests containing single eggs, as reported for Fan-tailed and Black Berrypeckers, may well represent incomplete clutches. It is not known whether these species are single-brooded or multiple-brooded.

The few berrypecker nests found have been cup-shaped and bound to branches or vines. Fern stems and fronds are important construction materials for Black, Fan-tailed and Streaked Berrypeckers, all of which also decorate the outside of the nest with patches of pale greenish lichen. These pale patches perhaps have a camouflaging function, helping to reflect light and break up the outline of the nest, even if there are no lichens on the branch itself. The Mid-mountain Berrypecker is reported to build a high-sided cup-shaped nest slightly constricted at the top and quite large for the size of the bird, but the eggs of this species are unknown. This berrypecker has been noted as nesting in January, and a female was in breeding condition in September.

Nothing is known of the breeding behaviour of the Spotted Berrypecker except for the fact that a juvenile was found in September. Similarly, the Obscure Berrypecker is virtually unknown, although there are now two records of what are likely to be juvenile-plumaged individuals in July and October.

The Yellow-bellied Longbill is one of the characteristic and commonest members of the avifauna of lowland rainforest, yet its nesting habits are essentially undescribed. Its more montane congener, the Slaty-chinned Longbill, makes a cup-shaped nest similar to that of the berrypeckers, bound with spider web, decorated with spider egg sacs, and lined with plant down. Nests of the latter



The berrypeckers are aptly named, as small fruits are an important component of their diet. The **Fan-tailed Berrypecker**, for example, often plucks berries directly from fruiting shrubs and trees, either while perched or when hovering. It usually forages in the lower or middle storeys of forest, but will ascend to the canopy when fruits are present. It has also been noted gleaning arthropods from foliage, often close to the ground. Indeed, behavioural observations suggest that this species, and most other berrypeckers, regularly consume insects.

[*Melanocharis versteri*,
W New Guinea.
Photo: Morten Strange]

species are noted from the late wet season to the early dry season, varying with local conditions. They have reportedly contained a single egg, though this may represent an incomplete clutch.

One of the commonest of New Guinea's hill-forest birds is the Dwarf Longbill, yet the only nest of which details are available is from Fergusson Island, as long ago as 1896. This, too, was cup-shaped, made of dried grass and lined with soft vegetable silk, and it held a single egg. The Pygmy Longbill, another common bird of the lowland and hill forests, is even less known, and its nest has not yet been described.

Thus, the breeding biology of two of the four longbills is still largely unknown, and that of the other two is very little known. This represents a major gap in knowledge of the family, and efforts to elucidate these aspects of the two genera concerned, *Oedistoma* and *Toxorhamphus*, could be invaluable in helping to resolve the systematic position of all four species.

Accurate data on the longevity of the family's members are, predictably, extremely few. Ringing studies have revealed that a Black Berrypecker lived for longer than 6 years and 6 months, but no comparable information exists for the remaining nine species.

Movements

Melanocharitids appear to be primarily sedentary, with some suggestion of local movements or wandering recorded for the Mid-mountain Berrypecker and, perhaps, the Yellow-bellied Longbill. There is a need for some long-term ringing studies as a means of shedding light on this poorly known phenomenon.

Living in the rich environment of the tropical rainforests of New Guinea, these birds have no need for migration, or even much in the way of local movements if the food resources are as plentiful as they usually are for the Melanocharitidae. Berrypeckers and longbills, whether they are lowland, middle-altitude or highland species, appear to stick to their regular patches, with very little reported in the way of dispersal. The Spotted Berrypecker occasionally gathers in small flocks at flowering trees, which could indicate some sort of nomadism linked with the fruiting or flowering of trees, but such observations are at present rather few and incidental in nature. An immature Mid-mountain Berrypecker is known to have wandered down to the lowlands of Central Province, suggesting that dispersal may occur at times. Both this species and the Black Berrypecker are very occasionally reported at about 750 m near Tabubil, in Western Province, in an area in which they are not usually seen; these are unobtrusive birds, however,



In comparison with berrypeckers, the longbills tend to consume less fruit but more nectar and insects.

The *Toxorhamphus* species have an ecological niche more akin to sunbirds (*Nectariniidae*), which are absent from the forests of New Guinea.

The **Slaty-chinned Longbill**, for example, regularly probes the flowers of trees, vines and shrubs, including gingers (*Zingiberaceae*), presumably in search of nectar. It will also take arthropods by gleaning and hover-gleaning, occasionally stealing items from spiders' webs.

[*Toxorhamphus poliopterus poliopterus*,
Ubaigubi,
EC New Guinea.
Photo: William S. Peckover]



The breeding behaviour of berrypeckers and longbills is very poorly known, as only a few relevant observations have been reported. Sketchy details are known for the *Melanocharis* berrypeckers, including the **Fan-tailed Berrypecker**. Their nests are cup-shaped structures bound to a vine, placed in an upright fork or balanced on top of a branch. They are typically built with fine plant fibres, fern fronds and moss, and bound and strengthened with the silk of spiders' webs. Exterior walls are usually decorated with fragments of pale green lichen, presumably as camouflage. It is thought that only the female constructs the nest and incubates, but that both sexes feed the young. Further observations are required to confirm this hypothesis. Another focus for future research is the breeding behaviour of the *Oedistoma* and *Toxorhamphus* longbills, about which almost nothing is known. Some details about nest architecture in this group may help to elucidate their taxonomic relationships.

[*Melanocharis versteri*
virago,
Tari Gap, New Guinea.
Photo: Clifford &
Dawn Frith]

Very little is known about the basic breeding biology of berrypeckers and longbills. In particular, no data are available for fledging and incubation periods in any member of the family, nor is it known whether they are single-brooded or multiple-brooded. On the basis of very few reports, the typical clutch size appears to be two eggs. Previous observations of nests containing one egg may represent incomplete clutches, but it seems likely that single-egg clutches do occur, as this photograph of a hatching Fan-tailed Berrypecker attests.

[*Melanocharis versteri*
virago,
Tari Gap, New Guinea.
Photo: Clifford &
Dawn Frith]



and this apparent absence of records could simply be a reflection of lack of observer coverage.

Mid-mountain Berrypeckers are reported as being absent sometimes from areas where they normally occur, suggesting that some kind of local nomadism may be involved, but details are few and the species is secretive and easily overlooked. As with the two berrypeckers mentioned in the preceding paragraph, Yellow-bellied Longbills have been seen at about 750 m near Tabubil, in an area where they are not usually found, again raising the prospect of sporadic local wandering. The phenomenon is largely unknown and hitherto little reported, and it certainly merits further study. It may well be that some local movements do occur at times, perhaps associated with weather conditions such as drought or prolonged heavy rain, or there could be some kind of altitudinal or age-related dispersal. Only longer-term ringing studies are likely to provide much-needed information on this poorly understood aspect of berrypecker biology.

Relationship with Man

The berrypeckers and longbills do not figure much in the lives of the people of New Guinea, beyond the occasional snaring or catapulting of one for later consumption as food. Their dull plumages and small size mean that they are not suited for *bilas*, personal adornments, which are still important in some areas and have an adverse effect on some of the larger, showier species such as parrots (Psittacidae) and birds-of-paradise.

Since the taxonomic status of the berrypeckers and longbills was elevated to that of family rank (see Systematics), a recent development has been a rise in their "significance profile" for visiting birdwatchers. Many of these are anxious to add to their lists of collective bird families observed, and the Melanocharitidae, along with the other endemic New Guinea families the Paramythiidae and – often treated as a family – the Cnemophilidae, are now an important part of their birding agenda.

The mysterious Obscure Berrypecker, until recently one of the least-known birds in the world, has also been the subject of several articles in popular magazines. These have detailed the circumstances of its original collection, its apparent disappearance for more than 50 years during the middle of the twentieth century, and its subsequent rediscovery in the late 1970s.

The family is also something of a challenge for avian taxonomists. As mentioned earlier (see Systematics), some of the

species have been assigned to various families over the years, and there is continuing uncertainty over their final placement. The resolution of this is dependent on further research, but a number of taxonomic alterations can be expected in due course.

Status and Conservation

Nine of the ten species of Melanocharitidae are considered by BirdLife International to be of Least Concern. They all have wide distributional ranges on the very large island of New Guinea and are not faced with any obvious immediate wide-ranging threats. There are, nevertheless, some local and recently increasing losses as a result of logging, mining activities and forest clearance for gardens, as the human population grows at an alarming rate, so there is no room for complacency.

Logging and a systemic failure to follow environmental planning processes, both in the Indonesian part of the island, West Papua, and in Papua New Guinea itself, are serious and growing problems, with high-level corruption evident in both countries. This is likely to worsen as demand for timber increases, prices rise, and rapacious Chinese and Malaysian commercial companies do whatever is necessary in order to maintain a ready supply of raw timber, often with potentially disastrous long-term consequences for the environment and local human communities. It is becoming urgent that a properly certificated international system be put in place in order to ensure that logs derive only from sustainable and properly run ventures, and not from short-term "rip-and-run" exploitation. All of this has profound long-term environmental implications for the New Guinea ecosystems, of which the berrypeckers and longbills are an essential component.

One melanocharitid, the aptly named Obscure Berrypecker, is a Data-deficient species and one of the most mysterious of New Guinea birds. Originally described from the Arfak Mountains, in the Vogelkop of north-west New Guinea, it seems not to have been recorded there since. Otherwise, it has been found at five widely separated areas in the eastern half of New Guinea. It is possibly simply a cryptic arboreal species that has been frequently overlooked, as recent records of this berrypecker, or of a very similar but as yet undescribed taxon, from several widely separated sites suggest that it is, in fact, fairly common. Nevertheless, as some doubts have expressed as to the validity of some of these recent reports, study of the type specimen, held in the Natural History Museum of Leiden, in the Netherlands, is being carried out.

Both the Streaked and the Spotted Berrypeckers appear to be decidedly uncommon species, occurring at low density overall, but the Black, Mid-mountain and Fan-tailed Berrypeckers are all often quite common. At a study site in lowland rainforest at the Brown River, near Port Moresby, the estimated density of Black Berrypeckers was as high as 20 individuals per 10 ha.

Similarly, the four species in the longbill subgroup are all quite common forest-dwellers, with no immediate concerns for their conservation. Indeed, the Slaty-chinned Longbill was reported as being the most abundant bird in the forest at 1200–1700 m on Mount Karimui, accounting for some 9% of the total avifauna in that locality. Yellow-bellied, Pygmy and Dwarf Longbills are likewise common birds of the lowland forest, the first and last of these three often being among the most numerous small passerines in this habitat.

General bibliography

Barker, Barrowclough & Groth (2002), Barker, Cibois *et al.* (2004), Beehler (1978a), Beehler *et al.* (1986), Bell (1982a, 1982b, 1984a), Beresford *et al.* (2005), Bock (1994), Boles (2007), Butchart & Stattersfield (2004), Christidis *et al.* (1993), Coates (1990), Coates & Lindgren (1978), Coates & Peckover (2001), Collar *et al.* (1994), Diamond (1972a), Dickinson (2003), Ewen *et al.* (2006), Gregory (1993, 1995a, 1995b), Groth (2002), Harrison & Frith (1970), Hopkins & Hiaso (1994), Jönsson & Fjeldså (2006a), Mayr & Amadon (1947), Rand & Gilliard (1967), Salomonsen (1960a, 1967a, 1967b, 1985), Shepherd & Lambert (2007), Sibley (1996), Sibley & Ahlquist (1985b, 1990), Sibley & Monroe (1990, 1993), Smythies (1984), Stattersfield & Capper (2000), Stresemann (1914b).



Genus *MELANOCHARIS* P. L. Selater, 1858

1. Obscure Berrypecker

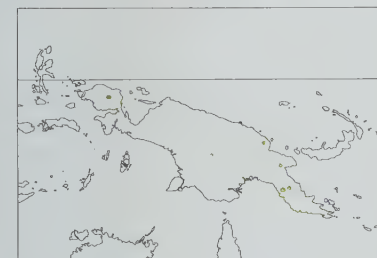
Melanocharis arfakiana

French: Piquebaie obscur **German:** Arfakbeerpenpicker **Spanish:** Picabayas Oscuro
Other common names: Arfak Berrypecker

Taxonomy. *Dicaeum arfakianum* Finsch, 1900, Arfak Mountains, New Guinea.

Perhaps forms a species pair with *M. nigra*. Birds from Boana, in S Huon Peninsula, exhibit better-marked pale eyering than those in rest of range, but taxonomic significance, if any, of this is uncertain. Monotypic.

Distribution. E half of New Guinea: Tabubil area (in Western Province), Keki (in Adelbert Mts), Boana (near Lae), and near Port Moresby at Efogi (on the Kokoda Trail) and Varirata. Also Arfak Mts (NW New Guinea), but no records subsequent to its original discovery there.



Descriptive notes. 11.5 cm; 11.5 g. Very small, quite short-tailed arboreal berrypecker with distinctively pale stubby bill. Upperparts are dull brownish to olive-greenish, with markedly greyish head, and grey crown, nape and mantle; dingy olive-grey below, with paler throat, yellowish wash on flanks, whitish-grey belly (sometimes washed yellow), bright lemon-yellow pectoral tufts; undertail-coverts and underside of tail grey, underwing-coverts whitish; iris dark, sometimes pale brown, with very thin faint orange eyering (visible in the hand); bill horn-coloured or pinkish-horn, sometimes brownish-grey above and dull orange below, gape yellow-orange; legs olive-green (appear brownish in the field) with slightly paler soles. Distinguished from similar female-plumaged *M. nigra* mainly by bright yellow (not white or yellowish-white) pectoral tufts, greyish head, pale bill, also by voice. Sexes alike. Immature not certainly described; Jul and Oct individuals resembling adult but with faint narrow dark streaks on dingy yellowish underparts were possibly immatures. Voice. Very rapid swizzling "swizzly swizzly swizzly" series, sometimes shortened, given from high in trees; resembles that of *M. nigra*, but distinctively much faster and higher-pitched. Sharp "zit-zit-zit" call noted from birds at Efogi.

Habitat. Hill forest, forest edge and secondary growth, also native gardens adjacent to forest; from 640 m to at least 1100 m.

Food and Feeding. Few data on diet. Known to take small berries; one specimen had arthropod remains in stomach. Seen singly or in presumed pairs. Strongly arboreal, frequenting middle levels and lower canopy; descends to shrub layer to take berries. Active, usually keeping quite high up, flying rapidly from tree to tree, behaviour not unlike that of Red-capped Flowerpecker (*Dicaeum geelvinkianum*); will also sit motionless for minutes on end at c. 5–8 m, rather in manner of a *Microeca* flycatcher (Petroicidae). Has been noted as hovering and gleaning from foliage, presumably for arthropods.

Breeding. Probable juveniles seen in Jul and Oct, mutual chasing by presumed paired individuals in May–Aug, and family party of four at Efogi in Sept. Strong response to playback of tape recording at these times suggests territoriality; apparent territories quite large, c. 200 m in linear dimension. No other information.

Movements. Resident, perhaps moving locally in response to fruiting of trees. Found in same sites around Tabubil throughout year.

Status and Conservation. Data-deficient. Restricted-range species: present in West Papuan Highlands EBA and Central Papuan Mountains EBA. One of the least-known New Guinea birds; very easily overlooked as it is quite strongly arboreal, active, and hard to see well. Originally described from the Arfak Mts, in NW New Guinea, but not recorded there since; otherwise recorded from five widely separated areas in Papua New Guinea. Only two specimens, one dated 1867 from the Arfaks and one in 1933 from SE part of the island, until some reported sightings from the Kokoda Trail, near Port Moresby (in 1978/79 and 1980/81), and from Tabubil, in Western Province (1978, 1987). These later reports, widely doubted at the time, now seem perfectly plausible in light of subsequent discoveries. Individuals found at Boana, near Lae, in 1991 and near Tabubil in 1992 appear to be of this species, and are clearly not *M. nigra* or *M. versteri*, suspicions of which clouded some of the earlier reports; the possibility that they represent an undescribed taxon very similar to present species seems exceedingly remote. Two males tape-recorded and collected in Jul 1994 above Tabubil appear to fit the scanty published descriptions of present species, but confirmation of their identity requires comparison with the type specimen (the 1933 specimen was preserved in alcohol, and may likewise never have been compared with the type; it is likely to have become faded over the years). The species is widespread at a number of sites around Tabubil from 640 m up to c. 1100 m, and has been found at Keki, in foothills of Adelbert Mts, at c. 1000 m, and at a similar altitude at Boana, near Lae; it has also been heard at c. 800 m in Varirata National Park, adding credence to earlier reports from the Efogi and Ower's Corner area from late 1970s to 1981. Probability is that this species is fairly widespread but cryptic and has simply been overlooked.

Bibliography. Anon. (2007a), Beehler *et al.* (1986), Butchart & Stattersfield (2004), Coates (1990), Coates & Lindgren (1978), Coates & Peckover (2001), Collar *et al.* (2001), Finch (1979, 1980a, 1982a), Gregory (1995a, 1995b, 1997), Gregory & Eastwood (1994), Gregory & Webster (2004), Mayr & Rand (1936), Murray (1988a), Opi (1975), Rand & Gilliard (1967), Salomonsen (1960a), Schodde (1978a), Shackelford (2006), Stattersfield & Capper (2000).

2. Black Berrypecker

Melanocharis nigra

French: Piquebaie noir **German:** Weißbüschel-Beerenpicker **Spanish:** Picabayas Negro

Taxonomy. *Dicaeum niger* Lesson, 1830, Manokwari, western New Guinea.

Perhaps forms a species pair with *M. arfakiana*. Four subspecies recognized.

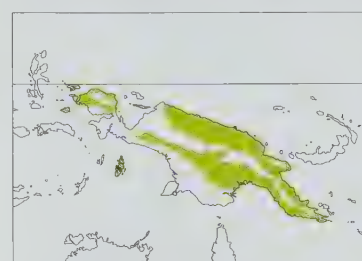
Subspecies and Distribution.

M. n. pallida Stresemann & Paludan, 1932 – Waigao I, in West Papuan Is.

M. n. nigra (Lesson, 1830) – West Papuan Is (Salawati and Misool) and NW New Guinea (Vogelkop).

M. n. unicolor Salvadori, 1878 – Geelvink Bay (Yapen I) and N, E & SE New Guinea.

M. n. chloroptera Salvadori, 1876 – Aru Is, and SC New Guinea from Mimika R E to Fly R.



Descriptive notes. 11.5 cm. Small, active, quite short-tailed and stubby-billed forest berrypecker. Male nominate race is shiny blue-black above and dark grey below, with white pectoral tufts and whitish underwing-coverts; iris brown; bill black; legs grey. Female is rather nondescript, dull olive-green above, olive-grey below, with white or yellowish-white pectoral tufts and underwing-coverts. Immature is like female, but underparts lightly washed yellowish, pectoral tufts and underwing-coverts yellowish-white, paler base of lower mandible. Races differ mainly in plumage colour of males: *chloroptera* is like nominate but with upperwing-coverts and remiges edged green, contrasting with black of back; *pallida* has black upperparts and grey underparts; *unicolor* is entirely shiny blue-black, apart from pectoral tufts. Voice. Song a rapid high-pitched stuttering twittering sequence, e.g. "whit-ee-chee whit-ee-chee whit-ee-chee", with variations on patterns within each song; may begin quietly but quickly gains volume, and often stops suddenly. Gives very fast, jumbled "chee-per-chee-per-chee", similar to call of presumed *M. arfakiana* but lower-pitched and slower. A common call is a rather wheezy drawn-out note very like call of Variable Dwarf-kingfisher (*Ceyx lepidus*), scolding upslurred and rather wheezy "schree", also a series of short high-pitched insect-like "tsee-see-tsee" notes at variable speed which may be given by two individuals antiphonally. Some regional variation, but all calls fall broadly within same structure; in Adelbert Mts (race *unicolor*) a trisyllabic "wi ti tiieew" followed by reeling "tiddler-tiddler-tiddler"; race *chloroptera* at Mt Karimui said to utter a very rapid series of thin twittering notes the pitch of which "describes a perfect sine wave".

Habitat. Rainforest, hill forest, monsoon forest, tall secondary growth; also visits canopy of mature teak (*Tectona*) plantations. Sea-level to c. 1200 m; locally to 1450 m where congeners absent.

Food and Feeding. Small berries, also insects and spiders (Araneae). An active feeder, frequently moving and rarely still for long, except when feeding on berries. Gleans from branches and foliage; also hovers at times, and observed to take insects from spider webs. Studies suggest that males may forage at higher levels than those preferred by females; former often recorded high in canopy of fruiting or flowering trees, whereas females forage more in middle and lower storeys of forest.

Breeding. Recorded in May, Jun, Sept, Oct, Dec and Jan, and may occur in both wet and dry seasons; noted in pairs from Apr to Dec in Port Moresby area. Vocalizes from perch in middle storey and then shifts rapidly to another, behaviour possibly associated with territoriality. Nest, built by female alone, cup-shaped, neat and woven from thin brown fibrous fern parts and/or fine epiphyte roots, decorated with pieces of pale-coloured lichen, c. 50 mm wide and 50–60 mm deep, bound to bare twig fork of sapling in shaded site c. 2.25–12 m above ground. Clutch 1 or 2 eggs, pinkish-white to creamy, with dark streaks and blotches mainly in zone around larger end; no information on duration of incubation and fledging periods; young fed by both sexes. Recorded longevity in excess of 6 years and 6 months.

Movements. Mainly sedentary, as indicated by recoveries of ringed individuals. Some local wandering possible, as the species is only rarely seen at a site near Tabubil, in C New Guinea.

Status and Conservation. Not globally threatened. Fairly common to common, and widespread. Heard far more often than it is seen, as both secretive and very active; possibly more common than it appears. Estimated density 20 birds/10 ha at one study site in lowland rainforest at Brown R, near Port Moresby.

Bibliography. Beehler *et al.* (1986), Bell (1982a), Berlepsch (1911), Coates (1990), Coates & Peckover (2001), Diamond (1972a), Gyldestolpe (1955b), Madarász (1899), Mayr & Rand (1937), Mees (1965a), Parker (1963), Rand & Gilliard (1967), Salomonsen (1960a), Seale (1977), Stresemann & Paludan (1932a, 1932b), Symes & Marsden (2005).

3. Mid-mountain Berrypecker

Melanocharis longicauda

French: Piquebaie à longue queue **Spanish:** Picabayas Colilargo **German:** Gelbbüschel-Beerenpicker

Other common names: Lemon-breasted/Yellow-bellied Berrypecker, Long-tailed (Black) Berrypecker

Taxonomy. *Melanocharis longicauda* Salvadori, 1876, Arfak Mountains, New Guinea.

Five subspecies recognized.

Subspecies and Distribution.

M. l. longicauda Salvadori, 1876 – NW New Guinea (Vogelkop and Wandammen Mts).

M. l. chloris Stresemann & Paludan, 1934 – WC & SW New Guinea.

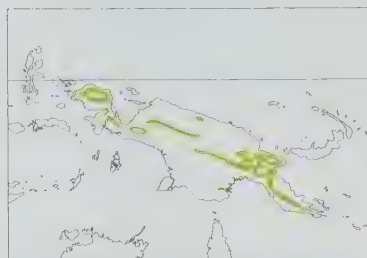
M. l. umbrosa Rand, 1941 – NC New Guinea around R Idenburg.

M. l. capitata Mayr, 1931 – mountains of C & NE New Guinea, including Huon Peninsula.

M. l. orientalis Mayr, 1931 – mountains of SE New Guinea.

Descriptive notes. 12.5 cm. Small berrypecker with medium-length tail. Male nominate race is black above, glossed blue-green on crown and mantle; outer web of outer tail feathers white on basal three-quarters (often hard to see in field); pale olive-grey below, flanks tinged yellow, belly paler and yellower, pectoral tufts pale yellow, underwing-coverts white; iris brown; bill black; legs black to dark brown. Distinguished from similar *M. nigra* mainly by longer tail with white in outer rectrix, yellow (not white) pectoral tufts; from *M. versteri* by smaller size, shorter tail, yellower underparts, pale yellow (not white) pectoral tufts. Female is slightly bigger and appears proportionately shorter-tailed than male, plumage rather nondescript, dull olive-green above, tail brownish with basal white outer webs as male, pale olive-grey below, with pale chin, yellowish flanks and paler yellow belly; bill black with paler base. Immature is similar to female, but gape and base of lower mandible yellowish; young male acquires black first on tail, before upperparts. Races

On following pages: 4. Fan-tailed Berrypecker (*Melanocharis versteri*); 5. Streaked Berrypecker (*Melanocharis striativentris*); 6. Spotted Berrypecker (*Rhamphocharis crassirostris*); 7. Dwarf Longbill (*Oedistoma iliolophus*); 8. Pygmy Longbill (*Oedistoma pygmaeum*); 9. Yellow-bellied Longbill (*Toxorhamphus novaeguineae*); 10. Slaty-chinned Longbill (*Toxorhamphus poliopterus*).



chippy-chip-chippy-chip" song, not unlike that of described as similar to the "sine-wave twittering" of *M. nigra*.

Habitat. Forest and secondary growth in mountains; has a liking for dense shrubs and thickets, particularly on forest edge, and will forage around native gardens adjacent to forest. Found from 700 m to c. 2100 m, largely between *M. nigra* of lower elevations and *M. versteri* of higher levels, with marginal overlap with both; absent from some areas, perhaps owing to exclusion by those species.

Food and Feeding. Small berries, also spiders (Araneae), and likely to take insects. Diet and behaviour similar to those of congeners. Inconspicuous and active. Forages mainly on berries in understorey and middle levels of forest, sometimes to lower canopy. Feeds also by gleaning, and occasionally while hovering. Usually seen singly; adult males observed less often than female-plumaged birds. May be seen with other species in fruiting trees, but seems not to join mixed-species foraging flocks.

Breeding. Poorly known. Nesting recorded in Jan and female in breeding condition in Sept. One nest known, large for size of bird, a quite neat cup with high sides, slightly constricted at top, bound to horizontal branch fork 7.5 m above ground. No other information.

Movements. Presumed to be resident; some altitudinal dispersal possible, as wandering immature male recorded in lowlands of Central Province.

Status and Conservation. Not globally threatened. Quite common in some areas, uncommon in others, and seemingly absent from quite large areas. A patchily distributed species, inconspicuous and easily overlooked. Occupies a wide range on the main island of New Guinea.

Bibliography. Beehler *et al.* (1986), Coates (1990), Coates & Peckover (2001), Diamond (1972a), Filewood *et al.* (1972), Gould (1885a), Gyldenstolpe (1955a), Hartert *et al.* (1936), Mayr (1931c), Rand (1941), Rand & Gilliard (1967), Salomonsen (1960a), Salvadori (1876).

4. Fan-tailed Berrypecker

Melanocharis versteri

French: Piquebaie éventail **German:** Fächerschwanz-Beerenpöcker **Spanish:** Picabayas Abanico
Other common names: Verster's Berrypecker

Taxonomy. *Pristorhamphus versteri* Finsch, 1876, Arfak Mountains, New Guinea.

Birds of this species present on Mt Bosavi and in Torricelli Range of undetermined race, but presumed to belong with *virago*. Individuals from higher elevations notably larger than those from lower altitudes, but this is not considered taxonomically significant. Four subspecies recognized.

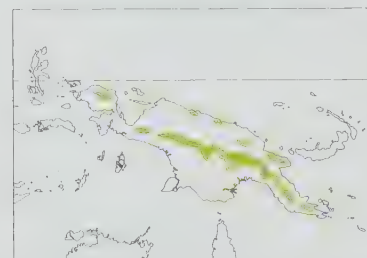
Subspecies and Distribution.

M. v. versteri (Finsch, 1876) – mountains of Vogelkop, in NW New Guinea.

M. v. meeki (Rothschild & E. J. O. Hartert, 1911) – mountains of WC & C New Guinea from Weyland Mts E to Hindenburg Range.

M. v. virago (Stressmann, 1923) – mountains of N, EC & NE New Guinea, including Cyclops Mts, Torricelli Range, and Sepik Mts E to Huon Peninsula.

M. v. maculiceps (De Vis, 1898) – mountains of SE New Guinea, including Herzog Mts.



wing-coverts; iris dark brown; bill black, gape yellow; legs black. Distinguished from similar *M. longicauda* by larger size, longer tail, white (not yellow) pectoral tufts, lack of yellow tones on underparts. Female is somewhat larger than male but with proportionately shorter tail, plumage nondescript, dull olive-green above, olive-grey below, fading to paler on lower underparts, belly yellowish with sometimes slightly streaked appearance; has less white in tail than male, with spots about mid-point of feathers (often very inconspicuous). Immature resembles female. Races exhibit minor plumage differences, based on colour of underparts and extent of white in tail: *meeki* is similar to nominate but darker below, with altitudinal variation in size; *maculiceps* has palest underparts and most white in tail of all the races; *virago* is intermediate between preceding two. **VOICE.** Harsh, rasping "schwet dee-dee-dee", scratchy querulous "dee dee dee", high-pitched nasal "ee" and upslurred "chee-chee-chee"; also faint high-pitched notes, including a "ts ts" series; thin drawn-out whistle rather like call of a jewel-babbler (*Ptilorhoa*) reported.

Habitat. Forest and dense secondary growth in mountains; visits fruiting trees in native gardens adjacent to forest, also tree-fern patches in alpine savanna. From c. 1250 m to 3680 m, mainly above 1700 m; perhaps most common at 2300–2600 m. Overlaps with *M. longicauda* in some areas, at lower levels of its own altitudinal range, and may replace that species entirely in others.

Food and Feeding. Feeds on small berries and arthropods. Frequents lower levels, shrubbery and forest edge, ascending to canopy at times when fruit is present; regularly observed to forage very low down or on ground, far more so than congeners. Typical active berrypecker, seldom pausing for long except when feeding. Gleans and hover-gleans. Female-plumaged individuals seem to outnumber males, and latter perhaps occupy a narrower elevational zone, perhaps more towards middle levels of altitudinal range. Usually seen singly, sometimes in pairs. May associ-

ate loosely and temporarily with mixed-species flocks that are passing through, but seems seldom to join them.

Breeding. Poorly known for so common a species. Nesting recorded in Jul and Nov, and young seen in Aug. Nest a smooth, neat, deep, thick-walled cup, large for size of bird, made of felted fibres (presumably from ferns), with thick felted lining of orange-brown fluff from bases of fern leaves, bound with "animal silk" and extensively decorated with pale green, tan or buff lichens which help to camouflage it; bound to horizontal branch or vine fork. Clutch size uncertain, one nest held 1 egg, whitish, spotted and blotched dark, most heavily at larger end; no information on incubation and fledging periods.

Movements. Resident; no movements or wandering known.

Status and Conservation. Not globally threatened. Common to quite common, and widespread over much of its range. Occupies a reasonably wide range on main island of New Guinea.

Bibliography. Beehler (1978a), Beehler *et al.* (1986), Bell (1971b), Coates (1990), Coates & Peckover (2001), Diamond (1972a), Dupond (1937), Gilliard & LeCroy (1961, 1968), Gould (1885a), Gyldenstolpe (1955a, 1955b), Hartert *et al.* (1936), Hicks (1988a), Junge (1953), Mayr (1931c), Mayr & Gilliard (1954), Mayr & Rand (1937), Melville (1979), Morioka (1992), Rand (1961), Rand & Gilliard (1967), Salomonsen (1960a), Salvadori (1876).

exhibit minor differences in plumage colour and tail patterning: *chloris* is yellow below than nominate; *umbrosa* has underparts darker than previous; *orientalis* is similar to nominate, but male has white patch on inner web of outer rectrices; *capitata* is like last but with larger white spot on inner webs (forming a bar).

VOICE. A rapidly repeated buzzy "jjeteeleet jjeteeleet jjeteeleet" or "weetcha weetcha tink"; repeated trisyllabic slightly raspy "tree ti tsee" of typical *Melanocharis* quality, also a downslurred "bzhsst" and incessant twittering sibilant notes; harsh, quite deep raspy "tschree" also given. Has a thin, trilled, reeling "whee Garnet Robin (*Eugeryone rubra*); song also described as similar to the "sine-wave twittering" of *M. nigra*.

Food and Feeding. Small berries, also spiders (Araneae), and likely to take insects. Diet and behaviour similar to those of congeners. Inconspicuous and active. Forages mainly on berries in understorey and middle levels of forest, sometimes to lower canopy. Feeds also by gleaning, and occasionally while hovering. Usually seen singly; adult males observed less often than female-plumaged birds. May be seen with other species in fruiting trees, but seems not to join mixed-species foraging flocks.

Breeding. Poorly known. Nesting recorded in Jan and female in breeding condition in Sept. One nest known, large for size of bird, a quite neat cup with high sides, slightly constricted at top, bound to horizontal branch fork 7.5 m above ground. No other information.

Movements. Presumed to be resident; some altitudinal dispersal possible, as wandering immature male recorded in lowlands of Central Province.

Status and Conservation. Not globally threatened. Quite common in some areas, uncommon in others, and seemingly absent from quite large areas. A patchily distributed species, inconspicuous and easily overlooked. Occupies a wide range on the main island of New Guinea.

5. Streaked Berrypecker

Melanocharis striativentris

French: Piquebaie strié **German:** Streifenbauch-Beerenpöcker **Spanish:** Picabayas Estriado
Other common names: Striated/Green Berrypecker

Taxonomy. *Melanocharis striativentris* Salvadori, 1894, Moroka, Owen Stanley Range, south-east New Guinea.

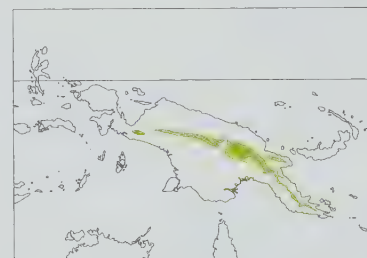
Proposed races *prasina* and *albicauda*, from N slopes of SE New Guinea, are synonymous with nominate. Three subspecies recognized.

Subspecies and Distribution.

M. s. axillaris (Mayr, 1931) – W & WC New Guinea (Weyland Mts and Snow Mts).

M. s. striativentris Salvadori, 1894 – mountains of EC & SE New Guinea.

M. s. chrysocome (Mayr, 1931) – mountains of Huon Peninsula, in NE New Guinea.



Descriptive notes. 12.7–14 cm. Medium-sized dull-coloured berrypecker lacking distinct male plumage. Male nominate race is olive-green above, outer rectrices with well-concealed white at bases; throat and underparts olive-grey, many feathers edged whitish or yellowish, giving streaked appearance (especially on lower breast and abdomen); underwing-coverts olive grey-brown; iris dark brown, distinctive dull buff eyering; bill blackish-brown, gape-line and nares orange-buff; legs dark brown. Distinguished from females of *M. longicauda* and *M. versteri* mainly by buff eyering, orange-buff gape and streaked appearance of underparts. Female is larger than male, but with shorter tail; plumage very similar, white at tail bases much reduced or absent. Immature is similar to adult, with tail as female, but gape and nares dull yellowish (not orange-tinged); young male has white in tail vestigial or absent. Races exhibit minor differences in coloration and tail patterning: *axillaris* has underparts heavily streaked, axillaries and underwing-coverts white, lacks white in tail; *chrysocome* is similar to nominate but slightly larger in size, with underparts darker, streaking less marked. **VOICE.** Little known. A scratchy "schree schree schree", supposedly harsher than similar sounds of congeners; also has distinctive loud "seep", repeated every few seconds.

Habitat. Forest, forest edge and secondary growth in mountains, from c. 1150 m to 2300 m, rarely as low as 500 m and as high as 2600 m. Overlaps with *M. longicauda* in lower-lying parts of range, and with *M. versteri* at higher levels.

Food and Feeding. Few data. Known to take small berries. Frequents shrubs and middle levels of habitat. Quite a secretive species, easily overlooked or misidentified; seems less active than congeners. In parts of range where co-exists with *M. longicauda* and *M. versteri*, habitat-partitioning mechanism not known.

Breeding. Poorly known. Nests have been found in Dec in SE New Guinea. Nest a cup-shaped structure, similar to that of *M. nigra* but larger and tapering a little below, built of fine fibre-like fern parts, smoothly felted, covered externally with plant down and spider silk, which bind nest to supporting branch, and decorated on outside with green lichen, which may help to camouflage it; two nests were placed on downward-sloping twigs or stems. Clutch 2 eggs, pinkish-white with dark streaking and blotching mainly in zone around larger end, like those of *M. nigra* but larger and with darker markings. No other information.

Movements. Poorly understood. Has been suggested as being locally nomadic, as it seems to be absent from some areas at times; secretive behaviour, however, complicates the picture.

Status and Conservation. Not globally threatened. Mostly uncommon to rare; described as common to abundant in a few areas. Has wide, albeit patchy, distribution, and seemingly absent from many areas. A rather poorly known species; conservation status possibly merits reassessment and may be better considered Data-deficient.

Bibliography. Beehler *et al.* (1986), Coates (1990), Coates & Peckover (2001), Finch (1981a), Gyldenstolpe (1955a), Harrison & Friith (1970), Hartert *et al.* (1936), Mayr (1931c), Mayr & Gilliard (1952b, 1954), Rand & Gilliard (1967), Salomonsen (1960a), Salvadori (1894), Schodde (1978a).

Genus RHAMPHOCHARIS Salvadori, 1876

6. Spotted Berrypecker

Rhamphocharis crassirostris

French: Piquebaie tacheté **Spanish:** Picabayas Moteado
German: Schlankschnabel-Beerenpöcker
Other common names: Thick-billed Berrypecker

Taxonomy. *Rhamphocharis crassirostris* Salvadori, 1876, Hatam, Arfak Mountains, New Guinea.

SPECIES ACCOUNTS

True affinities uncertain, and genus sometimes subsumed in *Melanocharis*; molecular studies required. Birds of this species from Huon Peninsula, currently included in race *piperata*, may represent a separate taxon. Three subspecies recognized.

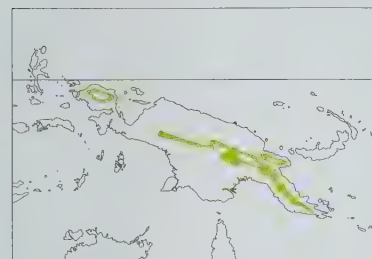
Subspecies and Distribution.

R. c. crassirostris Salvadori, 1876 – NW & W New Guinea (Vogelkop and Snow Mts).

R. c. piperata (De Vis, 1898) – C ranges of E New Guinea, including Huon Peninsula.

R. c. viridescens Mayr, 1931 – EC New Guinea (Herzog Mts; possibly also Kuper Range).

Descriptive notes. 11–14 cm. Distinctive berrypecker with peculiar long, stout bill and a narrow squared-off tail; striking sexual plumage dimorphism. Male nominate race is olive-green with oily greenish gloss above, darker on crown; uppertail-coverts and tail blackish; pale pearly grey below, slightly washed with yellow on flanks; pectoral tufts and underwing-coverts white or yellowish-white, axillaries pale yellow; iris red, olive-brown or dark brown; bill black; legs brownish-black. Female is very distinctive, with dark brownish-black head and body heavily marked with whitish apical spots, particularly on breast and throat,



the spots smaller on head and somewhat larger and triangular-shaped on body; median upperwing-coverts tipped white, producing single rather variable wingbar (poorly marked on some); remiges edged olive-yellow, outer rectrices with variable white tipping; iris dark brown, small white surrounding feathers giving appearance of an eyering; bill black to blackish-brown, sometimes paler base; legs grey to black. Female distinguished from rather similar Spotted Honeyeater (*Xanthotis polygrammus*) by lack of yellow ear patch and absence of black markings on underparts. Immature is similar to female, but upperparts almost lacking in spots, flight-feathers more clearly edged olive-yellow, spotting below duller and much less distinct, bill with obvious pale base of lower mandible, dark eye with pale eyering; may show pale gape-line when very young. Races differ in minor degrees of size or in plumage marking and coloration: *piperata* is larger than nominate, has longer bill, more white at base of rectrices; *viridescens* is darker and with smaller white spots than previous. **VOICE.** A rapid downslurred series of “seeu-seeu-seeu” notes, of typical berrypecker quality but also suggestive of an insect. Also, an indrawn, sibilant series similar to that of Red-collared Myzomela (*Myzomela rosenbergii*) reported.

Habitat. Forest, forest edge and secondary growth, also in native gardens adjacent to forest; mountains from 850 m to 2700 m, mainly 1150–2300 m.

Food and Feeding. Poorly known. Takes berries and small fruits, such as figs (*Ficus*), also gleans arthropods from foliage and epiphytes; behaviour like that of a honeyeater (Meliphagidae). Tends to keep to middle levels and lower canopy, rarely descending to shrub layer. Visits flowering trees, where it remains inside dense foliage. Usually seen singly; reported as gathering in small flocks of up to twelve individuals at fruiting trees. Associates with other species only when they happen to be feeding in same flowering or fruiting tree.

Breeding. Juvenile in Sept in EC New Guinea. No other information available.

Movements. Presumed to be resident; possibly some local wandering in association with fruiting or flowering of trees.

Status and Conservation. Not globally threatened. Very uncommon to rather rare, and poorly known. Occurs at low density. Considered unlikely to be at risk, as it is distributed over a wide range.

Bibliography. Beehler (1978a), Beehler *et al.* (1986), Coates (1990), Coates & Peckover (2001), Gilliard & LeCroy (1961), Gould (1885b), Gyldestolpe (1955a), Mayr (1931c), Mayr & Gilliard (1954), Rand & Gilliard (1967), Salomonsen (1960a), Salvadori (1876), Schodde (1978a).

Genus *OEDISTOMA* Salvadori, 1876

7. Dwarf Longbill

Oedistoma iliolophus

French: Toxorampe à ventre gris

Spanish: Picudo Pechigris

German: Graubauch-Pfriemschnabel

Other common names: Plumbed Longbill, Grey-bellied Longbill/Honeyeater, Dwarf Honeyeater, Long-plumbed False-sunbird

Taxonomy. *Melilestes iliolophus* Salvadori, 1876, Meos Num and Yapen Island, Geelvink Bay, New Guinea.

Genus was in the past usually placed in the honeyeater family (Meliphagidae), but DNA studies indicate that it belongs with current family. Has sometimes been subsumed in genus *Toxorhamphus*, despite the fact that it predates latter by almost 40 years. Present species sometimes placed in genus *Melanocharis*, and phylogenetic analysis based on protein allozymes suggested closer affiliation to that genus than to *Toxorhamphus*. Relationship with *O. pygmaeum*, however, uncertain, and further genetic work required in order to reveal true taxonomic positions of the two. Species name often listed as *iliolophus*, but should be treated as a noun, and thus invariable; race *fergussoni* often listed as *fergussone*, but this name is not demonstrably adjectival and should be treated as a noun in genitive case, therefore invariable. Five subspecies recognized.

Subspecies and Distribution.

O. i. cinerascens (Stresemann & Paludan, 1932) – Waigeo, in N West Papuan Is.

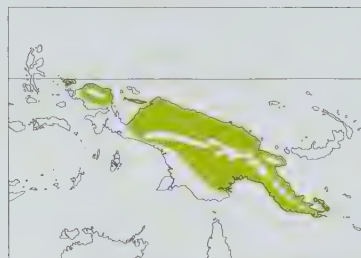
O. i. affine (Salvadori, 1876) – mountains of Vogelkop, in NW New Guinea.

O. i. iliolophus (Salvadori, 1876) – Geelvink Is (Meos Num, Yapen), and mainland N & C New Guinea from Geelvink Bay E, including Weyland Mts, Victor Emanuel Mts and Sepik Mts, to Huon Peninsula.

O. i. flavum (Mayr & Rand, 1935) – S & SE New Guinea lowlands.

O. i. fergussoni (E. J. O. Hartert, 1896) – D'Entrecasteaux Archipelago (Goodenough, Fergusson and Normanby), off SE New Guinea.

Descriptive notes. 11 cm. Very small, very drab-looking passerine with long decurved bill. Nominant race is dark olive-green above, olive-grey below, washed with yellow on flanks; iris dark brown, conspicuous but narrow fleshy yellow eyering; bill black, paler yellowish base; legs dull slaty blue. Sexes similar. Immature undescribed. Races differ only slightly in size or coloration, or



both: *cinerascens* has crown grey, not dark olive-green; *affine* is smaller, has crown olive-green; *flavum* resembles previous, but has more yellowish underparts; *fergussone* is largest race. **VOICE.** A scolding, anxious-sounding “twik twik” series; also, typically, a dry, sharp “chirrit” in flight, often first indicator of presence of species. No published reports of song as such.

Habitat. Rainforest and, locally, monsoon forest, in lowlands and hills; found also at forest edge and in secondary growth, visiting flowering shrubs. To c. 1200 m, locally to 1750 m in lower montane zone.

Food and Feeding. Feeds on insects, nectar and sometimes fruit. Forages in lower levels of vegetation, also at flowering trees and shrubs. Very active, and hard to see well; often glimpsed as it darts across a path or through forest understorey. Frequently flicks wings, and is seldom still for long. Best observed at flowering trees and shrubs, where it takes nectar. Probes into flowers of shrubs, trees, vines and wild bananas (*Musa*); also gleans from branches and trunks, and hovers occasionally. Takes insects from spider webs, and often seen to face vertically downwards on trunks. Recorded as visiting forest pools during dry weather, but uncertain if drinking, bathing or merely foraging. Usually seen singly, sometimes in pairs. Will associate loosely with mixed-species flocks with Yellow-bellied Gerygone (*Gerygone chrysogaster*), Frilled Monarch (*Arses telescopthalmus*) and Chestnut-bellied Fantail (*Rhipidura hyperythra*), but not a core member of such assemblages.

Breeding. Poorly known. Noted as breeding at Brown R., near Port Moresby, in Aug–Sept dry season and as being in breeding condition in Oct. One nest from Fergusson I (race *fergussone*), in Dec 1896, was a cup of dried grass lined with snow-white soft vegetable silk, the exterior covered with partly decayed dried leaves, attached to a twig; contained 1 egg, creamy white, with reddish spots forming ring around larger end and with few brown hair-like lines around middle. Maximum recorded longevity at R Brown study site 7 years 4 months. No other information.

Movements. Resident; in study at Brown R., individuals frequently retrapped at site of ringing.

Status and Conservation. Not globally threatened. Generally common within its widely distributed habitat, and often one of the most abundant birds of lowland forest and hill forest, but seemingly absent from much of S Trans-Fly. At study site at Brown R., density of c. 40 birds/10 ha, similar to that recorded for Yellow-bellied Gerygone and Little Shrike-thrush (*Colluricincla megarrhyncha*).

Bibliography. Beehler *et al.* (1986), Bell (1982a, 1982b, 1984a), Christidis *et al.* (1993), Coates (1990), Coates & Peckover (2001), Dupond (1937), Gilliard & LeCroy (1961), Gregory (1995a, 1995b), Gyldestolpe (1955b), Hopkins & Hiaso (1994), Mayr (1931c), Mayr & Rand (1937), Rand & Gilliard (1967), Rothschild & Hartert (1896b), Stresemann & Paludan (1932a, 1932b), Symes & Marsden (2005).

8. Pygmy Longbill

Oedistoma pygmaeum

French: Toxorampe pygmée

German: Zwergpfriemschnabel

Spanish: Picudo Pigmeo

Other common names: Pygmy Honeyeater

Taxonomy. *Oedistoma pygmaeum* Salvadori, 1876, Arfak Mountains, New Guinea.

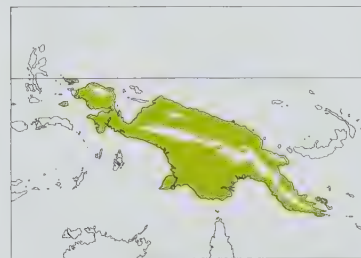
Genus was in the past usually placed in the honeyeater family (Meliphagidae), but DNA studies indicate that it belongs with current family. Has sometimes been subsumed in genus *Toxorhamphus*, despite the fact that it predates latter by almost 40 years. Relationship between present species and its sole congener, *O. iliolophus*, uncertain, and further genetic work required in order to reveal true taxonomic positions of the two. Described races *flavipectus* (S New Guinea E from Etna Bay) and *olivascens* (NE coast E from Huon Peninsula) considered synonyms of nominate. Three subspecies recognized.

Subspecies and Distribution.

O. p. waigeuense Salomonsen, 1966 – Waigeo, in N West Papuan Is.

O. p. pygmaeum Salvadori, 1876 – S West Papuan Is (Misool) and mainland New Guinea.

O. p. meeki (E. J. O. Hartert, 1896) – D'Entrecasteaux Archipelago (Goodenough I, Fergusson I), off SE New Guinea.



Descriptive notes. 7.3 cm; 5 g. Tiny, very short-tailed, canopy-dwelling passerine, the smallest of New Guinea birds; resembles a cormorant (*Sylvietta*), but with decurved shortish bill and odd body shape. Nominant race is yellowish-olive above, greyish below, abdomen and flanks washed with pale lemon-yellow; throat whitish, and chest slightly darker than rest of underparts; iris brown; bill black, whitish at base of lower mandible; legs blue-grey. Sexes similar, female slightly smaller and duller than male. Immature undescribed. Races differ minimally: *meeki* is slightly larger than others, more whitish below, and with crown grey (not green). **VOICE.** Usual call a continual fairly quiet clicking “chit chit chit” series, given by several individuals together and perhaps a contact call; also a quiet, more musical chattering. No apparent song documented.

Habitat. Rainforest, monsoon forest (in Trans-Fly region), forest edges and clearings, and gallery forest. Lowlands and hill forest from sea-level to c. 800 m, locally to c. 1370 m.

Food and Feeding. Diet poorly known, but insects, spiders (Araneae) and nectar taken. Seems to forage mainly in canopy, where highly vocal and usually heard as it calls from high in flowering trees; seldom seen in middle level or lower, but occasionally comes down to feed at forest edge. Feeds by gleaning and probing, also while hovering. Occurs in presumed pairs, or in small flocks of four or five or sometimes up to ten individuals. Found at flowering trees among flocks of other nectarivorous species, including Rainbow (*Trichoglossus haematodus*) and Red-flanked Lorikeets (*Charmosyna placensis*), Meyer's (*Philemon meyeri*) and Helmeted Friarbirds (*Philemon hucaroides*) and other honeyeaters (e.g. *Myzomela* and *Xanthotis* species), and Red-capped Flowerpeckers (*Dicaeum geelvinkianum*); sometimes occurs also in mixed flocks with Black-fronted White-eyes (*Zosterops minor*), Hooded Pitohuis (*Pitohui dichrous*) and Green-backed Gerygones (*Gerygone chloronota*).

Breeding. Female in breeding condition in Oct in Central Province of Papua New Guinea. No other information.

Movements. Appears to be resident; may move locally in response to flowering of trees.

Status and Conservation. Not globally threatened. Fairly common but unobtrusive; very vocal, and often located by its calls. Has very wide range in New Guinea, being present over much of mainland and on a few satellite islands, and considered not to be at any immediate risk.

Bibliography. Beehler *et al.* (1986), Christidis *et al.* (1993), Coates (1990), Coates & Peckover (2001), Dupond (1937), Gregory (1995a, 1995b), Gyldestolpe (1955b), Hopkins & Hiaso (1994), Mayr & Rand (1937), Rand & Gilliard (1967), Stresemann & Paludan (1932a).

Genus *TOXORHAMPHUS* Stresemann, 1914

9. Yellow-bellied Longbill

Toxorhamphus novaeguineae

French: Toxorampe à ventre jaune

Spanish: Picudo Ventrigualdo

German: Gelbbauch-Pfriemschnabel

Other common names: Green-crowned/Canary/New Guinea Longbill, Canary Bowbill/False-sunbird

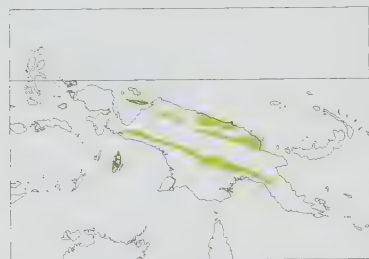
Taxonomy. *Cinnyris Novaeguineae* Lesson, 1827, Manokwari, north-west New Guinea.

Genus was in the past usually included within the honeyeater family (Meliphagidae), but DNA studies indicate that it belongs with present family. Present species and *T. poliopterus* form a species pair, the two replacing each other altitudinally, with only marginal overlap. Two subspecies recognized.

Subspecies and Distribution.

T. n. novaeguineae (Lesson, 1827) – West Papuan Is (Waigeo, Batanta, Salawati, Misool), Yapen I (in Geelvink Bay) and N & W mainland New Guinea (E to Astrolabe Bay and Ramu R and, in S, to Etna Bay).

T. n. flaviventris (Rothschild & E. J. O. Hartert, 1911) – Aru Is. and S New Guinea from Utakwa E to Lakekamu R.



Descriptive notes. 12.5 cm. A small passerine with a strongly decurved long dark bill. Nominate race is olive-green above, outer tail feathers with narrow whitish terminal margins (not visible on folded tail, best seen during flight); throat and underparts citrine-yellow, washed olive on breast; iris brown, narrow whitish eyering; bill blackish, paler base of lower mandible; legs mid-grey to blue-grey. Differs from *T. poliopterus* in having less dark-looking, more olive (not grey) head and wings, yellow chin and throat; readily told from superficially similar female of Olive-backed Sunbird (*Cinnyris jugularis*) by lack of yellow supercilia.

much longer and more decurved bill, also forest-dwelling habits. Sexes similar, female smaller and slightly shorter billed than male. Immature undescribed. Race *flaviventris* is similar to nominate, but more yellowish and less olivaceous below, with more greyish-yellow chin, and with ill-defined light yellow patch in centre of throat. **Voice.** Vocal, heard more often than seen. Song, one of characteristic sounds of lowland forests, a sweet, slightly mournful descendent “twee twee twee twee” series, also a similar “pitchew pitchew pitchew pitchew”. Calls a raspy “zwik” note, and high-pitched buzzy “tsweet tsweet” like that of a flowerpecker (Dicaeidae).

Habitat. Lowland forest, hill forest and monsoon forest with abundant vines, also secondary growth if still fairly dense. In S of range occurs in lowlands to c. 500 m, rarely to 750 m; in N also mainly in lowlands, but in Central Highlands to 1200 m at Baiyer R, a site where other mainly lowland species, e.g. Large-billed Gerygone (*Gerygone magnirostris*), have an outpost.

Food and Feeding. Insectivorous, and also takes nectar, but dietary details not known. Very active, constantly moving from perch to perch; responds to playback of taped song, but wary. Frequents middle levels and understorey, and ascends to canopy to visit flowering trees. Probes among foliage for arthropods. Usually seen singly or in pairs. Occasionally joins mixed-species flocks with Frilled Monarch (*Arses telescopthalmus*), Wallace’s Wren (*Sipodotus wallacii*), Yellow-bellied Gerygone (*Gerygone chrysogaster*) and sometimes *Melanocharis nigra*.

Breeding. No information. Apparently on territory at Kiunga (Western Province) and Karawari (West Sepik) in Jul–Aug.

Movements. Resident, but some local movements may occur; in Western Province, has been found rarely near Tabubil, at 750 m.

Status and Conservation. Not globally threatened. A fairly common to common species, although frequently elusive; perhaps more numerous than it may appear. Occupies a wide range, and considered not to be at any immediate risk.

Bibliography. Beehler *et al.* (1986), Christidis *et al.* (1993), Coates (1990), Coates & Peckover (2001), Gregory (1995a, 1995b), Gyldestolpe (1955b), Hopkins & Hiaso (1994), Mees (1965a), Rand & Gilliard (1967), Stresemann & Paludan (1932a, 1932b).

10. Slaty-chinned Longbill

Toxorhamphus poliopterus

French: Toxorampe à tête grise

Spanish: Picudo Cabecigrís

German: Graukinn-Pfriemschnabel

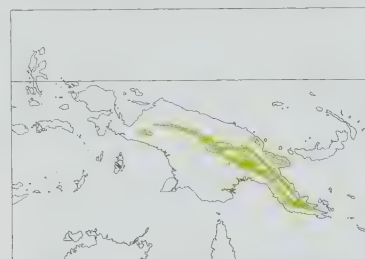
Other common names: Grey-winged Longbill, Grey-winged Bowbill/False-sunbird

Taxonomy. *Melilestes poliopterus* Sharpe, 1882, Astrolabe Mountains, south-east New Guinea. Genus was in the past usually included within the honeyeater family (Meliphagidae), but DNA studies indicate that it belongs with present family. This species and *T. novaeguineae* form a species pair, the two replacing each other altitudinally, with only marginal overlap. Proposed race *septentrionalis* (described from Huon Peninsula) included within nominate. Two subspecies currently recognized.

Subspecies and Distribution.

T. p. maximus Rand, 1941 – mountains of W & C New Guinea (N slope of Weyland Mts and Snow Mts).

T. p. poliopterus (Sharpe, 1882) – mountains of E & SE New Guinea, including Central Highlands, Mt Bosavi, Adelbert Mts, and Saruwaged Mts (in Huon Peninsula).



Descriptive notes. 12.5 cm; 14–15 g. A small passerine with a long, dark, strongly decurved bill and a dark head. Male nominate race has head and nape dark bluish-grey, upperparts dark olive-green; upperwing and tail dark grey, outer tail feathers narrowly tipped white; chin and upper throat slaty grey, prominent citrine-yellow spot on lower throat, underparts pale yellowish-olive; iris red-brown or dark brown; bill black; legs slate-blue, dark olive-grey or dusky brown. Distinguished from *T. novaeguineae* by dark head, grey wings and citrine throat spot; readily told from superficially similar female of Olive-backed Sunbird (*Cinnyris jugularis*) by grey head, lack of yellow supercilia, much longer and more decurved bill, and forest-dwelling habits. Adult female is similar to male, but smaller and paler. Immature undescribed. Races differ marginally in intensity of coloration and size; *maximus* is slightly bigger than nominate. **Voice.** Heard more often than seen; varied vocalizations, some of which reminiscent of a sunbird (Nectariniidae) in quality. Song seems to be variable, generally sweet and slurred, with disyllabic notes and repeated single notes; one song reported as being very similar to that of Scrub White-eared Honeyeater (*Meliphaga albonotata*). Calls include a sweet “tsip”, a “tsee-tsee tsee-tsee” series, also a dry scold, and an incisive slightly metallic “chik” that can be extended into distinctly syllabized scolding series, which seems to function as an alarm; one flight call is a disyllabic sneezing series similar to that of *Oedistoma iliolophus*.

Habitat. Primary forest in hills and lower mountains, also secondary growth and edges of gardens in forest; recorded also at forest edge in highlands and in scattered trees in mid-mountain grassland. Occurs mostly from c. 500 m to c. 2000 m but altitudinal limits vary; can occur as low as 300 m and as high as 2450 m. Occurrence influenced by lower altitudinal limits of favoured forest habitats, and presumably by competition with *T. novaeguineae*, which seems to be absent inland from Port Moresby (where present species occurs down to 300 m) and erratic in occurrence at Tabubil, in Western Province (where present species found irregularly down to c. 500 m); both species occur at c. 1200 m at Baiyer R (in Central Highlands), but probably separated there by altitude, with present species somewhat higher up.

Food and Feeding. Diet poorly known: feeds on arthropods and nectar. Tends to be shy and hard to see; responds to playback of taped song, but always very active and very wary, and seldom perches for long in one place. Darts about swiftly. Forages mainly in understorey and middle levels, and visits canopy to exploit flowering trees; frequently observed in the substorey, feeding from flowers of wild gingers (Zingiberaceae) and a white lily-like species. Usually seen singly.

Breeding. Breeding recorded in May, Jun, Aug and Oct in highlands and in Apr and Sept at Sogeri Plateau (near Port Moresby), suggesting a wide range of local timing including late wet season to early dry season, but varying with local conditions. Nest is a distinctive neat, smoothly finished cup of fine greenish vegetation and fibres, interwoven with spider webs and externally decorated with spider egg sacs, lined with thick layer of white plant down, sited in crotch of sapling, or on slender branch (with base of nest built around branch); one was at 1.8 m over a forest stream, another was 2.7 m up in a vine stem growing from a small tree in partly cleared forest. Nests containing 1 white egg recorded, but these may represent incomplete clutches. No other information available.

Movements. Resident; no movements reported.

Status and Conservation. Not globally threatened. Fairly common to common, but elusive; occupies large range in New Guinea, in widely distributed habitat, but absent from Vogelkop. Often common at the higher altitudes; reported as being the most abundant bird species on Mt Karimui between 1200 m and 1700 m, where it comprised c. 9% of the total avifauna.

Bibliography. Beehler *et al.* (1986), Christidis *et al.* (1993), Coates (1990), Coates & Peckover (2001), Diamond (1972a), Gilliard & LeCroy (1961, 1967a), Gregory (1995a, 1995b), Gyldestolpe (1955a), Hopkins & Hiaso (1994), Mayr (1931c), Mayr & Gilliard (1954), Melville (1979), Rand (1941, 1961), Rand & Gilliard (1967), Watson *et al.* (1962).

Class AVES
Order PASSERIFORMES
Suborder OSCINES
Family PARAMYTHIIDAE
(PAINTED BERRYPECKERS)



- Rather robust small to medium-sized passerines with long wiry black filoplumes on flanks; colour patterns bold and contrasting.
- 12–22 cm.



- New Guinea.
- Montane forest.
- 2 genera, 2 species, 5 taxa.
- No species threatened; none extinct since 1600.

Systematics

The two enigmatic species that constitute the Paramythiidae are confined to the mountains of New Guinea, with much of the altitudinal range of the Crested Berrypecker (*Paramythia montium*) lying above that of its smaller relative, the Tit Berrypecker (*Oreocharis arfaki*). Of diverse appearance, the affinities of these two species within the passerines have for long been uncertain.

The male Tit Berrypecker bears a strong superficial resemblance to the Great Tit (*Parus major*) of Eurasia, and in 1875 it was originally described by A. B. Meyer as "*Parus (?) arfaki*". Around the same time, T. Salvadori named it *Oreocharis stictoptera* and referred it to the family Dicaeidae, containing the flowerpeckers and allies. A decade or so later, R. B. Sharpe, in his *Catalogue of the Birds in the British Museum*, incorporated this species in the Dicaeidae, along with an eclectic assemblage of genera that included also *Melanocharis* and *Rhamphocharis* of the melanocharitid berrypeckers. The Tit Berrypecker remained an aberrant member of the Dicaeidae for the next hundred years, although at least one subsequent author was inclined to associate this species with the tits in the family Paridae.

When the unique Crested Berrypecker was first described, in 1892, C. W. De Vis referred it to the starling family (Sturnidae). Later, Sharpe placed this species in its own monotypic family, Paramythiidae, between two sturnid groups, namely the glossy starlings, at that time treated as a family Eulabetidae, and the oxpeckers, then treated as the family Buphagidae. This treatment of the Crested Berrypecker in a monotypic family was retained for the next three decades.

As the preceding paragraphs imply, the Tit Berrypecker and the Crested Berrypecker differ from each other in several respects. One species is small and sexually dimorphic, whereas the other is medium-sized, sexually monomorphic and crested. One species is strong-flying and is often conspicuous; the other flies only short distances and is generally skulking. The two are linked, however, by their possession of specialized long wiry black filoplumes on the flanks, a peculiarity of Paramythiidae. In addition, the bill of the Crested Berrypecker is similar to that of the Tit Berrypecker, both species have a vestigial tenth primary (see Morphological Aspects), and both feed almost exclu-

sively on berries (see Food and Feeding). The bills of these species lack the serrated cutting edges that are a feature of the melanocharitid berrypeckers and the *Dicaeum* flowerpeckers, and the tongue structure, unlike that of the flowerpeckers, is simple. The vestigial outermost primary, P10, is a character which they share with typical *Dicaeum* flowerpeckers, although not with the melanocharitid berrypeckers. By 1933, E. Mayr had formed the opinion that the Crested Berrypecker is closely allied to the Tit Berrypecker, and he considered that the colour pattern of the former bore a close resemblance to that of the male Tit Berrypecker. "Common to the two genera are the black head and throat, the green, contrasting upper parts and wings, the bluish tail, and the yellow under tail-coverts. The main difference in coloration is the exchange of yellow with blue on the abdomen, breast and cheeks in *Paramythia*". In his *List of New Guinea Birds*, Mayr included the Crested Berrypecker in the Dicaeidae, following the flowerpeckers, the melanocharitid berrypeckers and the Tit Berrypecker in taxonomic sequence. This treatment set the standard for most authors and students of New Guinea birds for the next four-and-a-half decades, including F. Salomonsen in his 1967 text for J. L. Peters's *Check-list of Birds of the World*.

During this time, C. J. O. Harrison and S. A. Parker made a study of the morphological evidence and nest structure of these species, and proposed that the Tit and Crested Berrypeckers be regarded as aberrant bulbuls (Pycnonotidae), but this view failed to gain acceptance. Clearly, however, these birds are well differentiated from the flowerpeckers, and also from the melanocharitid berrypeckers, both in external morphology and in aspects of nidification.

The analytical work based on DNA–DNA hybridization, pioneered by C. G. Sibley and J. E. Ahlquist during the 1970s and 1980s, indicated that the genera *Oreocharis* and *Paramythia* are, indeed, closely related to each other and sufficiently well differentiated from the Dicaeidae to warrant placement in a separate family, the resurrected Paramythiidae. Interestingly, Sibley and Ahlquist also placed the melanocharitid berrypeckers in a family of their own, the Melanocharitidae, together with the longbills of the genera *Toxorhamphus* and *Oedistoma*, a small group of species that, prior to these authors' studies, had traditionally been considered to be honeyeaters and had therefore been included in Meliphagidae.

Recent research by F. K. Barker, A. Cibois and their colleagues, based on the sequencing of nuclear genes, supports the view that the painted berrypeckers are well removed from the flowerpeckers. Moreover, this work reveals for the first time that the paramythyids belong with the "core Corvoidea" radiation, which roughly corresponds to Sibley and Ahlquist's "parvorder Corvida", in contrast to the flowerpeckers, which belong with the "Passerida" radiation, roughly corresponding to Sibley and Ahlquist's "parvorder Passerida". Its findings indicate also that the paramythyid berrypeckers are not closely related to the melancharitid berrypeckers. Their nearest allies now appear to be the Old World orioles and figbirds (Oriolidae), another family comprised of partially to wholly frugivorous species.

Across its geographical range the Tit Berrypecker exhibits minor variations in plumage between populations, but it also exhibits widespread individual variation that defies attempts to separate these populations as subspecies. For example, Mayr and A. L. Rand, of the American Museum of Natural History, examined a series of specimens from the mountains of New Guinea's south-east and compared them with a series from the Huon Peninsula, in the north-east, and with two individuals from the Arfak Mountains of the Vogelkop, in the far west of the island. They found that the males from south-east New Guinea tended to have the black of the crown extending farther down the back of the head than was the case with those from the two other regions, although one of the Arfak males resembled the south-east individuals in this character; further, two of the south-eastern specimens were similar to the Arfak and Huon Peninsula specimens in having the green of the back extending up on

to the nape. In addition, Mayr and Rand found that, in their series of south-eastern specimens, some females had a more whitish belly and others a more greyish belly. N. Gyldenstolpe, working at the State Museum of Natural History, in Stockholm, Sweden, believed, however, that Tit Berrypeckers from the Wahgi Valley of east-central New Guinea, and representing all New Guinea populations east of the Vogelkop Peninsula, are sufficiently distinct from those of the Arfak Mountains of the Vogelkop to be separated as a subspecies, for which he proposed the name *bloodi*. Incidentally, Gyldenstolpe noted that adult females of his proposed race are darker green on the upperparts, darker grey on the throat and chest, greyer on the middle of the abdomen, and deeper yellowish on the sides of the body than are adult females from the Arfak Mountains, while males are blacker on the crown and much darker chestnut on the abdomen than are Arfak males.

Subsequently, other authors, including F. Salomonsen, also compared specimens of Tit Berrypeckers from the Vogelkop with series of skins from various other parts of New Guinea. All are in agreement that this species displays too much individual variation, and that the differences between populations are too weakly marked, to justify separation into subspecies. Furthermore, some Vogelkop specimens were found to match exactly specimens of "*bloodi*". The outcome is that the Tit Berrypecker is considered a monotypic species.

In contrast, the Crested Berrypecker is a polytypic species with two groups of races, a western group and an eastern one. Each group is remarkably uniform in its external morphology over much of its range. In eastern New Guinea, a single subspecies, the nominate race, extends along the central ranges from

Taxonomists have long struggled to determine the evolutionary relationships of the painted berrypeckers, which have been variously allied to starlings (Sturnidae), tits (Paridae) and flowerpeckers (Dicaeidae). Recent molecular analyses place them in the "core Corvoidea" radiation, and suggest that their closest relatives are the Old World orioles and figbirds (Oriolidae). There are only two extant species of painted berrypecker. Although they are clearly divergent in plumage pattern and size, they are linked by one peculiar feature: their flanks bear elongated black filoplumes which are generally hidden beneath the wing. The function of these specialized feathers is unknown. The **Crested Berrypecker** is typical of the family in having a fairly short and robust bill. With a striking head pattern and an expressive crest, it is one of the most attractive of New Guinea's birds.

[*Paramythia montium*
montium,
Mt Scratchley,
SE New Guinea.
Photo: William S. Peckover]



at least the Star Mountains eastwards to the mountains of the south-east peninsula, individuals in the western part of this distributional area differing only slightly from those in the south-east in having the undertail-coverts slightly lighter, more lemon-yellow, rather than dull golden-yellow, and the wing on average slightly longer. In the south-east, Mayr and Rand found that this subspecies also exhibited a slight variation in size with altitude, especially noticeable in the females. In the north-east, the isolated subspecies *brevicauda* is confined to the outlying mountain ranges of the Huon Peninsula. It is distinguished from the nominate race only by its slightly shorter tail. The western form of the Crested Berrypecker, *olivacea*, was described by E. D. van Oort in 1910. Soon after its discovery, W. R. Ogilvie-Grant regarded this very distinctive taxon as a separate species. Otherwise it has been treated only as a subspecies of *P. montium*, although evidence of intergradation between the western "*olivacea* group" and the eastern "nominate group" is lacking. Specimens from the area between the Snow Mountains and the Star Mountains of west-central New Guinea are required in order to enable a proper investigation of the two groups to be undertaken.

Rand, reporting on a series of *olivacea* collected in the Snow Mountains during the 1938–1939 Archbold Expedition to New Guinea, noted a correlation between increase in size and increase in altitude, and also that the individuals from lower altitude, besides being smaller, were on average slightly more olive on the upperparts than were those from higher elevations. He remarked that Crested Berrypeckers from the Weyland Mountains are also small and on average slightly more olive above than those from the Snow Mountains. Rand concluded, however, that it would be inadvisable to separate these populations as additional races. Subsequently, Salomonsen, using the characters detailed by Rand, considered that the larger individuals were separable as an altitudinal subspecies, *alpina*, confined to the area surrounding Mount Wilhelmina and the mountains bordering the Baliem Valley, and at least partially isolated from the lower-altitude *olivacea*. A few years later, in the mountains bordering the Ilaga Valley, farther to the west, S. D. Ripley obtained a series of specimens that, in terms of measurements, agreed with the proposed *alpina*, except that the lower size limit of these birds overlaps marginally with measurements used by Salomonsen to define *olivacea*. Salomonsen's and Ripley's combined wing-length measurements for *alpina* are 112–123 mm for males, compared with 100–108 mm for male *olivacea*, and 104–120 mm for females, compared with 97–106 mm for female *olivacea*. It is not clear if this overlap in size represents a cline. The proposed subspecies *alpina* has been recognized by some authors, although not by others. Further analysis of Ripley's specimens may help to resolve the matter.

Finally, the proposed race *occidentis*, for Crested Berrypeckers from the Hellwig Mountains, on the southern watershed of the Snow Mountains, was shown by Salomonsen to be, technically, a synonym of *olivacea*.

Morphological Aspects

The painted berrypeckers are handsomely plumaged, arboreal, berry-eating passerines. Of the two species in the family, one, the Tit Berrypecker, is small and robust, 12–14 cm in total length and 16.5–21.7 g in weight. The other species, the Crested Berrypecker, is medium-sized, 19–22 cm in length and 36–61 g in weight, and somewhat similar in size and proportions to a plump bulbul. The variation in size shown by the Crested Berrypecker generally reflects an increase in size correlated with an increase in altitude. In addition, Crested Berrypecker males tend to be slightly larger, on average, than females.

These birds have a short neck and a plump body. The tail of the Tit Berrypecker is shortish and square, that of the Crested Berrypecker being longish, rounded and somewhat graduated. The wing of both species is moderately long and moderately broad, and the wingtip is rounded. The Tit Berrypecker has a wing length of 68–76 mm, and the larger Crested Berrypecker a wing length of 91–123 mm. The longest primary is P7 in the

case of the Tit Berrypecker, and P6 in the Crested Berrypecker. On both of these species, the outermost primary, P10, is vestigial. As noted by Harrison and Parker, a vestigial P10, when associated with a longer, narrower wing, is characteristic of species requiring sustained or long-distance flight, whereas a long P10 is associated with a short rounded wing that is characteristic of sedentary birds. Furthermore, a long narrow wing is usually evolved from a shorter rounded wing, the process being accompanied by a reduction in size of P10. Tit Berrypeckers are often seen in flocks flying into and out of the crowns of fruiting trees, often flying strongly above the canopy, and sometimes heading across a forested or semi-cleared mountainside towards the next spur or ridge. Such behaviour may be in keeping with the possession by this species of a reduced P10. The Crested Berrypecker, however, is never seen in sustained flight above the canopy; instead, it moves through vegetation in the upper, middle and lower levels of the forest and forest edge, flying only short distances between trees and bushes and across small open spaces. The possession of a vestigial P10 by this species must, therefore, be considered an anomaly. It is most likely, as speculated by Harrison and Parker, that the vestigial outermost primary of paramythiids is a relict character, derived from a long-winged form no longer extant. The flight behaviour of the Tit Berrypecker would seem to support opinion that it represents a lower evolutionary stage than that presented by the Crested Berrypecker (see Systematics).

Both members of the family have a fairly strong bill that is distinctly shorter than the head. That of the Crested Berrypecker tapers evenly towards the tip, with the culmen curved; it is broad basally at the nostrils, but towards the tip it is laterally compressed. The upper mandible is slightly notched at its tip and projects a little beyond the lower mandible. The Tit Berrypecker's bill is similar but is proportionately shorter, with the notch at the tip of the upper mandible poorly defined. In both species, the bill is black. The nostrils are partially covered by an operculum, leaving a transverse narrow aperture at the lower edge. Rictal bristles are lacking in the case of the Tit Berrypecker, and those of the Crested Berrypecker are short, fine, very sparse and difficult to detect. The tongue of the Crested Berrypecker is described as being relatively broad and tapering, with a small median notch at the tip.

The legs and feet of the Tit Berrypecker are moderately strong, with well-curved claws and smooth tarsi, those of the male being greyish-brown to dark brown and those of the female grey-brown to light brown or pale grey. The Crested Berrypecker has quite strong legs and feet, with similarly curved claws and smooth tarsi, but the leg colour of both sexes is black. Male Tit Berrypeckers have a dark olive-brown iris colour, whereas the females of this species have brownish-grey eyes, while both sexes of the Crested Berrypecker have the iris dark blue-grey to dark slate-brown.

The plumage of painted berrypeckers is soft and downy. A peculiarity of these two species, one that is not visible in the field, is the presence of long wiry black filoplumes on the flanks, the function of which is unknown. One species, the Tit Berrypecker, is sexually dimorphic in plumage, whereas the sexes of the Crested Berrypecker are alike. The colour patterns of the male Tit Berrypecker and the Crested Berrypecker are bold and the coloration distinctive: both have black on the crown, a black throat and bib, and yellow undertail-coverts. In addition, as with all paramythiid plumages, the back is green, the upper surface of the tail is blue-grey, and the main colour of the underwing is distinctively delineated on the underside of the flight-feathers. Apart from these similarities in colour and pattern, the two species are, however, quite different from each other in appearance.

At a glance, the male Tit Berrypecker resembles a Great Tit, a widespread species of Europe, Asia and north Africa. It has a contrasting large yellow area on the side of the head encompassing the cheek and the ear-coverts, and the abdomen is bright yellow with a large burnt-orange central area. It also has distinctive pale yellow terminal spots in the outer webs of the tertials, a character which it shares with the female. The underwing is mainly yellow. The female Tit Berrypecker is sub-



The **Tit Berrypecker** is fairly plump with a relatively short, square tail. It is dichromatic, the male being much brighter than the female, with a black head offset by yellow cheeks. The male's pattern gives the species its name, as it resembles that of the Great Tit (*Parus major*). The sexual dichromatism extends as far as iris colour, the male having a dark olive-brown iris, while the female has brownish-grey eyes. Both sexes have distinctive yellow patches on the outer webs of the tertials, and these are clearly visible in this photo. Like the Crested Berrypecker (*Paramythia montium*), the Tit Berrypecker is restricted to the mountains of New Guinea, where it is usually found between 2000 m and 3000 m. It tends to be fairly common, living in pairs or small flocks in the understorey of humid forest.

[*Oreocharis arfaki*,
Ubaigubi,
EC New Guinea.
Photo: William S. Peckover]

dued in coloration and somewhat undistinguished in appearance. Its crown is green, like the back, the throat and bib are plain grey, and the cheeks and ear-coverts are grey, lightly mottled whitish; it has dusky scalloping on the yellow flanks and abdomen, perhaps indicating a relict pattern. The underwing of the female is mainly pale yellow.

Immature Tit Berrypeckers of both sexes are like the adult female in plumage. The young male begins to acquire adult plumage first on the head and throat, and finally on the underparts. The juvenile plumage of this species is also similar to that of the adult female, although it has not been described in detail.

The Crested Berrypecker is unique in appearance. Ornithologists generally regard it as being among the most attractive of New Guinea birds and, as noted by Rand and E. T. Gilliard, its coloration harmonizes beautifully with the mossy forests of its high mountain home. It seems a pity, therefore, to liken this evocative species to a bulbul. The feathers of the forecrown are elongated and rounded at their tips, and form an erectile crest. The forecrown and crest are black, contrasting with the whitish to pale grey hindcrown and nape; these last two regions are usually partially covered by the flattened crest, resulting in the pale area appearing as a long broad stripe extending backwards from above each eye. The underparts are blue-grey, this coloration extending to the neck and ear-coverts, and the underwing is mainly pale grey. The two groups of subspecies presently treated as forms of the Crested Berrypecker (see Systematics) are easily distinguished: both members of the western "*olivacea* group" have a longer crest, and the white feathers of the nape are heavily tipped black, whereas the two members of the eastern "nominate group" have an area of golden olive-yellow on the flanks, though this is normally concealed under the closed wing.

Young Crested Berrypeckers resemble the adults, but are much duller. The immature of the eastern, nominate race has the hindneck and nape dark olive-green, like the back, and the pale grey area on the head is confined to a small patch above and backwards from the eye; the underparts are dull olive-tinged bluish-grey, becoming sooty on the upper throat and chin, and with the feathers of the abdomen fringed yellowish-olive, becoming dull olive-yellow ventrally. The juvenile of the western race *alpina* is described as being largely grey below, with a black throat and pale, whitish-yellow lower underparts.

Little has been documented with regard to the moult of paramythiids. An assessment of the meagre data available for the Tit Berrypecker suggests that this species probably commences the moult in October, although information is lacking for the period from November to March. For the Crested Berrypecker, the available data appear to suggest that moult may occur mainly during the period March–May, extending into June, probably following breeding, and also that a minority of the population may moult during the rest of the year, with least moult activity occurring during July–September, prior to breeding. This, however, does not take into account the lack of information for the period December–February. There is also the possibility that, for both species, there may be some variation in the timing of moult among the various populations.

Habitat

The distribution of the paramythiid berrypeckers is centred on New Guinea's central mountain ranges, a cordillera that extends the length of the main body of that island. The Tit Berrypecker, occurring at lower montane elevations than those occupied by its relative, has a virtually unbroken distribution along this cordillera, from the Weyland Mountains in the west to the area about Mount Simpson in the far south-east. It is found also on most outlying ranges, being present in the Tamrau and Arfak Mountains of the Vogelkop Peninsula, the Wandammen Mountains, the Gauttier Mountains, the Torricelli Mountains, and all ranges of the Huon Peninsula. The presence of this species on these outlying ranges appears to represent a relict distribution: during glacial periods of the Pleistocene Epoch, montane forest extended down to much lower elevations than it does today, facilitating the colonization of these ranges. Similarly, the

Crested Berrypecker is found along the length of the Central Ranges, from the Weyland Mountains in the west eastwards to Mount Suckling in the far south-east, although, being restricted to higher elevations, its distribution is broken in a number of areas. The only outlying ranges in which this species is found are those of the Huon Peninsula. Apparently, these are the only ones that are at present high enough to support sufficient suitable habitat for this species.

Painted berrypeckers inhabit montane forests in the temperate to alpine zones. The Tit Berrypecker is found mainly in mossy forest, primarily from around 2200 m up to 2800 m; occasionally it occurs as low as 850 m and as high as 3650 m. It also visits nearby disturbed and partly cleared habitats. The Crested Berrypecker is found in mossy montane forest, forest edge, stunted subalpine forest and alpine thickets, from around 2150 m, but mainly above 2450 m, up to the tree-line at around 3800–4100 m. Local variations in the lower limit of occurrence of both of these species appear to be correlated with the varying downward extent of moss forest.

The two species overlap broadly in altitudinal range, and are generally sympatric in mossy forest. Moreover, both frequent the upper and lower strata of the forest and forest edge, although they do not associate with each other. The Tit Berrypecker is seen mostly in the canopy, and it readily visits the crowns of emergent and isolated fruiting trees; it also spends time in the middle stage and occasionally the substage of the forest. The Crested Berrypecker moves freely between the crowns of bushy trees in the canopy and shrubs in the substage, and it occasionally visits the ground.

General Habits

Both members of this family are arboreal and frugivorous, and are encountered most often when they are visiting fruiting trees and shrubs. They are generally common and are frequently observed, although our knowledge of the behaviour of these birds remains limited. So far as is known, both are diurnal, being active solely by day.

The Tit Berrypecker moves about in pairs, in small groups and in loose, vocal, single-species flocks of five to 30 or more individuals. According to one authority, flock-members are generally paired. They move quickly and nervously through the canopy in the manner of white-eyes (*Zosteropidae*), and they often fly together as a flock above the canopy from one group of trees to another. Although flock-members attract attention with their frequent wheezy calls, they are often difficult to observe in the thick foliage. They visit various fruiting trees, shrubs and plants, mostly in the canopy but also in the middle storey and forest-edge shrubbery. Some of the fruiting trees which they visit are frequented at the same time by other bird species, including melanocharitid berrypeckers, honeyeaters and birds-of-paradise (*Paradisaeidae*). One observer noted that, even when feeding in some fruiting tree along with other species, Tit Berrypeckers were continually moving in and out of the tree, so that the flocks may have been much larger than was suspected. Solitary pairs loafing in the middle and lower stages of the forest are less active, and sometimes inactive; they call infrequently and, although not particularly shy, are often difficult to locate.

The Crested Berrypecker is usually seen in small parties and single-species flocks containing up to ten or more individuals, but when breeding it is more often found in pairs. On Mount Albert Edward, on one occasion when a flock crossed a small glade, Rand was able to count the individuals and he found that there were more than 75 birds in the flock. As observed by Rand, flocks of this species are occasionally accompanied by mainly or partially insectivorous bird species, including the Blue-capped Ifrit (*Ifrita kowaldi*), the Black-throated Honeyeater (*Lichenostomus subfrenatus*) and the Friendly Fantail (*Rhipidura albolimbata*). Such flocks are loose and scattered, and move rather quickly through the forest, the berrypeckers pausing only briefly to feed on berries of trees and taller shrubs. The Crested Berrypecker is a moderately active, rather restless bird that re-

Both members of the family feed almost exclusively on small fruits, which they generally ingest whole. The **Crested Berrypecker** forages restlessly in groups of up to 75 individuals, usually keeping low in dense cover, where it can be surprisingly difficult to observe. It moves acrobatically through branches, stopping to investigate the tips of twigs, and occasionally capturing insects. There is little information about food plants, but field observations suggest that it visits a wide range of trees and shrubs, typically consuming a few berries before moving on.

[*Paramythia montium*
montium,
Kumul Lodge,
Mount Hagen,
Papua New Guinea.
Photo: Ian Merill]



mains for only a short time in any one fruiting tree or plant. It is generally quiet, and its calls are mostly subdued and usually given infrequently. Sometimes it is conspicuous and easy to observe, especially when it visits a fruiting plant in an exposed situation. It is also more conspicuous at higher elevations, where the trees are stunted.

Although it is not shy, the Crested Berrypecker is often unobtrusive and it skulks in bushy vegetation, where it may briefly loaf and preen. Two partners may then perch close to or next to each other, and allopreening has been observed between two individuals. The crest is usually depressed, but it is sometimes raised when the bird is excited or alarmed, and sometimes the tail is held cocked. The flight of this species is described as being jerky and noisy. In contrast to the Tit Berrypecker, Crested Berrypeckers fly only short distances, within the forest and low across forest glades, and not above the canopy. According to one authority, this species has "a bizarre habit of plucking certain large ericaceous flowers and rubbing its plumage with the crushed corollas". Such unusual behaviour requires an explanation (see Food and Feeding).

Nothing has been documented with regard to the agonistic or territorial behaviour of these two species. Likewise, there is no available information on their drinking, bathing and roosting habits.

Voice

Painted berrypeckers appear to have a limited repertoire, although their vocalizations are not very well known, and no songs have been described or identified as such. Typically, their calls are subdued, but they differ markedly between the two species.

The Tit Berrypecker is much more vocal than is its larger relative. Its usual calls are shrill and wheezy, and are frequently uttered by flock-members while feeding or in flight. They are reminiscent of those of a pygmy-parrot (*Micrositta*) and in-

clude a fine "tzee-tzee" and a long fine wheeze. This latter call is also given weakly, infrequently and with a ventriloquial quality by individuals loafing quietly in the lower strata of the forest, apparently in alarm or when they are disturbed. The aforementioned calls have been described by other authors variously as a very high, drawn-out "sss" or "z-z-z", similar to the call of the Cedar Waxwing (*Bombicilla cedrorum*) of North America, and as a "continuous high nasal buzz".

The usual call of the Crested Berrypecker in eastern New Guinea is a short low scratchy note, like the sound of dry leaves and twigs scraping together. This is probably a contact call. It has been described by other authors as a faint squeaking, kissing or rasping note, and has been likened also to the sounds made by birdwatchers when "squeaking" or sucking on the back of a hand in order to attract birds. Other calls given by this paramythiid include a nasal "swetch" or "zek", a very harsh "schhh", perhaps in alarm, and a "pzee" note, the last usually given by adults when arriving at the nest-site together.

Food and Feeding

These birds feed almost exclusively on small fruits, which they usually swallow whole. Both species visit a variety of fruiting trees and shrubs, although there is very little available information on which species of plant they frequent. In an avifaunal study by J. M. Diamond, the size of fruits in the stomachs of a number of Tit Berrypeckers was found to range in diameter from 1 mm to 7 mm, and the stomachs of a small number of Crested Berrypeckers contained fruits 2–8 mm in diameter.

The stomach contents of Tit Berrypeckers would appear to indicate that this species feeds entirely on small fruits. Its berry diet is, however, at times supplemented with other plant parts and products. For example, I. S. Majnep and R. Bulmer report that this species feeds also on the blossoms of a stinging tree, possibly of the genus *Fleurya*, and it has been observed to hang

upside-down in order to probe a flower. The Tit Berrypecker feeds mostly on berries in the canopy, but it also exploits those in the forest middle storey and, occasionally, in forest-edge shrubbery. The fruit-bearing plants that it visits include a tree of the genus *Pipturus*, a vine of the genus *Nothocnide*, and species of the epiphytic and free-standing umbrella tree/shrub (*Schefflera*).

The diet of the Crested Berrypecker is composed almost entirely of small fruits, of many kinds. Included in the plant items consumed by this species are the fruits of umbrella trees, the fruit of a wild raspberry (*Rubus*), the hard immature seed "cones" that are produced at the tips of twigs of a *Dacrycarpus* tree and concealed from below by short, needle-like leaves, and the fruits and/or seeds of sedges (Cyperaceae). On rare occasions, insects have been recorded in the stomach contents of this species, and it has been observed by the present writer to devour the contents of an arthropod cocoon. The nestling is fed with fruit and insects (see Breeding).

When foraging, the Crested Berrypecker is continually moving among branches and often investigates the tips of twigs acrobatically, as though searching for insects or for an obscure plant product. When visiting a fruiting tree, it takes only a few berries before moving on, even though other, seemingly suitable berries are within reach. This suggests either that it feeds unsystematically or, perhaps more likely, that it is highly selective with regard to the quality and/or ripeness of the fruit that it chooses to eat. A berry-bearing tree may hold fruit continuously over a period of many weeks and be visited by this species, and probably by the same individuals, on successive days.

Unlike the Tit Berrypecker, the Crested Berrypecker has not been reported as eating flower parts. One may speculate, however, that its reported habit of rubbing its plumage with the crushed corollas of certain large ericaceous flowers (see General Habits) could possibly be related to the consumption of such items.

Breeding

The breeding habits of these two species are only partly known, and nothing has been documented in respect of their courtship behaviour. Apparently, both species form monogamous pairs when nesting. Each species builds an open cup-shaped nest composed of moss, and both sexes feed the young.

The breeding season of the Tit Berrypecker is poorly known. Specimen data from 43 individuals, comprising 22 adult males, 14 females and seven immature males, collected in eastern New Guinea between late May and early October, indicate that the gonads were enlarged only in all August–October males, including an immature male in female-like plumage, and in one female collected in early October. This suggests that breeding in that region probably begins in October–November, in the late dry season to early wet season. The observation of fledged young in mid-July indicates that nesting had taken place also in June, early in the dry season. Of five male and three female specimens of this species from the Snow Mountains region of western New Guinea in October and early January to early February, only two males had enlarged gonads, one in October and the other in February. Little is known of the breeding habits of the Tit Berrypecker. It is presumed to form monogamous pairs when nesting. Its nest, as reported by Majnep and Bulmer, is an open cup composed of moss, and, as also reported by local people, both male and female undertake the task of incubation. The clutch size and the appearance of the egg, however, are undescribed, as also is the nestling, although two fledglings were seen to be attended and fed by both parents.

Active nests of the Crested Berrypecker were found in the Lake Habbema area of western New Guinea in August, and also in mountains south of the Tari Valley, in eastern New Guinea, in late August, October to December, and February. In addition, females from south-east New Guinea had enlarged gonads in September. The breeding season would seem, therefore, to extend from August to February. A juvenile specimen of unknown

age was obtained in the Snow Mountains region of western New Guinea in early September, suggesting that breeding may occur at some time earlier in the year, too.

Most of what is known of the nesting habits of the Crested Berrypecker is derived from data obtained by Rand in the Snow Mountains region of western New Guinea, and by C. B. Frith and D. W. Frith in the Tari Gap area of eastern New Guinea. This species forms monogamous pairs when breeding. It is not known if both sexes contribute to nest-building, but the female alone incubates; the male stays nearby and accompanies her while she is off the nest. The nestling Crested Berrypecker has abundant grey down, both above and below. It is fed by both parents, with fruits and insects, and both also remove the nestling's faeces.

The Crested Berrypecker's nest is cup-shaped, bulky, deep, loose and untidy, and is large for the size of the bird. One nest was composed of a coarse moss-like liverwort, or mosses, with some lichens and semi-woody stems throughout, and was scantily lined with fine grass stems, rootlets and semi-woody stems; in the bottom of the nest was a thick cushion, 50 mm thick, of chaff from tree-ferns. This nest measured 140 mm in diameter and 160 mm in depth externally, and 90 mm across by 50 mm deep inside. Another nest had external dimensions of 155 mm by 148 mm, and internally was 78 mm by 47 mm. Nests are sited 0.9–4 m above ground, placed either in the fork of a small lightly to densely foliated sapling or in the dense branches of a shrubby bush or sapling, in the latter case being supported on all sides by dense twigs. Nests are usually found at the forest edge, although the difficulty of detecting them within forest may give a false impression that this is the preferred situation.

This species lays a single egg, ovate in shape, with no gloss. The egg is white, off-white or very pale buff, sparsely and finely spotted throughout with dark browns and greys, or dark purple-browns and purple-greys, or purples, browns and russet. The markings are denser around the larger end, where they often form a wreath, with or without purple-grey blotches. The egg dimensions are 29.5–30.2 × 20.6–21.1 mm, and the weight 6.2 g. The incubation period is apparently more than 12 days, but information on the fledging period is lacking. Similarly, there is no information on the breeding success of this species, although the rate of predation of eggs and small young seems to be lower for Crested Berrypeckers than it is for species that build open nests at low altitudes.

Movements

Painted berrypeckers are resident throughout the year in New Guinea. At certain montane locations regularly visited by ornithologists both species may be found at any time, although the Tit Berrypecker is more variable in abundance, can be elusive, and may occasionally go unrecorded. It has not been determined for either species whether populations are wholly or partially sedentary or are to any extent nomadic. Nothing is known of local movements, and neither species undertakes long-distance migration.

The Tit Berrypecker is strong-flying, often forms flocks, and readily overflies forest and semi-cleared areas. This suggests that it is probably locally nomadic in its search for fruiting trees. Further, the lack of recognizable racial variation in this species across its entire range (see Systematics) may be an indication that populations are in flux as a result of nomadism or dispersal. Its presence on most outlying mountain ranges, however, is not considered evidence of a propensity to colonize these isolated ecological islands by flying directly from the Central Ranges. Rather, this is more likely a relict of a former much more extensive, non-fragmented distribution during glacial periods of the Pleistocene (see Habitat).

When not breeding, the Crested Berrypecker often occurs in small single-species flocks of up to ten or more individuals. On one occasion, a flock was found to contain more than 75 of these berrypeckers (see General Habits). Such behaviour suggests that this species, too, is likely to be at least partially nomadic. Moreover, the high level of uniformity in external



Although both species of painted berrypecker forage communally, they tend to breed in socially monogamous pairs.

The **Crested Berrypecker** is typical of the duo in building a bulky, mossy, cup-shaped nest, roughly 1–4 m above the ground in the fork of a sapling. The female of this species apparently lays a single egg which it incubates alone. The egg hatches after at least 12 days, after which the nestling is provisioned with fruit and insects by both sexes, as seen here.

[*Paramythia montium montium*, Tari Gap, Papua New Guinea. Photo: Clifford & Dawn Frith]

morphology within each group of races (see Systematics) could, again, be due to nomadism or dispersal. This species' colonization of the outlying high mountain ranges of the Huon Peninsula presumably occurred during glacial periods of the Pleistocene when montane forest extended down to much lower altitudes than it does today, allowing an expansion of this berrypecker's range.

Relationship with Man

The relationship that the paramythiid berrypeckers have with humans is very limited. Traditional stories relating to these birds probably exist in Papuan folklore but await formal documentation. Furthermore, and unlike some other avian species, such as plumed birds-of-paradise and brightly coloured parrots (Psittacidae), they are not usually sought after for their plumage for use in, for example, head-dresses. On the other hand, in the mountains of New Guinea where native peoples traditionally live off the land, mainly by gardening, even the smallest birds are opportunistically hunted for food. This would include both paramythiid species. In the only reported instance of such activity, Rand noted, during the 1933–1934 Archbold Expedition to south-east New Guinea, that the natives who visited the expedition's camps on top of the Wharton Range found the Crested Berrypecker a favourite food. "They shot them with their four-pronged arrows, removed the entrails, and strung the birds on a piece of fibre by threading through the nostrils."

The knowledge which the traditional mountain Papuans have of the animals and plants of their local area is often remarkable and encyclopaedic. Often, they have a name for every bird found regularly in that area, and they distinguish the female of a sexually dimorphic species by using a name different from that used for the male. Surprisingly, the Kalam people of the highlands of east-central New Guinea even recognize a close kinship between the two paramythiids. According to Majnep and Bulmer, the name of the Tit Berrypecker in the Kalam language is *tbwm-kab-ket*, meaning "it haunts the fruit of *Schefflera* species"; the male is referred to as *tbwm-kab-ket pok*, meaning "brightly col-

oured", or *tbwm-kab-ket klwak*, "yellow", while the female is called *tbwm-kab-ket kl*, which translates as "mottled". The name of the Crested Berrypecker is *tbwm-kab-ket nonm*, which means "mother of *tbwm-kab-ket*".

It is worth noting also that the painted berrypeckers, especially the Crested Berrypecker, are among the species most sought after by birdwatchers visiting New Guinea. As a result, these birds play a small but important role in ecotourism, by drawing the visitors to favoured sites.

Status and Conservation

Painted berrypeckers are generally moderately common to locally abundant within their geographical range and specific habitat. Because large expanses of suitable habitat remain along the entire length of New Guinea, there is presently no concern about the status of any paramythiid taxa, even though their population sizes are unknown.

Nevertheless, in some areas, especially at mid-montane elevations up to around 2100 m, forests have been extensively converted to agriculture or turned into man-made grasslands. Much of the range of paramythiids lies above this zone, although cultivation occurs locally also up to around 2700 m. At higher elevations, during exceptional periods of dry weather, grass fires lit by man frequently result in severe damage to areas of high-mountain forest and alpine thickets, and an associated expansion of high-mountain grasslands. For paramythiids, the effect of such an event is likely to be a long-term or permanent reduction in the size of local populations. Despite this, however, these two species are considered not to be at any immediate risk.

General Bibliography

Anon. (2007a), Barker *et al.* (2004), Bock (1994), Butchart & Stattersfield (2004), Coates (1990), Diamond (1972a), Dickinson (2003), Frith & Frith (1992), Harrison & Parker (1966), Majnep & Bulmer (1977), Mayr (1933b, 1941), Mayr & Rand (1937), Ogilvie-Grant (1915), Rand (1942b), Rand & Gilliard (1967), Ripley (1964), Salomonsen (1961b, 1967a, 1985), Sharpe (1885, 1897, 1909), Sibley (1996), Sibley & Ahlquist (1990), Sibley & Monroe (1990, 1993), Smythies (1984).



PLATE 24

Family PARAMYTHIIDAE (PAINTED BERRYPECKERS) SPECIES ACCOUNTS

Genus *OREOCHARIS* Salvadori, 1876

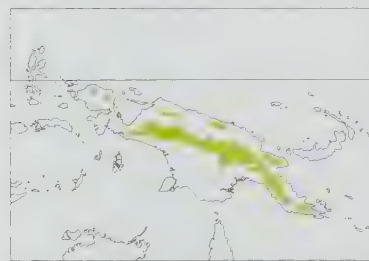
1. Tit Berrypecker

Oreocharis arfaki

French: Oréochare des Arfak **Spanish:** Picabayas de las Arfak
German: Gelbbauch-Beerenpicker
Other common names: Painted/Arfak/New Guinea Berrypecker, Arfak Flowerpecker

Taxonomy. *Parus* (?) *Arfaki* A. B. Meyer, 1875, Arfak Mountains, New Guinea. *O. stictoptera* is a synonym of current name for this species. Affinities of this genus and *Paramythia* have long been uncertain; traditionally placed in flowerpecker family (Dicaeidae), and suggested by some authors as being aberrant bulbuls (Pycnonotidae), while present species initially thought possibly to belong with the tits (Paridae); recently, both genera included with berrypeckers and longbills in family Melanocharitidae. Both, however, are well differentiated from these other families in external morphology and in aspects of nidification, and molecular-genetic analyses also support treatment as a separate family. Present species exhibits widespread individual variation; proposed race *bloodi* (Western Highlands) unwarranted. Monotypic.

Distribution. Mountains of New Guinea: Vogelkop (Tamrau Mts, Arfak Mts), Wandammen Mts, Gaultier Mts, Torricelli Mts, Central Ranges, and mountains of Huon Peninsula.



Descriptive notes. 12–14 cm; 16.5–21.7 g. Male has large yellow area on side of head (encompassing cheek and ear-coverts); rest of head, side of lower neck, throat and bib on upper breast black; upperparts olive-green, uppertail-coverts blue-grey; flight-feathers black with green edges, tertials each with prominent pale yellow terminal spot on outer web; upper surface of tail blue-grey, becoming darker towards tip; underparts below bib bright yellow, large central area on abdomen burnt orange; iris dark olive-brown; bill black; legs greyish-brown to dark brown. Female is obscure-looking, but with diagnostic yellow

spotting on tertials (as in male) and scalloping on flanks; top of head olive-green with or without indistinct darker mottling, yellow on cap and sides of neck, rest of upper surface similar to that of male; cheek and ear-coverts grey, lightly mottled whitish, throat and bib (on upper breast) plain grey, lower breast and flanks yellow with dusky scalloping, abdomen yellowish-white with obscure dusky scalloping; iris brownish-grey; bill black; legs grey-brown to light brown or pale grey. Juvenile and immature are similar to female. **Voice.** Calls typically shrill and wheezy, and frequently uttered, including fine “tzee-tzee” and long fine wheeze, reminiscent of calls of a pygmy-parrot (*Micropsitta*); described also as a very high, drawn-out “sss” or “z-z-z”, similar to call of Cedar Waxwing (*Bombicilla cedrorum*).

Habitat. Montane forest, especially mossy forest; also visits disturbed and partly cleared habitat. Mainly between 2200 m and 2800 m, occasionally as low as 850 m and as high as 3650 m.

Food and Feeding. Diet as indicated by stomach contents entirely small fruits. Observed to probe a flower, and reported also as feeding on blossoms of a stinging tree. Fruits, from a variety of trees and shrubs, usually swallowed whole. Moves about in pairs, in small groups and in loose flocks of five to 30 or more individuals. Visits various fruiting trees, shrubs and plants, including *Schefflera*, a *Pipturus* tree and a *Nothocnide* vine. Forages mostly in canopy but also at middle level of forest, and occasionally in forest-edge shrubbery.

Breeding. Few data collected to date. In W part of range, two males with enlarged gonads in Oct and Feb; in E, males with enlarged gonads in Aug–Oct, female in breeding condition in Oct, and fledged young observed in Jul. Nest reported as cup-shaped, composed of moss; incubation said to be undertaken by both sexes; two fledglings seen to be fed by both parents. No other information available.

Movements. Resident; probably locally nomadic.

Status and Conservation. Not globally threatened. Generally common throughout range. No known threats, but some habitat loss in some parts of range.

Bibliography. Beehler (1988), Beehler *et al.* (1986), Coates (1990), Coates & Peckover (2001), Diamond (1972a), Frith & Frith (1992, 1993b), Gilliard & LeCroy (1961, 1970), Gyldenstolpe (1955a, 1955b), Majnep & Bulmer (1977), Mayr & Rand (1937), Salomonsen (1961b), Salvadori (1876), Thorpe (1975).

Genus *PARAMYTHIA* De Vis, 1892

2. Crested Berrypecker

Paramythia montium

French: Paramythie huppée **German:** Schopfbeerenfresser **Spanish:** Picabayas Crestado
Other common names: Mountain Berrypecker, Olivaceous Berrypecker (“*olivacea* group”)

Taxonomy. *Paramythia montium* De Vis, 1892, Mount Suckling, south-eastern New Guinea. Affinities of this genus and *Oreocharis* have long been uncertain; traditionally placed in flowerpecker family (Dicaeidae), and suggested by some authors as being aberrant bulbuls (Pycnonotidae); recently, both genera included with berrypeckers and longbills in family Melanocharitidae. Both, however, are well differentiated from these other families in external morphology and in aspects of nidification, and molecular-genetic analyses also support treatment as a separate family. Races form two groups, “*olivacea* group” (with *alpina*) in W and “*nominate* group” (with *brevicauda*) in E; these sometimes considered two separate species, and evidence of intergradation between the two groups is lacking, but specimens from area between Snow Mts and Star Mts of WC New Guinea required for further study. Subspecific separation of populations in Weyland Mts and Snow Mts region of W New Guinea has been considered inadvisable, and recognition of altitudinal race *alpina* therefore made with reservation; further analysis of specimens needed. Proposed race *occidentis* (from Hellwig Mts, on S slopes of Snow Mts) regarded as a synonym of *olivacea*. Four subspecies tentatively recognized.

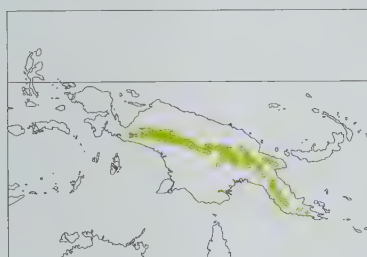
Subspecies and Distribution.

P. m. olivacea van Oort, 1910 – W New Guinea (Weyland Mts and Snow Mts).

P. m. alpina Salomonsen, 1961 – area surrounding Mt Wilhelmina (= Mt Trikora) and Mt Carstenz (= Mt Jaya), on upper slopes of Snow Mts (Nassau Range), in W New Guinea.

P. m. montium De Vis, 1892 – mountains of C, E & SE New Guinea (E from Star Mts).

P. m. brevicauda Mayr & Gilliard, 1954 – mountains of Huon Peninsula, in NE New Guinea.



Descriptive notes. 19–22 cm; 36–61 g. Highly distinctive passerine; feathers of crown elongated, forming flattened, erectile crest. Nominative race has forehead, forecrown, crest, face and bib on upper breast black, hindcrown to nape whitish to pale grey (usually partially covered by flattened crest, pale area appearing as contrasting long broad stripe extending backwards from above eye); upperparts and upperwing green, wingtip blackish-brown, tail blue-grey; ear-coverts, hindneck and underparts to belly blue-grey, area on flanks (often hidden under wing) and area on lower abdomen to undertail-coverts golden olive-yellow;

iris dark blue-grey to dark slate-brown; bill and legs black. Sexes alike, female on average smaller than male. Immature is much duller than adult, has hindneck and nape dark olive-green, as back, pale grey area on head confined to small patch above and back from eye; dull olive-tinged bluish-grey below, becoming blackish on upper throat and chin, feathers of abdomen fringed yellowish-olive, becoming dull olive-yellow ventrally. Race *brevicauda* is like nominate but with shorter tail; *olivacea* is distinctive, with longer crest, streak above eye to nape white, feathers of nape white basally with black tips, back olive-green, and flanks wholly greyish-blue; *alpina* is like previous but larger (male wing 112–123 mm, compared with 100–108 mm), with upperparts clearer green, less olive-green, juvenile largely grey below with black throat and pale whitish-yellow lower underparts. **VOICE.** Usual call in E of range a short low scratchy note, like sound made by dry leaves and twigs scraping together; also described as a faint squeaking, kissing or rasping note. Other calls include a nasal “swetch” and a very harsh “schhh”.

Habitat. Mossy montane forest, forest edge and alpine thickets; from c. 2150 m, mainly above 2450 m, up to tree-line at c. 3800–4100 m.

Food and Feeding. Food almost entirely small fruits of a variety of trees and shrubs; also fruits of umbrella trees (*Schefflera*), immature seed “cones” of *Dacrycarpus* species, and fruits/seeds of sedges (Cyperaceae). Insects recorded rarely in stomach contents; observed to devour contents of an arthropod cocoon. Nestling fed with fruit and insects. Fruits swallowed whole. Usually in pairs; also in loose parties of up to ten or more individuals, and sometimes in dispersed flocks of up to at least 75 birds. Flocks occasionally accompanied by mainly or partially insectivorous species, including Blue-capped Ifrit (*Ifrita kowaldi*), Black-throated Honeyeater (*Lichenostomus subfrenatus*) and Friendly Fantail (*Rhipidura albolimbata*). Active; ranges from canopy to shrubby levels, and occasionally descends to the ground. When feeding, takes only a few berries in one tree before moving on. Often explores ends of twigs acrobatically.

Breeding. Season Aug–Feb. Nest cup-shaped, bulky, deep, loose and untidy, composed of a coarse moss-like liverwort, or mosses, with some lichens and semi-woody stems throughout, scantily lined with fine grass stems, rootlets and semi-woody stems and a thick cushion of chaff from tree-ferns; placed 0.9–4 m above ground in dense branches of shrubby bush or sapling and supported on all sides by dense twigs, or in fork of lightly to densely foliated small sapling. Clutch 1 egg; incubation by female alone, period apparently more than 12 days; chick fed by both parents, no information on duration of nestling period.

Movements. Resident; perhaps locally nomadic.

Status and Conservation. Not globally threatened. Generally common, especially at higher elevations. Despite suffering some loss of habitat, present species is considered not to be at any immediate risk.

Bibliography. Beehler *et al.* (1986), Clapp (1986b, 1993), Coates (1973, 1990), Coates & Peckover (2001), David & Gosselin (2002a, 2002b), Diamond (1972a), Frith & Frith (1992, 1993b), Gilliard & LeCroy (1961), Gyllenstolpe (1955a), Hartert *et al.* (1936), Hopkins (1992), Mayr & Gilliard (1954), Mayr & Rand (1937), Mees (1964b), Rand (1936b, 1942b), Rand & Gilliard (1967), Ripley (1964), Rothschild & Hartert (1896a), Salomonsen (1961b), Sclater (1893), Sims (1956), Strange (2001).

Class AVES
Order PASSERIFORMES
Suborder OSCINES
Family DICAETIDAE (FLOWERPECKERS)



- Very small to small passerines, with short, sometimes rather deep bill, short tail, sometimes brightly coloured and occasionally with some iridescence.
- 7–13 cm.



- Oriental and Australasian Regions and south-west Pacific islands.
- Forests, including mangroves, occasionally scrub, plantations, gardens.
- 2 genera, 44 species, 147 taxa.
- 3 species threatened; none extinct since 1600.

Systematics

This family of small passerines is confined to the Oriental and Australasian zoogeographical regions, except for two species in the Solomon Islands. Which genera should be included in the family Dicaetidae, and to which other groups the family is related, have for long been matters of dispute among taxonomists.

In 1872, C. J. Sundevall grouped the flowerpeckers with the *Zosterops* white-eyes, some Neotropical honeycreepers of the family *Thraupidae*, the New World warblers (*Parulidae*) and the pardalotes (*Pardalotus*) in the “cohort Cichlomorphae”, on the basis of the bill form and the fact that all of these possess just nine long primaries. The sunbirds (*Nectariniidae*), however, he placed in another cohort, the “Cinnyrimorphae” or “Tubilingues”, along with four other families comprising other Neotropical honeycreepers (the nectarivorous tanagers), the Hawaiian honeycreepers (*Drepanididae*), Australian honeyeaters (*Meliphagidae*) and the sugarbirds (*Promerops*) of southern Africa, a grouping based on tongue structure and preferred diet. H. Gadow, writing a decade or so after Sundevall, also thought that the flowerpeckers were close to the *Zosteropidae*. R. B. Sharpe, on the other hand, placed the flowerpeckers in the *Fringilliformes*, and included within his family Dicaetidae an unlikely assortment of taxa. In addition to the two flowerpecker genera, *Prionochilus* and *Dicaeum*, he incorporated: the painted berrypecker genus *Oreocharis* (*Paramythiidae*); the *Melanocharis* and *Rhamphocharis* berrypeckers (*Melanocharitidae*); the waxbill genus *Parmoptila* (*Estrildidae*); the monospecific *Pholidornis*, which is of uncertain affinities but currently treated as a penduline-tit (*Remizidae*); the Hawaiian honeycreepers; the Central American *Pinaroloxias* (*Emberizidae*); and *Pardalotus*. Later, he removed the Hawaiian honeycreepers and the genera *Pholidornis* and *Parmoptila* from the Dicaetidae.

Some decades thereafter, in the 1940s, J. Delacour believed that the flowerpeckers were close to the nectariniid sunbirds, as did E. Mayr and D. Amadon. In 1953, W. J. Beecher placed the flowerpeckers with the sunbirds and white-eyes in a group that he termed the “sylvioid nectar feeders”, which he suggested as being derived from the bulbuls (*Pycnonotidae*); all of these he included in a large family *Sylviidae*. In J. L. Peters’s *Check-list of Birds of the World*, published in 1967, F. Salomonsen included the genera *Melanocharis*, *Rhamphocharis*, *Oreocharis*, *Paramythia* and *Pardalotus* with *Prionochilus* and *Dicaeum* in the Dicaetidae. In the following year, A. L. Rand and E. T. Gilliard

included *Rhamphocharis*, *Oreocharis* and *Paramythia* in the Dicaetidae, and W. S. Peckover and L. W. C. Filewood, in 1976, included these three genera along with *Melanocharis* in the family. The latter course was followed by B. M. Beecher and B. W. Finch in their 1985 New Guinea checklist.

With the advent, in the 1980s, of molecular-genetic methods of attempting to understand the relationships of living organisms, there have been numerous, and often surprising, revelations. Nevertheless, relatively little light has been shed on the affiliations of the flowerpeckers. C. G. Sibley and J. E. Ahlquist, from their studies based on analysis of DNA–DNA hybridization, placed the flowerpeckers in a tribe Dicaetini, containing only *Prionochilus* and *Dicaeum*, within a subfamily Nectariniinae of an enlarged family Nectariniidae, which included also a subfamily Promeropinae for the two sugarbirds. In this arrangement, the subfamily Nectariniinae contained a second tribe, the Nectariniini, for the sunbirds and spiderhunters. R. A. Cheke and C. F. Mann,



The two genera that form the Dicaetidae comprise 44 species of small, thick-necked, short-tailed, long-winged passerines. The less speciose genus is *Prionochilus*, with six species including this **Yellow-rumped Flowerpecker**.

Prionochilus flowerpeckers exhibit a few morphological differences from those of the sister genus *Dicaeum*. For example, their outer primary is long, rather than absent or vestigial as in *Dicaeum*. All *Prionochilus* have short, deep, broad bills, and a four-pronged tip to the tongue.

[*Prionochilus xanthopygius*, Samarakan, Bintulu, Sarawak, Borneo. Photo: Doug Wechsler/VIREO]

Dicaeum flowerpeckers are typically dumpy creatures with short legs. The size and shape of the bill vary across the genus: in some it is short and stout, while in others it is fairly long and slim, as in the case of the **Black-sided Flowerpecker**.

Plumage varies from being dull to brightly coloured, with some forms showing a single splash of vibrancy such as the scarlet throat and breast of this species. Some 16 *dicaeids*, including the **Black-sided Flowerpecker**, possess white pectoral tufts. Although frequently hidden away, they are important adornments used in display.

[*Dicaeum monticulum*, Kinabalu Park, Sabah, Borneo.
Photo: Jimmy Chew]

in their monograph dealing with all of these avian groups, followed the taxonomic treatment of Sibley and Ahlquist.

Clearly, there is still much to be learnt about the true affiliations of the flowerpeckers. In the meantime, and notwithstanding the limited genetic findings of recent years, it seems preferable to accord them a family of their own, Dicaetidae, a treatment preferred by most authors since the middle of the last century.

As currently constituted, the Dicaetidae consists of 44 species, divided between two genera. Interestingly, quantitative analyses of the vocalizations of flowerpeckers, carried out as part of a phylogenetic study by K. N. Iddi, indicate that the calls of the *Prionochilus* species fit into a separate clade from those of *Dicaeum* species. Iddi suggests that, on the basis of vocalizations, *Prionochilus* is the basal genus in the family.

The genus *Prionochilus* contains six species, occurring in South-east Asia, the Greater Sundas and the Philippines, one being restricted to Borneo and two to the Philippines. All have a short, broad and deep bill, with the nasal opening circular or oval, and non-operculate. The tongue forms an elongate, slightly concave triangle, the distal fifth of which is cleft, and each prong thus produced is split again over the distal half of its length, such that the tongue has a four-pronged tip. There are ten long primaries, as opposed to the nine possessed by *Dicaeum* flowerpeckers. The proventriculus of the Scarlet-breasted Flowerpecker (*Prionochilus thoracicus*) is markedly broader than the oesophagus, and is much thicker-walled, and the proximal part of the duodenum is quite narrow. As this observation is based on only one species, however, the genus will be difficult to characterize until further anatomical material becomes available. In terms of plumage characters, a white or pale malar stripe is exhibited by four of the six species, although only by the female of the Scarlet-breasted Flowerpecker, and is perhaps an ancestral character that has become lost in the other two species, namely the Yellow-rumped Flowerpecker (*Prionochilus xanthopygius*) and the Olive-backed Flowerpecker (*Prionochilus olivaceus*). As well as lacking a pale malar stripe, the Olive-backed Flowerpecker is the only member of the genus that does not have a red or orange crown patch in one or both sexes. Three species, the Palawan (*Prionochilus plateni*), Yellow-rumped and Crimson-breasted Flowerpeckers (*Prionochilus percussus*), share many characters and may constitute a superspecies, but there is some overlap in distribution in a few parts of Borneo, probably resulting from habitat destruction in recent decades.

Dicaeum, the other genus in the family, contains 38 species, with a total range covering tropical Asia, Wallacea, the New Guinea region and Australia. All except one have a vestigial tenth, outermost primary, the exception being the Yellow-bellied Flowerpecker (*Dicaeum melanoxanthum*), the tenth primary of which is more obvious but still very short. These species have the nasal opening oval and non-operculate. The bill is often short, deep and broad, but it may be narrow, or much less deep, and in some cases it is decurved. At least four tongue types are recognizable, with some slight intraspecific variation. The Bicoloured (*Dicaeum bicolor*), Thick-billed (*Dicaeum agile*), Yellow-sided (*Dicaeum aureolimbatum*) and Grey-sided Flowerpeckers (*Dicaeum celebicum*) have a broad, flat, slightly concave, two-pronged non-tubular tongue. The Red-striped (*Dicaeum australe*), Yellow-bellied and Buzzing Flowerpeckers (*Dicaeum hypoleucum*), on the other hand, have a narrow to medium-broad tongue, with the lateral edges curled inwards and forming a tube on each side of the flat central plate, the distal end of which extends to form two prongs. The tongue of the Olive-capped Flowerpecker (*Dicaeum nigrilore*) is narrow, four-pronged, and with the outer edges fringed with fine hairs (fimbriated). The fourth type, a long, narrow tubular tongue with the distal third bifurcated to form two incomplete tubes, is possessed by the Orange-bellied (*Dicaeum trigonostigma*), Flame-breasted (*Dicaeum erythrothorax*), Blood-breasted (*Dicaeum sanguinolentum*), Pygmy (*Dicaeum pygmaeum*), Midget (*Dicaeum aeneum*) and Scarlet-backed Flowerpeckers (*Dicaeum cruentatum*). This marked variation in tongue structure suggests that the members of this genus as currently constituted do not form a natural group, and that *Dicaeum* should be split into perhaps four or more genera, but lack of comprehensive anatomical material precludes such a move at present.



Otherwise, the proventriculus is broader than the oesophagus, but, unlike the condition in *Prionochilus*, is not noticeably thickened. The proximal part of the duodenum is considerably broader than that of *Prionochilus*, but this observation is based on examination of only one species, the Mistletoebird (*Dicaeum hirundinaceum*).

The relationships of the 14 recognized taxa that together make up the Thick-billed and Brown-backed Flowerpeckers (*Dicaeum everetti*) are problematic. One form, the subspecies *finschi* of the Thick-billed Flowerpecker, could perhaps be raised to species rank, or all 14 forms could be considered conspecific. The latter solution, however, would seem unacceptable owing to the apparent sympatry of the subspecies *modestum* of the Thick-billed Flowerpecker with Brown-backed Flowerpeckers of the race *sordidum* in Peninsular Malaysia and of the nominate race in Borneo. The subspecies *bungurensis* of the latter is somewhat intermediate between the two species. The three Philippine subspecies of the Thick-billed Flowerpecker, *aeruginosum*, *affine* and *striatissimum*, were previously separated at the species level, as the "Striped Flowerpecker".

Two forms of the Plain Flowerpecker (*Dicaeum concolor*), the nominate race of south-west India and *virescens* of the Andaman Islands, are rather distinctive and may perhaps represent separate species. Indeed, this was the treatment preferred by P. C. Rasmussen and J. C. Anderton in their 2005 work on the birds of the Indian Subcontinent, in which the remaining five subspecies are treated under the name of "*D. minullum*".

Relationships among the species in this genus are not always clear. The Whiskered (*Dicaeum proprium*), Yellow-vented (*Dicaeum chrysorrheum*), Yellow-bellied and White-throated Flowerpeckers (*Dicaeum vincens*) appear not to be particularly close, although a relationship between the last two has been suggested on the grounds of their superficial plumage resemblance. The Yellow-bellied Flowerpecker, however, is much larger than all other flowerpeckers, and, as stated above, it is unique within the genus in having an obvious, albeit rather small, tenth primary. The Yellow-sided and Olive-capped Flowerpeckers exhibit some resemblances to each other in plumage, but they differ markedly in bill shape and tongue structure.

A group of six species is confined to the Philippines, and all appear to be closely related. These are the Flame-crowned (*Dicaeum anthonyi*), Bicoloured, Cebu (*Dicaeum quadricolor*), Red-striped, Black-bellied (*Dicaeum haematostictum*) and Scarlet-collared Flowerpeckers (*Dicaeum retrocinctum*). The Bicoloured and Cebu Flowerpeckers could be considered as one

superspecies, and the last three as another, although the bill shape of the Scarlet-collared Flowerpecker is rather different from that of the others.

Far more widespread in its distribution, the Orange-bellied Flowerpecker consists of 17 subspecies in two groups, one in mainland southern Asia and the Sundas and the other in the Philippine Islands. The species perhaps evolved in the Philippines, which is its area of greatest differentiation, and spread from there westwards through Borneo to other parts of the Sundas and to mainland southern Asia as far west as Bangladesh. It does not appear to be very close to any other members of the genus. On the other hand, the allopatric Buzzing and Plain Flowerpeckers are possibly closely related to each other, one subspecies of the former being particularly similar to the latter in plumage. The Pale-billed Flowerpecker (*Dicaeum erythrorhynchos*) may also be closely allied to these, but it has a markedly downcurved bill. The Pygmy Flowerpecker, however, appears not to have any close relatives.

The allopatric Crimson-crowned (*Dicaeum nehrkorni*), Flame-breasted, Ashy (*Dicaeum vulneratum*), Olive-crowned (*Dicaeum pectorale*), Red-capped (*Dicaeum geelvinkianum*), Louisiade (*Dicaeum nitidum*), Red-banded (*Dicaeum eximium*) and Midget Flowerpeckers constitute a well-marked superspecies from the region bounded by Wallacea, New Guinea and the Solomon Islands. Some authorities would accept fewer species. Males of all eight have some red on the breast and, in some species, also on the crown and/or rump. The bill varies from being short and stout to being of medium length and rather slender, and that of one species, the Flame-breasted Flowerpecker, is slightly decurved. Eastwards from this region, on the island of San Cristobal, in the south-easternmost Solomons, is found the Mottled Flowerpecker (*Dicaeum tristrami*), a relatively dull, mainly brownish species with no bright colours in its plumage. It has the most easterly distribution of all members of the genus, and has no obvious close relatives.

In the Lesser Sundas, the Black-fronted (*Dicaeum igniferum*) and Red-chested Flowerpeckers (*Dicaeum maugei*) constitute a further superspecies. The former has a longish, slender bill and the latter a short bill of medium thickness. The males of both species have plumage colours of black, white and red, whereas the females are more greyish and brownish, having less black and less red.



This **Yellow-bellied Flowerpecker** is a good example of the more brightly coloured group of *Dicaeum* flowerpeckers. In this species, the male's head, mantle and wings are blue-black, slightly glossy in suitable light, while the bright yellow belly, flanks, vent and undertail-coverts are offset by a greyish-black breast and throat sides and a white centre to the breast and throat. Females are similar but duller. Iris colour varies considerably across the genus, being white, yellow, orange, hazel, brown or, as here, a deep chestnut.

[*Dicaeum melanoxanthum*, Zhang Mu, Xizang, China. Photo: Dong Lei]

There has been little consensus among taxonomists over species limits within the next superspecies, which ranges from the Himalayas eastwards to Australia. Here, five species are involved: the Fire-breasted (*Dicaeum ignipectus*), Black-sided (*Dicaeum monticolum*), Grey-sided and Blood-breasted Flowerpeckers, and the Mistletoebird. The bills of these five vary from short to medium in length, and from slender to medium in thickness. Marked racial differences exhibited by some of the species suggest that further splitting would be appropriate; on the other hand, some authorities may consider that all five species should be merged into one.

Although the Scarlet-backed Flowerpecker and the Scarlet-headed Flowerpecker (*Dicaeum trochileum*) have similar bills



Several species of *Dicaeum* flowerpecker have rather dull-coloured plumage, but none is more aptly named than the **Plain Flowerpecker**.

While this species is not quite as concolorous as its scientific name implies, it nevertheless has an uninspiring combination of olive-grey upperparts and yellowish-buff underparts. Its seven subspecies are spread across a vast swathe of Asia, but differ in little more than plumage tone, the brightest being the race virescens of the Andaman Islands. Intriguingly, *Dicaeum* flowerpeckers exhibit four distinct tongue types, suggesting that more than one genus may actually be involved.

[*Dicaeum concolor concolor*, Bondla, Goa, India. Photo: Jussi Vakkala]

The **Orange-bellied Flowerpecker** is one of the more brightly coloured members of the family. Its range extends from Bangladesh down through the Malay Peninsula to the Greater Sundas and the Philippines. Such an expansive distribution, encompassing so many islands, has resulted in significant differentiation at subspecies level. Altogether 17 races are recognized, some endemic to specific islands and others to archipelagos or island groups. These taxa fall into two broad groups: the "dorsale group" in the Philippines and the "nominale group", to which the bird seen here belongs.

[*Dicaeum trigonostigma dayakanum*,
Sinsuron Road,
Crocker Range Park,
Sabah, Borneo.

Photo: D. Wechsler/VIREO]



and share some plumage characters, they are perhaps not sufficiently closely related to warrant recognition as a superspecies. Moreover, although their ranges are largely discrete, there is some overlap in distribution in the Sundas, which may be a phenomenon of recent origin. As a point of interest, these two species have hybridized in the wild in Borneo, and the Scarlet-backed Flowerpecker has hybridized also with the Fire-breasted Flowerpecker in south-east China, but it is difficult to evaluate the significance of such events.

There is clearly a need for much research on the systematics and relationships of the Dicaetidae. As further studies are conducted, and additional genetic data are uncovered, it seems very

likely that several modifications will be made in the classification of these interesting birds.

Morphological Aspects

The family contains 44 species of very small to small, short-necked, arboreal oscine passerines ranging in length from about 7 cm to 13 cm, and in mass from approximately 4 g to 13 g. The flowerpeckers have rather long wings. The outermost primary of the *Prionochilus* species is long, whereas that of the Yellow-bellied Flowerpecker is present but very short, and that of all other *Dicaeum* species is only vestigial. The tail is rather short, and never elongated, measuring about 18–24 mm in *Dicaeum* species except for the larger Yellow-bellied Flowerpecker, which has a tail of up to 47 mm; the tail of *Prionochilus* is up to 33·5 mm long. The number of rectrices varies from eight to twelve.

The legs of all flowerpeckers are short. The bill is generally rather short, serrated distally, frequently broad, deep and blunt, but in some cases thinner and much less deep, and occasionally slightly downcurved. The shape may even vary somewhat among different subspecies of a species, as illustrated by the Thick-billed Flowerpecker. The nasal opening is circular or oval, and non-operculate, but partly covered by a membrane. Rictal bristles are very short. The tongue generally forms an elongate, flattened, slightly concave, two-pronged or four-pronged triangle, that of some of the species being more tubular. Details of the tongue and variations in its morphology, have already been given (see Systematics). Tongue and bill shapes are obviously adaptive, and presumably polygenic. Tongue shape would also be influenced by bill shape, such that a narrow bill would result in a narrow tongue.

Although their diet contains other items, such as invertebrates (see Food and Feeding), almost all flowerpeckers seem to be closely associated, at least part of the time, with mistletoes (Loranthaceae), of which they eat the fruit and probably other plant parts. The birds have a blind-ending stomach, the muscular lower part of which, the ventriculus, or gizzard, can be closed off by a sphincter. Arthropod food passes from the oesophagus through the glandular first part of the stomach, the proventriculus, and into the ventriculus for muscular and peptic digestion.

While some flowerpeckers are brightly coloured and others dull, a large majority of family members combine both traits by being sexually dimorphic. In such species, males have the bright garb, often in complex patterns, while the females are relatively non-descript. The **Fire-breasted Flowerpecker** is a good example. The male (left) is responsible for the species' English name, several races having flaming red on the breast, as well as on the tips of some throat feathers. The pinkish-buff belly is bisected by a fairly broad black stripe. The crown and upperparts are an iridescent blue-black, turning to black on the ear-coverts and the sides of the neck and breast. The female (right) is a much plainer bird, with a greyish-olive head, olive mantle and yellowish-buff underparts.

[*Dicaeum ignipectus formosum*,
Lishan, Taiwan.
Photos: Penshing Liao]



The proventriculus in *Prionochilus* is noticeably broader and thicker-walled than the oesophagus, whereas, in *Dicaeum*, it is similarly broader but its walls are not noticeably thicker than those of the oesophagus, and the proximal part of the duodenum is very much broader than that of *Prionochilus*. In both genera, mistletoe berries are swallowed whole and the viscous seeds bypass the ventriculus, which is closed by the sphincter, and pass directly from the proventriculus to the duodenum, and, aided by the laxative effects of the berries, complete their journey through the gut in a few minutes. Such an adaptation is found also in unrelated birds, such as some meliphagid honeyeaters, that feed in extensively on mistletoes.

Whereas the plumage of some flowerpeckers may be dull, many members of the family have bright coloration, occasionally with iridescence, and many species are sexually dichromatic. There appear not to be any seasonal differences in plumage. Sexual dichromatism is marked in 27 species, examples being the Crimson-breasted Flowerpecker in *Prionochilus* and the Cebu and Scarlet-backed Flowerpeckers in *Dicaeum*. The females are much less brightly coloured, and often the complexity of patterning is reduced, as are iridescence and areas of red. With three further species, the Golden-rumped (*Dicaeum annae*), Whiskered and Pygmy Flowerpeckers, the phenomenon occurs but is not so obvious. The remaining 14 species exhibit no sexual dichromatism.

Juvenile plumage of seven species is unknown. In some cases, where there is no sexual dichromatism, as with the Thick-billed and Pale-billed Flowerpeckers, differences from the adult plumage are slight, the juvenile being somewhat duller, whereas in others, such as the Red-striped and Black-belted Flowerpeckers, the differences are more pronounced. Where sexual dichromatism exists, the juvenile may be quite similar to the female but usually duller, as with the White-throated, Cebu and Orange-bellied Flowerpeckers. Among some species displaying marked sexual dichromatism, however, the juvenile may differ significantly from both sexes, as demonstrated by the Scarlet-breasted, Crimson-crowned and Ashy Flowerpeckers.

Pectoral tufts, invariably white, have been recorded as present on both sexes of five species, namely the Thick-billed, Red-striped, Black-belted, Black-sided and Blood-breasted Flowerpeckers. For eleven species, among them the Crimson-breasted



Flowerpeckers are not renowned for their vocal talents. While this may partly reflect the paucity of studies of their vocalizations, it does appear that their relative silence reflects a real phenomenon. The song of the **Red-chested Flowerpecker** is relatively simple, comprising two or three high-pitched whistles, and this can be considered fairly typical for the family. Along with the **Black-fronted Flowerpecker** (*Dicaeum igniferum*), this species forms a superspecies endemic to the Lesser Sundas.

[*Dicaeum maugei maugei*, West Timor, Indonesia. Photo: Morten Strange]

and Yellow-rumped Flowerpeckers in *Prionochilus* and the Scarlet-backed and Scarlet-headed Flowerpeckers in *Dicaeum*, pectoral tufts, again white, have been recorded on males only. Since these tufts are sometimes rather difficult to detect, they may be found to be more widespread in occurrence among the Dicaeidae.

Iris colour sometimes differs between the sexes, and varies from white to various shades of yellow, orange, red, chestnut, brown or hazel; in one species, the Blood-breasted Flowerpecker, some individuals have a blue iris. Most flowerpeckers have a dark bill, brown, grey, black or blue in colour, sometimes with a pale base of the lower mandible, but the bill of the Pale-billed Flowerpecker is, as the species' vernacular name suggests, pale



Most flowerpecker calls are simple in form, comprising one or two notes. Some species' calls are loud and strident, others are thin and high-pitched, and yet others staccato or rasping. That of the **Buzzing Flowerpecker** is—as its name hints—a high-pitched buzz. This may be given as a single note, or in a short series. Either version may be the precursor to a rapid trill, interspersed with metallic notes. The Buzzing Flowerpecker is a rather drab species, its plumage tone varying among the five subspecies, although all share the broad pattern of dark upperparts and pale underparts.

[*Dicaeum hypoleucum pontifex*, Baracatan, Davao, Mindanao, Philippines. Photo: Doug Wechsler/VIREO]

horn, with the base of the lower mandible pinkish-flesh. The legs of dicaetids are generally dark, being various shades of horn, brown, grey, black or blackish-green. Those of the Cebu Flowerpecker are reported as changing from glossy black in the non-breeding season to pink when breeding.

Few data are available on moult. In the Mistletoebird, there is a partial post-juvenile moult into an adult-like first immature plumage, the extent varying individually. It is followed at about the age of one year by a moult into complete adult plumage.

Habitat

Flowerpeckers can be found in a wide variety of well-vegetated habitats, no members of the family being particularly specialized in this respect or being reliant upon any restricted habitat type. Flowers and fruits are the main, and in some species perhaps almost exclusive, food sources for these passerines, and any plants that can supply these needs may be utilized.

Five of the 44 species are recorded only from lowlands, with no specific altitudes documented. These are the Palawan, Cebu, Louisiade, Midget and Scarlet-headed Flowerpeckers. Eight species, among them the Olive-backed, Crimson-breasted and Brown-backed Flowerpeckers and the Mistletoebird, are found from sea-level to 1000 m or so, and a further three, the Scarlet-breasted, Black-belted and Scarlet-collared Flowerpeckers, are recorded at up to 1250 m. Seven dicaetids, of which the Yellow-breasted (*Prionochilus maculatus*), Orange-bellied and Buzzing Flowerpeckers are examples, occur at sea-level and upwards, and reach their maximum altitude between 1500 m and 1800 m. Ten others, including the Yellow-vented, Pygmy and Blood-breasted Flowerpeckers, extend from sea-level to between 2100 m and 2350 m. The Thick-billed Flowerpecker, however, breeds at all elevations from sea-level to 3000 m, although it is normally found below 975 m in the non-breeding season, while the Plain Flowerpecker has an even greater range, occurring from sea-level to 3700 m.

Only seven species of flowerpecker have not been recorded down to sea-level. The Crimson-crowned Flowerpecker lives at 600–2400 m, the Flame-crowned at 800 m to at least 2000 m, and the Black-sided at 460–2500 m, while the Whiskered

Flowerpecker is found only above 900 m, the Olive-capped from 900 m to at least 1600 m and the Fire-breasted at 600–4000 m; the Yellow-bellied Flowerpecker occurs at 1000–4000 m, but in winter is found down to 775 m.

Although flowerpeckers occupy a variety of vegetated habitats, the majority of the species have a fondness for mistletoes, which they utilize as a food source. In return, the birds are important to these parasitic plants for pollination and seed dispersal, both genera of flowerpeckers having the digestive tract adapted to deal with mistletoe berries (see Morphological Aspects).

A wide range of pristine habitats and also those influenced by man is utilized by the family as a whole. All species are known to exploit one or more different forest types, depending on their geographical and altitudinal distributions. Lowland dipterocarp forest harbours at least seven species, including Yellow-breasted and Plain Flowerpeckers. Lower montane forest is home to at least eight dicaetids, including the Blood-breasted and Grey-sided Flowerpeckers, and upper montane and moss forests provide habitat for a further six, among them the Crimson-crowned and Flame-crowned Flowerpeckers. Alluvial forest has five species, including Yellow-vented and Scarlet-backed Flowerpeckers. Peatswamp-forest has seven species, examples being the Yellow-breasted, Yellow-rumped and Thick-billed Flowerpeckers, and a further six are found in mangroves, among them the Thick-billed Flowerpecker and the Mistletoebird. Six members of the family occur in heath forest, two examples being the Yellow-rumped and Black-sided Flowerpeckers. Deciduous or semi-deciduous forests are likewise the recorded habitat of six species, including the Golden-rumped and Pale-billed Flowerpeckers. Some forest types would appear to be less suitable for flowerpeckers. Thus, paperbark (*Melaleuca*) forest harbours only one species, the Orange-bellied Flowerpecker; pine forest also has just one, the Yellow-bellied Flowerpecker; and upland forest on ultra-basic soil has only the Scarlet-breasted Flowerpecker. Ashy and Black-fronted Flowerpeckers are the only members of the family found in coastal forest other than mangroves.

Various types of woodland are occupied by six species, including the Golden-rumped and Red-chested Flowerpeckers. In Australia, the only flowerpecker present, the Mistletoebird, occurs in both mulga (*Acacia*) and mallee (*Eucalyptus*) woodlands, as well as in other habitats. Four dicaetids can be found in coconut



For such a wide-ranging family whose members are often relatively abundant, the biology of the Dicaetidae has been poorly studied. This generalization extends to the diet. Of the 44 species of flowerpecker, 27 have been observed to feed on fruit, particularly berries, but the others are simply conjectured to do so. The **Crimson-breasted Flowerpecker** falls into the first group. It commonly feeds on the purple berries of *Melastoma*, as here, crushing them before consumption. It also makes use of its strong bill to pierce figs (*Ficus*) and the fruit of *Eugenia* shrubs prior to sucking out and consuming their edible contents.

[*Prionochilus percussus*
ignicapilla,
Panti forest,
Johor, Malaysia.
Photo: Ong Kiem Sian]



The large, curved bill of the **Yellow-vented Flowerpecker** enables it to feed on relatively larger fruits than many of its congeners. Like many dicaeids, this species feeds on the fruits of small figs (*Ficus*) and mistletoes (*Loranthaceae*). It also seeks out berries of *Muntingia calabura*, a Neotropical tree that has been naturalized in Asia because of its edible fruits. This flowerpecker is not entirely vegetarian, however, since it is also adept at catching and consuming small insects such as beetles (*Coleoptera*).

[*Dicaeum chrysorrheum chrysorrheum*,
Taman Negara, Malaysia.
Photo: Ong Kiem Sian]

groves; these are the Thick-billed, Red-striped, Black-belted and Scarlet-collared Flowerpeckers. Stands of bamboo are known to harbour one species, the Red-chested Flowerpecker, but no others. Savanna and similar rather open country is utilized by six species, examples being the Red-striped Flowerpecker and the Mistletoebird, but no member of the family is confined to open country.

More than 30 species are known to occur at forest edges and clearings, examples being the Olive-backed, Brown-backed, Whiskered, Red-striped, Black-belted, Scarlet-collared, Ashy and Mottled Flowerpeckers and the Mistletoebird. Secondary forest and other secondary habitats harbour 26 species, among which are the Palawan, Bicoloured, Plain, Pygmy and Scarlet-backed Flowerpeckers. Cultivation, including plantations and gardens, are exploited by some 25 members of the Dicaeidae, including the Yellow-sided, Red-capped, Black-fronted, Red-chested, Fire-breasted, Grey-sided, Blood-breasted, Scarlet-backed and Scarlet-headed Flowerpeckers.

Some habitats appear to be less attractive to this family, suitable evidently for only few of its species. Riverine vegetation away from forests is one such habitat, used by the Flame-breasted Flowerpecker. Beach vegetation and casuarina (*Casuarina*) groves attract the Scarlet-breasted Flowerpecker, and casuarina is a habitat also of the Blood-breasted Flowerpecker. Scrub hosts only Yellow-breasted, Flame-breasted and Crimson-breasted Flowerpeckers.

Little information has been documented with regard to the intraspecific and interspecific behaviour of flowerpeckers. There appears to be very little known about the ways in which flowerpeckers may partition the habitat in places where two or more species occur together.

General Habits

Although often common, flowerpeckers seem not to attract very much attention from ornithologists in the field. Many members of the family spend much time in the canopy. They are small and constantly on the move, as a result of which little has been recorded about the behaviour of most species.

Flowerpeckers are arboreal and diurnal, generally restless and active, ceaselessly flitting in or around foliage, and are rarely still for any period. Although often stated to prefer the canopy, almost all species for which relevant observations exist are known to forage also at other levels, even in low vegetation. The flight is high and rapid, frequently dipping in a rather erratic manner.

Dicaeids are encountered singly, in pairs or in small groups. Almost half of the family's species are frequently observed as pairs, but in two of these, the Fire-breasted Flowerpecker and the Mistletoebird, usually only during the breeding season. Of these, the Scarlet-backed is described as being aggressive, suggesting that it is territorial, but evidence of territoriality is absent for all others except the Pale-billed Flowerpecker, which defends a feeding territory. The latter species may form parties of up to ten or more individuals during the winter, and the Mistletoebird occasionally forms "large flocks", especially around food sources. The Yellow-bellied Flowerpecker, on the other hand, is described as being elusive and solitary, and is the only member of the family to fall in this category. Many of the flowerpeckers will join other species in loose mixed feeding groups (see Food and Feeding).

Non-breeding Mistletoebirds in Australia are highly nomadic, and solitary males may be encountered even during the breeding season. Furthermore, this species can become torpid in cold weather, a phenomenon that has so far not been recorded for any other species in this family.

Both the Yellow-vented Flowerpecker and the Scarlet-backed Flowerpecker are noted as being aggressive. In addition, interspecific competition is surmised as occurring among a few species. The Cebu Flowerpecker, a Critically Endangered species (see Status and Conservation), is thought to be threatened by competition from the much more aggressive Red-striped Flowerpecker. In Sulawesi, the Grey-sided Flowerpecker is aggressive towards the Yellow-sided Flowerpecker, and displaces it from foraging bushes in degraded habitats; the two species are mutually aggressive, and the former apparently has a less upright posture than does the latter. The Blood-breasted Flowerpecker is thought to be displaced by the Black-fronted and Red-chested Flowerpeckers in the lowlands of the Lesser Sunda.

Frugivores play an essential role in the ecosystem by dispersing plant seeds. The flowerpeckers' role is particularly important for at least twelve genera of mistletoe (Loranthaceae), since the intestinal tract of the birds is adapted to allow mistletoe seeds to pass quickly and unaltered through the digestive system. Studies of the relationship between the **Mistletoebird** of Australia and the grey mistletoe (*Amyema quandang*) have revealed that more than four-fifths of all seeds excreted by this species germinate successfully.

[*Dicaeum hirundinaceum*
hirundinaceum,
You Yangs,
Victoria, Australia.
Photo: Peter Fuller]



As a final point of interest, the Thick-billed Flowerpecker wags its tail from side to side when perched, a useful identification feature that appears not to have been observed for any other flowerpecker species.

Voice

As members of this family are not known for their vocal expertise, and because they are not skulking birds necessitating a knowledge of their vocalizations for identification or in order to draw them out from cover, little work seems to have been done on this aspect of their biology. Exceptions to this general statement include studies of the Mistletoebird's varied repertoire, carried out by N. Reid, and quantitative analyses of vocalizations of flowerpeckers, undertaken as part of a phylogenetic study by Iddi (see Systematics).

Most dicaeid calls that have been described are single or double notes, modified by such adjectives as loud, high-pitched, thin, sharp, rasping, strident, insect-like, buzzing, harsh, staccato and the like. Examples include a single buzzing note and a downslurred "bszzrt", given by the Red-capped Flowerpecker, a single "tzick" by the Red-banded Flowerpecker, a single loud "peeit" or "peeith" and a high "tsoot-eet" with rising second note, both uttered by the Olive-backed Flowerpecker, and a "swit" or "swit-szee", emitted by the Orange-bellied Flowerpecker.

Longer calls, or more continuous vocalizations, often interpreted as songs, have been noted for many species. The following are just some examples. The Yellow-rumped Flowerpecker produces seven to nine fast descending staccato notes, and the Golden-rumped Flowerpecker gives repeated, thin "see" notes all on the same pitch, the last three longer and more widely spaced. The song of the Whiskered Flowerpecker is described as consisting of rather buzzy high "swink" or "chenk" notes, which may be run together, some notes then rising and some falling. That of the White-throated Flowerpecker is said to be a series of two to four very high-pitched thin notes alternating in pitch, "tink-tuk-tink"; an ascending "keek-keek" ending with "tit-tiri-tit-tiri" and a rapid, irregular descending trill have also

been described for this species. The Olive-capped Flowerpecker delivers a rapid, rising and falling, high-pitched trill of about thirty notes, some rather sweet and described as being untypical for a flowerpecker. The song of the more familiar Orange-bellied Flowerpecker is a high-pitched rapid "sissipping", described also as an evenly rising series of rapid, very high

While berries and other small fruits probably form the bulk of most dicaeid diets, those with relatively hefty bills will tackle larger fruits, from figs (*Ficus*) upwards. The stronger the species' bill, the easier it is to penetrate the skin of large fruits, squeeze or suck out the contents, and discard the skin. The **Yellow-breasted Flowerpecker** is one of the stronger-billed species. It is adapted to feed on a wide variety of fruits, in addition to the nectar and pollen of mistletoes and probably the pollen of *Eugenia dyeriana* (*Myrtaceae*), a plant endemic to Malaysia.

[*Prionochilus maculatus*
oblitus,
Taman Negara, Malaysia.
Photo: Ong Kiem Sian]





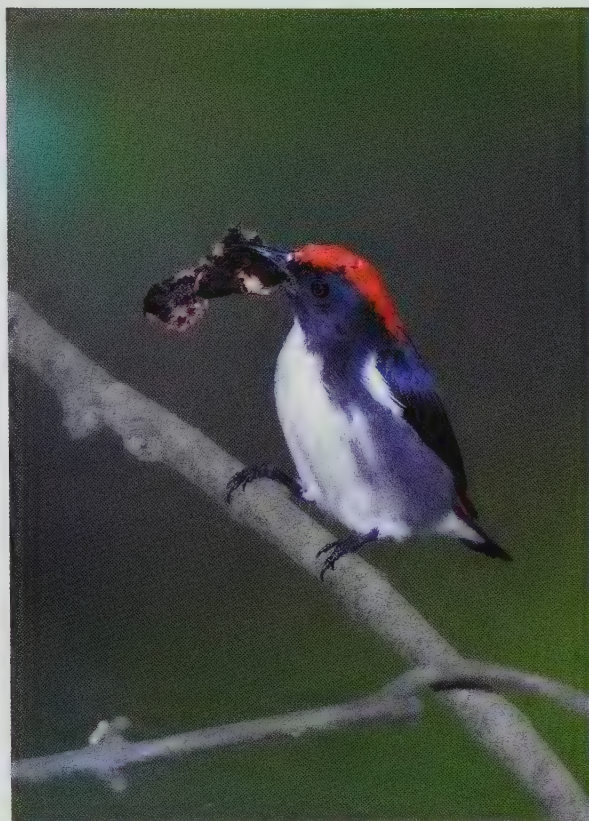
The action seen here might easily be misinterpreted. At first glance, it may look as though this male **Black-sided Flowerpecker** has lost control of the berry it was about to eat. Instead, it is actually using its strong, slim bill to good effect with considerable skill. Having picked the berry, the flowerpecker manipulates it with its bill, turning it to extract the fleshy pulp within. Once all the nutritional benefit has been procured, the bird has no further use for the relatively indigestible skin, so it drops it. The **Black-sided Flowerpecker** is not solely a frugivore. It is one of just three members of the family that has been recorded consuming seeds. It forages mostly at lower levels in the forest, which has enabled researchers at ground level to record the animal elements of its calorie intake. Insects, such as aphids (*Aphidoidea*), flies (*Diptera*) and leafhoppers (*Homoptera*), have all been found to form part of this bird's diet.

[*Dicaeum monticolum*,
Kinabalu Park,
Sabah, Borneo.
Photos: Doug Wechsler/
VIREO]



The **Scarlet-backed Flowerpecker** is an adaptable forager. This male has just chanced upon a comparatively large fruit, but the species more commonly consumes smaller items such as berries of *Muntingia calabura*, *Melastoma malabathricum*, figs (*Ficus*) and mistletoes (*Loranthaceae*). It also flycatches for insects from a perch, and consumes seeds and nectar. It inhabits a range of forest types from mangroves to heath forest, as well as scrubby areas and even gardens. It will feed in all strata, and does so most frequently in pairs or family parties.

[*Dicaeum cruentatum ignitum*,
Bukit Timah
Nature Reserve,
Singapore.
Photo: Jimmy Chew]



upslurred "psee" notes followed by a sharp, high, metallic "ptit-ptit-ptit-ptit", and as a high, slightly descending "tsi-si-si-sew..."; other song types of this species include a slower version of the last, an evenly descending series of notes, and a three-note version with the middle note the lowest. The Black-fronted Flowerpecker has a song described as a very rapid, descending series of short, thin, dry notes, the series lasting for about 6 seconds. Many species in this family produce trills, or

rapidly repeated call notes in various combinations, that could be interpreted as songs.

Among species with an extensive geographical distribution, differences in song have been noted from one part of the range to another. The song of the Plain Flowerpecker, for example, is a high-pitched trill, but in Laos it is described as a very high, thin "tsit tsit tsit-si-si-si", repeated every few seconds; farther west in south-west India, it is reported as a very high, thin, short trill "tseep tsip-tsip-tsip", and a very short, strongly descending "tse'e'e'ep" trill, whereas the song of this species in the Andaman Islands is an extremely high musical "sit sew, sit sew, sit sew..." and very short, more buzzing notes mixed with calls.

The most intensively studied flowerpecker, the Mistletoebird, has a considerable range of vocalizations. This is, however, probably a reflection of the fact that it has received much greater attention than has been paid to any other member of the family, and it is quite possible that other dicaetids, when equally well studied, will prove to be as vocally variable and versatile as this Australian species. Along with a variety of single-note, double-note and triple-note calls, some given in flight, a number of different song types have been identified for the Mistletoebird. One, given by both sexes, is "wissweet... wissweet..." or "wit-wissweet... wit-wissweet...", usually repeated. The song by territorial males on high perches is a clear, penetrating "kinsey kinsey kinsey" or "wicky wicky wicky", or sometimes "swizit swizit, weet weet swizit" or "witsoo witsoo witsoo...", wiss wiss wiss". In addition, the Mistletoebird delivers a soft warbling song which incorporates much mimicry, including imitations of the Mulga Parrot (*Psephotus varius*) and of at least 28 species of passerine. Subsong, alarm calls and distress trills have also been recorded.

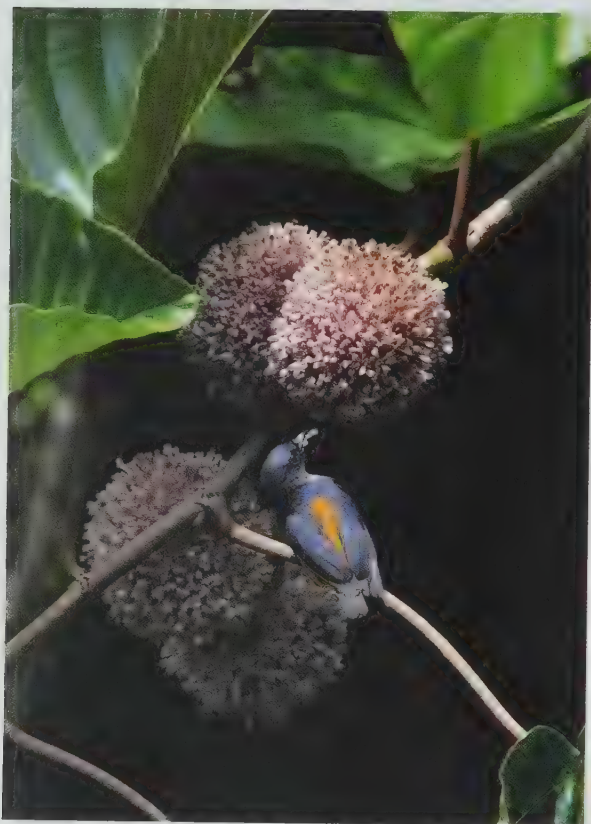
Food and Feeding

The Dicaetidae forage in vegetation at all levels, but in forest they are most frequently recorded in the canopy. Although occasionally seen alone, they are more often encountered in pairs or in small groups, but some, such as the Thick-billed Flowerpecker, are found in parties containing as many as 30 individuals, and a flock of 32 Orange-bellied Flowerpeckers, including nine depend-

Flowerpeckers feed extensively on fruit, but many are known to exploit other plant parts. Ten species have been recorded drinking nectar, and four are known to feed on pollen. These habits are recognized in the birds' common name, since the birds appear to peck at flowers. Endemic to the Philippine island of Mindanao, the **Olive-capped Flowerpecker** is among the poorly known members of its genus, and there is no solid information on its foraging preferences. Its diet is conjectured to include the nectar, pollen and fruits of mistletoes (*Loranthaceae*).

[*Dicaeum nigrilore*,
Mindanao, Philippines.
Photo: Ketil Knudsen]





end first. After consuming three or four berries, the bird rests for a few minutes, with its feathers puffed out. The slimy, sticky seeds then pass out of the cloaca, again broad end first, on to a branch, to which they stick as the flowerpecker jerkily frees itself of the sticky mass. The Grey-sided Flowerpecker squeezes the seeds out of larger fruits, such as cherries (*Prunus*), before swallowing the pulp, whereas smaller fruits it swallows whole. It then wipes its bill on a branch.

Mistletoe fruits are swallowed whole by the Mistletoebird. They enter the intestine rapidly after bypassing the ventriculus, which is closed by means of a sphincter. The seeds of the grey mistletoe (*Amyema quandang*), a species which fruits continuously in South Australia, are excreted at a rapid rate, and many at first adhere to the cloacal region, before the Mistletoebird wipes its lower body on a branch. By making small sideways jumps, the bird detaches itself from the thread that sticks the seeds to a branch. Many seeds may be linked together by these gelatinous threads. The germination rate of seeds passed in this manner is very high, with an average of 85%, and 43% seedling survival, in various studies. In one study at Brookfield, in South Australia, germination rates of seeds thus expelled were 93–100% and 82% of the resultant seedlings survived for three months or longer. For comparison, it is worth mentioning that only 31% of *Amyema quandang* seeds eaten by the Spiny-cheeked Honeyeater (*Acanthagenys rufogularis*), the only other bird species known to eat them, produce seedlings.

Seven species of flowerpecker are associated with figs. Otherwise, recorded associations of dicaeids with particular genera or species of plants are relatively few. Twenty-seven members of the family are known to eat fruits, and all others are believed to do so, whereas seeds are known foods for only three species. The extremely rare Cebu Flowerpecker (see Status and Conservation) favours two kinds of vine, one a red-flowering species and the other producing greenish-white flowers, as food sources. Nectar is a confirmed food item for ten species, and pollen is consumed by four. Interestingly, only one dicaeid, the Pale-billed Flowerpecker, is known to defend a feeding territory.

Invertebrates presumably play an important part in the diet of the Dicaeidae. Twenty-three members of the family are known to take a variety of insects, including beetles (Coleoptera), bugs (Hemiptera) and flies (Diptera). The Thick-billed Flowerpecker



It is not only by acting as seed propagators that flowerpeckers contribute to the forest ecosystem. Those species that consume nectar also play a valuable role. A good example is the **Orange-bellied Flowerpecker**, which consumes the nectar of the durian (*Durio*), a tree at the same time both renowned and infamous for producing huge fruit with an extraordinarily pungent, distinctive odour. When the flowerpecker repeats the process of eating nectar at successive durian trees, it acts as a pollinator. This dicaeid also eats the flowers of rubber trees (*Euphorbiaceae*).

[*Dicaeum trigonostigma dayakanum*, Danum Valley, Sabah, Borneo. Photo: John & Jemi Holmes]

ent juveniles, was observed at a forest-edge banyan tree (*Ficus*) in Peninsular Malaysia.

Many members of the family can be found in mixed parties, usually with other flowerpeckers, sunbirds and white-eyes. Examples are the Scarlet-breasted and Palawan Flowerpeckers in the genus *Prionochilus* and the Thick-billed, Yellow-sided and Flame-crowned Flowerpeckers in *Dicaeum*, all of which may join other species in loose mixed foraging groups. One dicaeid, the Fire-breasted Flowerpecker, is known to associate with mixed parties only outside the breeding season.

Flowerpeckers feed on various plant materials, as well as invertebrates. In particular, more than 21 species of mistletoe in at least twelve genera, including *Viscum* (sometimes placed in a separate family, Viscaceae), have been recorded as food sources for flowerpeckers. All members of the Dicaeidae probably have an association with mistletoes, since all of them have a modified intestinal tract adapted to deal with mistletoe berries. The muscular part of the stomach, the ventriculus, can be closed off by a sphincter, and mistletoe berries pass rapidly from the glandular proventriculus to the duodenum. Seeds of mistletoes that are swallowed pass through the digestive tract unharmed.

Although few mistletoes utilized as food plants have been identified to the level of species or even to the genus level, six species of *Amyema* and at least two each of *Dendrophthoe*, *Loranthus*, *Lysaena* and *Taxillus* have been recorded as food sources. *Scurrula* and *Viscum* are each visited by four species of flowerpecker. The Thick-billed Flowerpecker has been observed to revolve mistletoe berries in its bill in order to remove the edible pericarp, which it swallows; it then wipes the viscous seed on to an adjoining branch, using side-to-side movements of the head. The Yellow-breasted Flowerpecker punctures large figs (*Ficus*) and extracts the contents. The Yellow-sided Flowerpecker, before swallowing large fruits, squeezes them, perhaps to remove seeds, and then wipes its bill on a branch. The Orange-bellied Flowerpecker's habit of wiping the cloaca on a branch after defecating is believed to help in the dispersal of mistletoe seeds. In captivity, this species seems to have difficulty in passing fruits other than mistletoe berries. More details are known about the feeding behaviour of the Pale-billed Flowerpecker. This species uses its bill to test the ripeness of berries, before consuming them. It swallows berries of *Loranthus* and *Viscum* whole, the broad

As with other aspects, our knowledge of the breeding biology of most flowerpeckers is extremely sketchy. Nests, for example, have been described for less than two-thirds of the species, among them the **Pale-billed Flowerpecker**. This species suspends its nest from a twig or branch, usually amidst foliage to provide concealment, a tactic seemingly shared by other flowerpeckers. However, such precautions are not universal, as is apparent here. The nest itself is a pear-shaped purse of grass, down and moss, lined with soft material.

[*Dicaeum erythrorhynchos ceylonense*, Sri Lanka. Photo: Rolf Kunz]

The breeding season of the **Yellow-breasted Flowerpecker** may be somewhat variable in timing, as males with enlarged gonads have been recorded in February in Sabah, with juveniles as late as October on the Malay Peninsula.

Alternatively, this may simply reflect slight seasonal differences across the species' range, which extends from southern Myanmar east to Sumatra and Borneo.

This species lays two eggs, which are white with dark spots. To date there is no information available on the duration of the incubation or nestling periods, or the roles of the sexes in processes such as the provisioning of nestlings.

[*Prionochilus maculatus oblitus*,
Panti forest,
Johor, Malaysia.
Photo: Ong Kiem Sian]



feeds on tiny caterpillars of the three-spot grass yellow butterfly (*Eurema blanda*) in *Albizia* plantations. At least 17 species take spiders (Araneae), and the Scarlet-breasted Flowerpecker removes them from webs. Unlike the situation with mistletoe berries, invertebrate food passes from the proventriculus through the open sphincter to the ventriculus, and does not bypass the latter.

Flowerpeckers can be rather acrobatic when feeding, and the Scarlet-breasted Flowerpecker sometimes climbs tree trunks in the manner of a nuthatch (*Sitta*) in order to take insects. Several members of the family will capture invertebrates in the air. The Yellow-bellied Flowerpecker, for instance, sometimes sallies from dead branches to catch insects, and the Scarlet-backed Flowerpecker hawks flying insects from a perch, as well as seizing them while hovering. The Mistletoebird flicks its wings when foraging for insects, which it catches by snatching and by aerial hawking.

Breeding

Much fieldwork needs to be carried out in order to add to the rather sparse knowledge of the breeding biology of this family.

Both sexes of the Scarlet-backed Flowerpecker are, it appears, involved in all aspects of breeding. In the case of the Mistletoebird, the female builds the nest and incubates alone, but the male helps in the feeding of the young and both parents remove the faecal sacs of the nestlings; the incubation of the eggs lasts for a period of about 10–12 days, and the chicks leave the nest after 15 days. Similarly, both sexes of the Midget Flowerpecker feed the nestlings and both remove the chicks' faecal sacs, but nothing else is known of the breeding biology of this species.

Apart from some information on courtship displays and on the nest and eggs, little else seems to have been recorded on the general breeding behaviour of the Dicaeidae. The courtship display of the Mistletoebird has been observed. The male, while singing from a small dead twig about 60 cm above the ground, was seen to bow his head and fan his tail, which he held above the level of the body; with each bow, he flicked the tail alternately to one side and then the other. During this time the cadence and tempo of the song were continuously increasing. The

male then flew to the female, which crouched while holding the body feathers ruffled, and the two copulated. What may have been a courtship display has been recorded for one other member of the family, the Thick-billed Flowerpecker. An individual of this species, possibly a male, was observed to flutter over another, possibly a female, the male revealing the white median stripe and white flecking on the crown, while twittering excitedly.

The nests of a third or more of the family's members appear not to have been described. Of those that are known, the majority are described as "pouches", for instance that of the Brown-backed Flowerpecker; "pockets", as in the Orange-bellied Flowerpecker; or "purses", like that of the Pale-billed Flowerpecker. They are spherical, oval or pear-shaped, and usually inconspicuous and well concealed, such as that of the Thick-billed Flowerpecker, with a side entrance, and they may resemble a leaf. The Midget Flowerpecker, however, is said to have a poorly concealed nest. Dicaeid nests often have a felted appearance, as demonstrated by that of the Flame-breasted Flowerpecker. Materials used in the construction of the nest are many, and include soft fibres, flower buds, cobweb, vegetable down, grass and grass-seed ends, moss, lichen, clubmoss (*Lycopodiaceae*), rootlets, feathers, caterpillar frass, ferns and so on. Some species, among them the Pale-billed and Black-sided Flowerpeckers, line their nests, whereas others, such as the Flame-breasted Flowerpecker, leave the nest unlined. External decoration is sometimes added to the nest. As examples, moss is recorded as being used by, among others, the Yellow-vented Flowerpecker; caterpillar frass by, for instance, the Orange-bellied Flowerpecker; berries and reptile skin by the Pale-billed Flowerpecker; flowers by the Mistletoebird and others; and lichen by a number of species, including the Pale-billed Flowerpecker.

Few details of nest dimensions are available. The nests of the Fire-breasted and Scarlet-backed Flowerpeckers measure 90 × 60 mm, that of the Flame-breasted Flowerpecker is more or less the same, at about 90 × 55 mm, and the Plain Flowerpecker's nest measures 70 × 50 mm. Mistletoebird nests have been recorded as being 75–114 mm long and 38–64 mm in diameter.

The nest-site, although normally well concealed, varies somewhat among the members of the family. A nest of the Scarlet-breasted Flowerpecker was found in a low bush, whereas two



The little information available for flowerpeckers regarding the division of tasks between parents suggests that both sexes seem to share responsibility for raising the brood. Information has been gathered for only six species, and from these data it emerges that both sexes probably carry out together some combination of nest-building, incubating, brooding, feeding and the removal of faecal sacs. In the **Mistletoebird**, the female seems to play the major role. She incubates the 3-4 eggs for 10-12 days, then broods the chicks for a further 15 days. As can be seen here, however, the male (above) assists the female (below) in provisioning the young. The nest is a pear-shaped purse that appears to be fairly typical of the family. Constructed by the female from plant down, lichen, feathers, wool and spider webs, the nest is often decorated with Acacia blossom and, less appealingly (to human eyes, at least), the excreta of insect larvae. The nestlings appear to be carnivorous, their parents returning to the nest with spiders and other small arthropods. Only later in life do birds develop the taste for the mistletoe berries which give rise to the species' English name.



[*Dicaeum hirundinaceum*
hirundinaceum,
 Queensland, Australia.
 Photos: Michael Gore]

As with most other passerines, flowerpeckers' parental responsibilities do not cease once their young have fledged.

The fledglings are not immediately self-sufficient, and thus need regular provisioning at this critical stage in their lives before they become independent.

This female **Black-sided Flowerpecker** has found a good site for feeding berries to her offspring. Endemic to the highlands of Borneo, this species is relatively poorly known.

Young have been observed between November and February, and the clutch size appears to be three.

[*Dicaeum monticulum*,
Kinabalu Park,
Sabah, Borneo.
Photo: Bernard Van
Elegem]



nests of the Black-bellied Flowerpecker were well above ground, one of them suspended from the end of a branch and the other in a tree-fern, 7–11 m above ground. Nests of the Thick-billed Flowerpecker are placed 2–9 m above ground and have been found in mango trees (*Mangifera indica*) and a lantana bush (*Lantana*). A nest of the rare Brown-backed Flowerpecker was suspended from the end of a branch 5–6 m above ground. That of the Yellow-vented Flowerpecker is usually below 8 m, whereas the well-

concealed nest of the Olive-capped Flowerpecker is suspended by fibres from small twigs 15 m above the ground, and the nest of the White-throated Flowerpecker is even higher, at 18–38 m in a dipterocarp tree. Several other species build pendent nests, that of the Orange-bellied Flowerpecker, for instance, hanging from a slender twig 2–13 m above the ground. Similarly, the Pale-billed Flowerpecker's nest is suspended from a twig among leaves 1.5–12 m up, and it may also be secured to a supporting branch at its back and is often well concealed by surrounding foliage, but it may be supported by twigs at each end, in hammock-like fashion. As further examples, Mistletoebird nests are suspended at 0.5–15.2 m from outer twigs, or from a frond of a tree-fern, and Scarlet-backed Flowerpecker nests from terminal twigs at 2–15 m but mostly 6–9 m. Nests of Red-banded, Midget and Grey-sided Flowerpeckers are low down, usually below 2 m, the first of these three often building in ferns, and the Midget Flowerpecker's nest poorly concealed on a horizontal branch. The Plain Flowerpecker places its nest 6–12 m above ground on trees or tall bushes, but sometimes it selects a much lower site among nettles and briars.

Those members of the family for which the clutch size is known lay from one egg, as in the Crimson-breasted Flowerpecker, to four eggs, as in the Thick-billed Flowerpecker and Mistletoebird. The commonest clutch size is of two or three eggs. The eggs of approximately half of the Dicaetidae have been described. They range in colour from pure white, or white with a greyish, pinkish, bluish or greenish tinge, to orange-pink, and are glossed or unglossed and, in some cases, clouded. Flowerpecker eggs may be unmarked, or speckled, blotched or spotted with various shades of red, brown, grey and purple. The egg colours and patterns are not necessarily constant within a species. For example, the Scarlet-headed Flowerpecker usually lays white eggs, described as glossed or unglossed, but some of this species' eggs have a few darker markings and one was distinctly red-brown at the pointed end. Although the eggs of the Pale-billed Flowerpecker are pure white in India, those laid by the Sri Lankan subspecies, *ceylonense*, are often speckled.

Measurements of eggs are available for, again, about half of the species in this family. They vary from 11.5–15.5 × 7.8–10.8 mm, as recorded for the Blood-breasted Flowerpecker, to 16.5–17 × 12–12.4 mm, the size of the Black-bellied Flowerpecker's

Of the 44 species of flowerpecker, some 19 (43%) are restricted-range species, each with a distribution of 50,000 km² or less. In part, this can be attributed to the mass of islands on which the family occurs. One such restricted-range species is the **Black-sided Flowerpecker**. Limited to the Bornean Mountains Endemic Bird Area, it occurs only at altitudes above 460 m. Persisting primarily in isolated patches of its favoured hill or montane forest habitat, this species is certainly uncommon, though not yet sufficiently rare to be of conservation concern.

[*Dicaeum monticulum*,
Kinabalu Park,
Sabah, Borneo.
Photo: Doug Wechsler/
VIREO]



eggs. The dimensional range of Mistletoebird eggs is 16.3–17.8 × 10.7–11.9 mm; the eggs in a two-egg clutch laid by this species measured, respectively, 17.9 × 11.2 mm and 16.8 × 11 mm.

Not surprisingly, there are very few data available on breeding success for this family. In various studies of Mistletoebirds in Australia, up to about 70% of nests were successful in producing at least one young. At least three species of cuckoo have been recorded as laying in the nests of this flowerpecker. Equally little is known of the longevity of the members of this family. A male Mistletoebird in Queensland was recaptured more than nine years after it had been ringed. Otherwise, ringing studies have revealed that Scarlet-backed Flowerpeckers can live for more than 3 years 9 months and Yellow-breasted Flowerpeckers for more than 2 years.

Clearly, there is scope for much further fieldwork and intensive study of the breeding behaviour of the flowerpeckers. In particular, there is a need for studies aimed at determining the duration of the incubation and nestling periods of these fascinating birds.

Movements

Little is recorded of the movements made by this family, and it has been assumed that the majority of the species are sedentary. This may, however, be due simply to a lack of knowledge, as some movements in response to the seasonality of mistletoes, so important in the dicaeid diet, is to be expected. For species associated with fairly intact lowland tropical forest, any such movements need not be over any great distance. Non-breeding Mistletoebirds are recorded as being highly nomadic in some parts of Australia in response to the fruiting of mistletoes. The Sundaic Scarlet-breasted Flowerpecker is likewise thought to be nomadic in some areas.

In the Sundas, the Blood-breasted Flowerpecker has been recorded in southern Sumatra, outside its normal range, which extends from Java eastwards to Timor. It is not clear whether this is the result of vagrancy or is part of regular nomadic behaviour, or whether it indicates that the species has been recently extirpated from parts of Sumatra that were once within its normal range.

Altitudinal movements in response to changing seasons are recorded for, or assumed to be made by, six species of



flowerpecker the ranges of which include higher-lying areas. The Thick-billed Flowerpecker exhibits such movements in the Himalayas, occurring in Nepal at 150–3000 m in summer, but only below 915 m in winter. Elevational movements made by the Yellow-bellied Flowerpecker are combined with lateral shifts that could be considered to represent migration, whereby the species occurs only in the non-breeding season in south-east Yunnan, in extreme south China, and from north Thailand east to north Tonkin, in extreme north Vietnam. The Pale-billed Flowerpecker, too, undertakes seasonal altitudinal movements in the Himalayas, and the Plain and Scarlet-backed Flowerpeckers are thought also to perform such movements in higher parts of their ranges. Altitudinal movements are well documented for the Fire-breasted

The species with perhaps the smallest range in the family is the **Louisiade Flowerpecker**. It occurs on the three main islands within the Louisiade Archipelago, an Endemic Bird Area of 1600 km² off the east coast of New Guinea. While habitat loss has only been moderate, about two-thirds of the largest island, Sudest, have been degraded. Nevertheless, the Louisiade Flowerpecker is sufficiently common in the remaining habitat for it not to be considered of global conservation concern yet.

[*Dicaeum nitidum nitidum*, Misima I, Louisiade Archipelago, off SE New Guinea. Photo: William S. Peckover]



Given the high levels of avian endemism in Indonesia, it is hardly surprising that six species of flowerpecker occur only there. Of these, three occur in the Northern Nusa Tenggara Endemic Bird Area, which comprises the northern chain of Lesser Sunda islands from Lombok to Alor. The most attractive of this trio is the **Black-fronted Flowerpecker**. Despite the extensive deforestation inflicted on the Lesser Sundas, this species is widespread and common, and not in danger of global extinction.

[*Dicaeum igniferum igniferum*, Flores, Indonesia. Photo: Morten Strange]

Flowerpecker. In the Himalayas of India and China, this species occurs at 900–3950 m in summer and below 300 m in winter, and in Nepal it is found above 1830 m in summer but down to 915 m in winter. In Taiwan, Fire-breasted Flowerpeckers are encountered at up to 2135 m in the nesting season, but descend to below 900 m in the non-breeding season.

Flowerpeckers are not particularly strong fliers. Nevertheless, both the Thick-billed Flowerpecker and the Yellow-vented Flowerpecker are known to cross water, as both of these species reach Singapore during dispersal from Peninsular Malaysia. The Johor Strait separating Singapore from the mainland is about 1.2 km at its narrowest and 4.8 km at its widest point.

Relationship with Man

This inconspicuous and poorly studied family seems to have had minimal impact on humans. Being rather small, and not noted for their vocal expertise, flowerpeckers have not suffered the depredations of the bird trade, nor are they trapped for any other purpose. A few of the species have been kept in captivity, perhaps the best-known of these being the Orange-bellied Flowerpecker, and in earlier times Mistletoebirds were very occasionally kept in aviaries, but the dicaeids are not widespread cagebirds. Furthermore, they appear not to figure significantly in literature or augury.

Flowerpeckers are very important in the dispersal of mistletoes, depositing the seeds up to 500 m or more from the parent tree, and they may yet be found to be important pollinators or dispersers of other plants. In general, are not seen as pests, but there are some instances in which the Mistletoebird has been so regarded for the very reason that it does play a significant role in seed dispersal. This is because mistletoe is considered a serious economic pest in some areas of Australia, as it parasitizes commercial fruit trees and other trees, including native ones, sometimes leading to the death of major limbs or even whole trees.

Few ornithologists have been inspired to study the flowerpeckers. An exception is those situations when habitat destruction by human beings has put the continued existence of a species in doubt, as is the case for the Critically Endangered Cebu Flowerpecker (see Status and Conservation).

Status and Conservation

Flowerpeckers are, on the whole, catholic in their choice of habitat. Most species are tolerant of areas modified by man, so long as flowering plants, and particularly mistletoes, abound. Hence, the same species may be met with in a range of habitats, from various types of pristine forest through secondary vegetation to cultivation and gardens. As a result, conservation problems exist for only eight species.

Of the 44 species in the family, 36, or 81.8%, are considered of Least Concern as regards their conservation. Of the remaining eight, one is classed as Critically Endangered, two are listed as Vulnerable, and five, 11.4% of the family total, are currently considered Near-threatened. Most dicaeids are regarded as uncommon to common over their distributional range. Some, such as those with a distribution covering a large geographical area, may be quite common in some areas but rare in others. The Orange-bellied Flowerpecker is one such example, being recorded as common and widespread over much of its range, and uncommon to rare in some areas, but in the Philippines the subspecies on Cebu, *pallidus*, is close to extinction. Some species, particularly those confined to higher altitudes, such as the Black-sided Flowerpecker, may exist in isolated "pockets" and are often considered to be local and uncommon. Extirpation from one or more pockets would probably be permanent, as most such species are apparently quite sedentary and, once an area has lost a species, it is unlikely to be recolonized from outside.

Although some flowerpeckers are brightly coloured, they are small and not considered great songsters. They have, therefore, to a large extent escaped the attentions of the cagebird trade. Furthermore, they are normally not regarded as pests, although they are instrumental in spreading mistletoes. It seems, however, that this was not always the case. In Australia, the sole member of the family, the Mistletoebird, was once shot because of its role in spreading mistletoes, plants which were perceived as pests. According to reports, one man claimed that, over a period of six years, he had killed more than 1200 Mistletoebirds.

Of the eight species about which there are some conservation concerns, one occurs in Sri Lanka, two are Sundaic, and five are restricted to the Philippines. Seven belong in the genus *Dicaeum*, and the eighth in *Prionochilus*. The latter, the Scar-

Of the six species of *Prionochilus*, only one is classified as restricted-range. As its English name suggests, the **Palawan Flowerpecker** occurs only in the Endemic Bird Area that covers the Philippine island of Palawan and adjacent small islands. Palawan is the most forested island in the Philippines, but human immigration from densely populated islands is increasingly resulting in habitat destruction through logging, mining and agriculture. Common in much of its range and present in Palawan's principal protected area, this smart bird is not considered to be globally threatened.

[*Prionochilus plateni*
plateni,
Buenavista,
north of Puerto Princesa,
Palawan, Philippines.
Photo: Ian Merrill]





While none of the six *Prionochilus* flowerpeckers is considered globally threatened, one is classified as Near-threatened. The **Scarlet-breasted Flowerpecker** occurs in Thailand and on the Malay Peninsula, Sumatra and Borneo. It once occurred in Vietnam, but there have been no records there since the nineteenth century. While widespread, it is generally considered uncommon or rare throughout its range. Lowland forest in this region is under severe threat, but this flowerpecker's use of montane and secondary forests gives conservationists hope for its future.

[*Prionochilus thoracicus*, Panti forest, Johor, Malaysia.
Photo: Teo Nam Siang]

let-breasted Flowerpecker, has a reasonably wide distribution, but it appears everywhere to be uncommon to rare. Habitat destruction, particularly of lowland forest, is implicated as a potential threat, but, as the species is known to utilize highland and secondary forests, too, it is considered to be only Near-threatened.

The four other Near-threatened members of the family are the Brown-backed, the Whiskered, the White-throated and the Flame-crowned Flowerpeckers. The first of these, the Brown-backed Flowerpecker, is found in the west part of Peninsular Malaysia, in west and north Borneo and in the Riau Archipelago and the Natuna Islands, and is uncommon to rare throughout its range. The disappearance of lowland forest is believed to be responsible for the presumed decline of this species, but its use of submontane and secondary forests, gardens and plantations places it at less risk than would otherwise be the case. Although confined to south-western Sri Lanka, the White-throated Flowerpecker is common or even locally abundant in some parts of its range, perhaps numbering several tens of thousands. Much of its forest habitat is evidently still under threat, but it does appear able to cross from one forest island to another. Nevertheless, because of its severely restricted range and fragmented habitat it is placed in the conservation category of Near-threatened. The final two dicaeids in this category are both confined to the Philippines. The Whiskered Flowerpecker, found only on Mindanao, is rare to uncommon throughout much of its range, but seems to be locally common in a few areas. It is, however, a low-density species. The Flame-crowned Flowerpecker, resident in northern Luzon and on Mindanao, is likewise a low-density species, generally considered uncommon, although it is common on Mount Pasian, in east Mindanao.

All three globally threatened members of the family are confined to the Philippines. The Black-belted Flowerpecker qualifies as Vulnerable because its restricted range is now severely fragmented owing to clearance of lowland forest and scrub. This has resulted in a severe population decline, and the apparent extinction of the species on Guimaras, one of the three Philippine islands on which it had occurred but where it could not be found in 1992. In the mid-1950s, this flowerpecker was reported as being common on Negros, and in 1991–1992 it was abundant on Mount Talinis in secondary forest and an agriculturally

prepared area on that island. Within the range of this species, Mt Canlaon National Park, on Negros, receives formal protection and other sites where it occurs fall within the proposed Central Panay Mountains National Park. The Mount Talinis and Twin Lakes area on Negros has been proposed for receipt of funding for protection. North Negros Forest Reserve and, on Panay, Sampunong Bolo National Park receive only nominal protection. In 1988, it was estimated that only 4% of Negros and 8% of Panay remained forested, mostly above 1000 m. The Black-belted Flowerpecker's ability to tolerate substantial habitat modification may help to make its future relatively secure. Its population is believed to lie in the range 10,000–19,999 indi-



One of 23 restricted-range species confined to the Sri Lanka Endemic Bird Area, the **White-throated Flowerpecker** occurs only in a small area on the south-west of the island. Locally common, it appears able to withstand a certain amount of habitat fragmentation, having been observed crossing large forest openings and gaps between forest patches. Nevertheless, its small and increasingly fragmented range justify its precautionary treatment as Near-threatened.

[*Dicaeum vincens*, Sinharaja Forest Reserve, Sri Lanka.
Photo: Andy & Gill Swash]

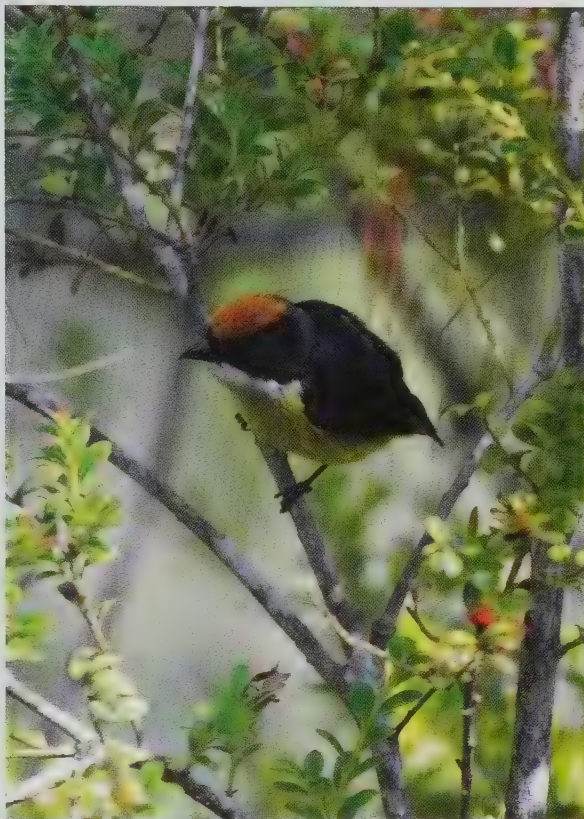
The Philippines have more globally threatened species than any country bar Indonesia and Brazil.

The Dicaeidae feature prominently on this Red List, with three species considered globally threatened, as well as two Near-threatened.

The **Flame-crowned Flowerpecker** falls into the latter group. This attractive bird is also a restricted-range species, occurring in the two Endemic Bird Areas centred on Luzon and Mindanao. It is generally uncommon, and only its preference for middle- and high-altitude forests saves it from entering the main threat categories.

[*Dicaeum anthonyi*
anthonyi,
Mt Polis, Luzon,
Philippines.

Photo: Göran Alstedt]



viduals and to be decreasing, and the total area of its distribution is approximately 24,000 km².

Also listed as Vulnerable, the Scarlet-collared Flowerpecker has a small, rapidly declining population and a small, severely fragmented, diminishing range, as a result of the destruction of lowland forest in the Philippines. Its decreasing population is estimated at 10,000–19,999 individuals and its total range at 9900 km². It was thought to be endemic on the island of Mindoro, but has more recently been found farther south, on Panay and Negros. Considered common, even abundant, through much of the last century, and still common in a few areas now, this flowerpecker is said to be unable to survive in highly degraded land. It was estimated in the late 1980s that no more than about 120 km² of forest remained on Mindoro, little of that below 1000 m. The species is found within the Mount Iglit–Baco National Park, where scattered forest patches are present, and Lake Naujan National Park, where little forest remains. Smaller protected areas include the MUFRC Experimental Forest, covering 7853 ha of eastern Mindoro. Conservation funding has been proposed for two further areas in which the species has recently been recorded, namely the Baloy/Madja-as mountain range on Panay, forming part of the proposed Central Panay Mountains National Park, and the Mount Talinis and Twin Lakes area, on Negros. It is found also in the nominally protected North Negros Forest Reserve. On Mindoro, disturbance of undergrowth during harvesting of rattan palms (*Calamus*) has a detrimental effect, at least in Siburan, which, although it lies within the F. B. Harrison Game Reserve, is threatened also by logging and swidden agriculture. There are proposals to devise and implement a management plan for the forest at Siburan, to conserve remnant forest at Malpalon and Puerto Galera, and to extend the Mount Iglit–Baco National Park to encompass remaining tracts of lowland forest.

Without doubt, the most seriously threatened of all the Dicaeidae is the Cebu Flowerpecker, which is classed as Critical owing to its tiny, decreasing population and severely fragmented range, the result of extensive deforestation. This species is estimated as numbering 85–105 individuals, all within a global range of just 8 km² or so. It is confined to the island of Cebu, in the central Philippines, where it was considered to be not uncommon in the 1890s, although it was recorded only from Toledo

and near Cebu City; even then it was considered in danger of extinction, chiefly because of habitat destruction. What remains of its habitat today apparently supports very few individuals indeed. Logging, and the clearance of forest for agriculture, such as sugar-cane fields, are particularly implicated in this flowerpecker's decline. A single individual was found in 1906, after which the species was considered to be extinct until 1992, when it was rediscovered at Tabunan, in Central Cebu National Park. In 1998 it was found at Nug-as, in 1999 it was recorded at nearby Mount Lantoy, and more recently it has been observed at Dalaguete. The available habitat at Tabunan covers only 300 ha, of which only one tenth is considered ideal; the angle of slope on which the forest stands is such that, combined with the effects of landslides and logging, it is unable to support much closed-canopy forest, which is believed to be the optimal habitat for this species. Nug-as has secondary lowland forest and scrub at 200–500 m, and transitional mid-montane forest above 500 m, but few tall trees. Mount Lantoy offers low secondary forest and dense scrub, some old-growth trees at its peak, at 500 m, and some tall dipterocarps at 300 m.

In 2001, the island of Cebu was believed to retain only 0.03% of its original dipterocarp forest, amounting to, at most, just 15 km². The forest at Tabunan, being within the Central Cebu National Park, is technically protected by law, but by the early 1990s it was suffering the depredations of casual loggers and settlers. Part of Nug-as lies in the Watershed Reserve for Alcoy and Boljo-on municipalities, and Mount Lantoy is within the Argao–Dalaguete Watershed Forest Reserve.

Proposals for the rescue of the Cebu Flowerpecker from the brink of extinction include a number of main requirements. The Strict Protection Zone status of the forest areas concerned must be maintained, and effective implementation of such protection ensured. Adjacent areas must be replanted with native species, with the aim of doubling the area of forest. The reforestation of Mount Lantoy needs to be completed, and the proposal to designate this area as a national park supported. A conservation-based development and educational programme should be produced. Low-level tourism may be encouraged, and the local population be assisted in developing land and crops in a way that will not conflict with the conservation of this species.

Interspecific competition with the highly aggressive Red-striped Flowerpecker may have contributed to the decline of the species, but probably to a significant extent only where habitat modification favours the commoner species. More research needs to be undertaken in order to ascertain how important this threat is, and also to determine whether the Cebu Flowerpecker occurs in other, as yet unexplored, areas on the island.

General Bibliography

- Alam & Rahman (1988), Ali (1931, 1932), Amadon (1951), Anon. (2007e), Attenborough (1995), Ballingall (1990), Beecher (1953), Beehler & Finch (1985), Bock (1994), Brooks *et al.* (1995), Burd (1995), Catibog-Sinha (1982), Cheke & Mann (2001), Close (1991), Collar *et al.* (2001), Corlett (1998), Curio (1994), Curio *et al.* (1996), Davidar (1985a), Davidson (1945), Delacour (1944), Dickinson (1970, 2003), Dutson (1993), Dutson, Evans *et al.* (1992), Dutson, Magsalay *et al.* (1993), Ericson, Christidis, Cooper *et al.* (2002), Ericson, Johansson & Parsons (2000), Evans *et al.* (1993), Frith, H.J. (1969, 1984), Gadow (1884), Gardner (1925), Higgins *et al.* (2006), Iddi (2005), Iddi *et al.* (2006), Itino *et al.* (1991), Kotagama & Goodale (2004), Lim Hsingyu (1995), Maberley (1997), MacMillen & Carpenter (1977), Madge (1986), Magsalay (1993, 1995), Magsalay *et al.* (1995), Mann (2002), Mason & Maxwell-Lefroy (1912), Mayr & Amadon (1947, 1951), McClure (1998), Morioka (1992), Murphy *et al.* (1993), Oberholser (1923), Pa-alan (1993), Paton & Collins (1989), Peckover & Filewood (1976), Pizzey (1980), Pizzey & Knight (1997), Raju (1998), Rand (1961, 1967a), Rand & Gilliard (1967), Rasmussen & Anderton (2005a, 2005b), Reid (1987, 1989, 1990, 1997), Rensch (1931b), Rheindt (2004a), Richardson & Wooller (1988), Salomonsen (1960a, 1960b, 1960c, 1961a, 1967a, 1985), Schnell *et al.* (1985), Schönwetter & Meise (1980), Sharpe (1885, 1909), Sheldon (1985), Sibley (1996), Sibley & Ahlquist (1983, 1985b, 1990), Sibley & Monroe (1990, 1993), Smythies (1984), Stattersfield & Capper (2000), Subramanya & Radhamani (1993), Sundevall (1872), Timmins (1992), Trainor (2007b), Travis (1982), van Tyne & Berger (1959), Wells (2007), Wolters (1977, 1979).

inches 3
cm 8

ssp olivaceus

ssp regulus

ssp parsonsi

1

2

3

ssp percussus

4

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6

7

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9

10

ssp everetti

ssp bungurensis

ssp finschi

ssp aeruginosum

ssp agile



Genus *PRIONOCHILUS* Strickland, 1841

1. Olive-backed Flowerpecker

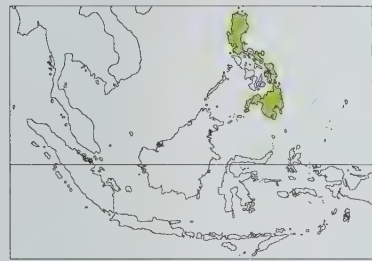
Prionochilus olivaceus

French: Dicée olive **German:** Grünmantel-Mistelfresser **Spanish:** Picaflor Oliváceo

Taxonomy. *Prionochilus olivaceus* Tweeddale, 1877, Dinagat, Philippines. Three subspecies recognized.

Subspecies and Distribution.

P. o. parsonsi McGregor, 1927 – Luzon and Catanduanes, in N Philippines.
P. o. samarensis Steere, 1890 – Samar, Leyte and Bohol, in EC Philippines.
P. o. olivaceus Tweeddale, 1877 – Dinagat, Mindanao and Basilan, in S Philippines.



Descriptive notes. c. 9·1 cm; 8·4–10·7 g. Male nominate race has crown and upperparts golden-olive, tail and primaries blackish-brown, edged olive, lores grey to greyish-white; sides of face, throat and breast pale olive-grey, centre of chin to belly and undertail-coverts white, lower flanks olive with white streaking; iris brick-red or blood-red; upper mandible black, lower mandible blue-grey with black tip; legs black to blackish-horn. Female is paler than male, with sides of throat and breast greyer. Juvenile has chest olive-tinged grey, loreal spot greyish, central white band below has olive-grey tinge, yellowish on belly; bill pale brown. Race *parsonsi* differs from nominate in having lores and sides of throat and breast black; *samarensis* has breast side browner, tending to form streak at posterior end. VOICE. Repeated single, loud “peeit” or “peeith”; high “tsoo-eet”, with rising second note; high rattling trill.

Habitat. Forest, forest edge and secondary growth, especially around flowering and fruiting trees; sea-level to 1000 m.

Food and Feeding. No detailed data on diet, but probably includes fruit, pollen and nectar of mistletoes (Loranthaceae). Forages in understorey. Joins mixed-species flocks.

Breeding. Nesting recorded in Aug; birds with enlarged gonads in May. No other information.

Movements. None recorded.

Status and Conservation. Not globally threatened. Uncommon in all parts of range. Poorly known.

Bibliography. Cheke & Mann (2001), Dickinson *et al.* (1991), Kennedy *et al.* (2000), McGregor (1909, 1927), Parkes (1971), duPont (1971b), Salomonsen (1960a), Tweeddale (1877a), Worcester (1898).

2. Yellow-breasted Flowerpecker

Prionochilus maculatus

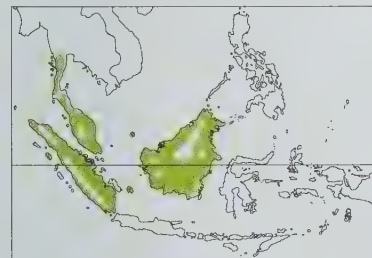
French: Dicée tacheté **German:** Goldbrust-Mistelfresser **Spanish:** Picaflor Moteado
Other common names: Yellow-throated Flowerpecker

Taxonomy. *Pardalotus maculatus* Temminck, 1836, Borneo.

Geographical variation not well marked. Race *septentrionalis* intergrades with *oblitus* in S Thailand. Proposed race *opistatus* (from Nias I) considered insufficiently distinct from nominate to warrant separation. Four subspecies recognized.

Subspecies and Distribution.

P. m. septentrionalis Robinson & Kloss, 1921 – extreme S Myanmar (S Tenasserim) and peninsular Thailand.
P. m. oblitus (Mayr, 1938) – extreme S Thailand and Peninsular Malaysia.
P. m. maculatus (Temminck, 1836) – Sumatra (including Nias I and Belitung) and Borneo.
P. m. natunensis (Chasen, 1935) – N Natuna Is (Bunguran).



Descriptive notes. 10 cm; male 7·5–11·8 g, female 7·8–7·9 g. Nominate race has dark olive-green head, orange patch on crown, pale lores; upperparts, including upperwing, olive-green, remiges with yellowish edgings, tail darker with black tip; malar stripe and ear-coverts greenish-olive, greyish-green or green, moustachial stripe and throat white; underparts yellow, broadly streaked greyish, green or olive-green, centre of abdomen with less streaking on brighter yellow ground; iris red; upper mandible black, lower mandible black or bluish-grey with paler base; legs grey. Sexes similar. Juvenile lacks orange on crown, is dull

greenish-olive above, dull greyish-olive below, with yellowish centre of belly, bill pale. Race *oblitus* has grey forehead, whitish upper throat; *septentrionalis* is more grey on head, is deeper yellow below than previous, has orange-chrome in centre of breast; *natunensis* has brighter and more yellow underparts than nominate, throat more washed with yellow, and dark markings more olive than grey. VOICE. High-pitched “tswik”; various harsh, metallic chattering calls; hoarse disyllabic, “tsweet-tsweet” or “chwit-chwit”.

Habitat. Dipterocarp, alluvial and secondary forests, peatswamp-forest, occasionally in montane forest, at forest edge, and in scrub, plantations and cultivation; to 1500 m.

Food and Feeding. Fruits, nectar and pollen of mistletoes (Loranthaceae); other fruits, including those of *Melastoma malabathricum* and figs (*Ficus*); also probably pollen of *Eugenia dyerana*. Large blue berries taken into bill, contents squeezed out and swallowed, skin discarded. Forages mostly in middle and upper storeys. Singly or in pairs.

Breeding. In Malay Peninsula, eggs mid-Aug, fledglings late Jul and late Oct, and juveniles early May to early Oct; laying in Mar on Belitung (Sumatra); in Borneo, juveniles May and Aug in

Kalimantan Tengah, and birds with enlarged gonads in Feb and Apr–Jul in Sabah. Nest pouch-shaped, with triangular entrance hole pointing upwards, constructed of fern rhizomes and tree cotton, reinforced at rim with spider webs, suspended 2·5 m up from twig of sapling, and surrounded by overhanging leaves, on forest path. Clutch 2 eggs, longish ovate, glossy white, with dense brown blotches and spots coalescing around broad end; no information on incubation and nestling periods; fledglings tended by both parents.

Movements. None recorded.

Status and Conservation. Not globally threatened. Locally common in S Myanmar; locally common to uncommon in S Thailand and common in Peninsular Malaysia; not uncommon in Sumatra and Borneo. Formerly occurred in Singapore, but now extinct there. Considered “near-threatened” in Malay Peninsula on account of possible future habitat loss. Occurs in several protected areas, e.g. Khao Pra Bang Wildlife Sanctuary, in Thailand, Way Kambas National Park, in Sumatra, and Danum Valley Conservation Area, in Borneo.

Bibliography. Cheke & Mann (2001), Danielsen & Heegaard (1995), King *et al.* (1975), Lekagul & Round (1991), MacKinnon & Phillips (1993), Mann (1996, 2008), van Marle & Voous (1988), Medway (1972), Medway & Wells (1976), Nash & Nash (1988), Pearson, D.C. (1975), Pieffer (1961), Robson (2000b), Salomonsen (1960a), Sheldon *et al.* (2001), Smythies (1957), Smythies & Cranbrook (1981), Smythies & Davison (1999), Verheugt *et al.* (1993), Wells (2007).

3. Crimson-breasted Flowerpecker

Prionochilus percussus

French: Dicée poignard **German:** Mennigbrust-Mistelfresser **Spanish:** Picaflor Carminoso

Taxonomy. *Pardalotus percussus* Temminck, 1826, Java.

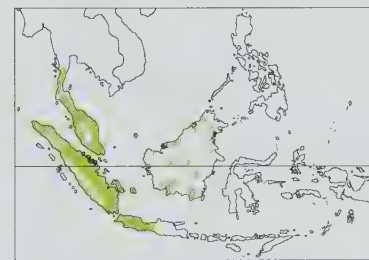
Forms a superspecies with *P. plateni* and *P. xanthopygius*, although some range overlap with latter in Borneo. Three subspecies recognized.

Subspecies and Distribution.

P. p. ignicapilla (Eyton, 1839) – extreme S Myanmar (S Tenasserim) S through Malay Peninsula (including Penang and Tioman I) to Sumatra (including Bangka and Belitung), also N Natuna Is (Bunguran) and Borneo.

P. p. regulus (Meyer de Schauensee, 1940) – Batu Is, off W Sumatra.

P. p. percussus (Temminck, 1826) – W Java.



Descriptive notes. 10 cm; male 7–10 g, two females 6 g and 10 g. Male nominate race has black forehead, scarlet patch on crown, white malar stripe bordered below by blackish-blue line; otherwise slaty blue above, including upperwing and tail, remiges edged pale blue; throat and underparts deep yellow, with red patch of varying size in centre of breast, flanks dark grey, concealed pectoral tufts white, underwing-coverts white; iris red, brown or orange-brown; bill black, basal half of lower mandible pale blue-grey; legs black or bluish. Female is olive-green above, with dull orange crown patch, whitish malar stripe, throat pale

greyish, sometimes with yellowish tinge, underparts greyish-olive, yellow in centre, with whitish undertail-coverts. Juvenile is dull greenish-olive above, dull olive-grey below, whitish in centre of belly. Race *ignicapilla* has underparts less deep yellow than nominate; *regulus* has greenish-yellow underparts with breast patch deep orange. VOICE. “See-sik”, sometimes fast; monosyllabic “weg”.

Habitat. Lowland dipterocarp forest, peatswamp-forest, alluvial forest, lower montane forest, mangrove and secondary forest, at forest edge, in scrub and old plantations; sea-level to 1065 m, once at 1200 m.

Food and Feeding. Crushes berries of *Melastoma*; uses bill to puncture figs (*Ficus*) and *Eugenia* and “sucks” out contents, or bites out pieces; diet presumably includes also nectar, pollen and fruits of mistletoes (Loranthaceae). Found at all levels, but mostly in middle and lower storeys.

Breeding. In Malay Peninsula, oviduct egg in late May, nestlings May, fledglings Jun, and juveniles Apr, May and Aug–Oct; in Sumatra, juveniles in NW (Aceh) late Aug and in NC & SE (Sumatra Utara and Lampung) late Apr to Jun; in Borneo, laying in Apr (Sarawak) and dependent young in Jul (Kalimantan Tengah). Nest a pear-shaped bag, circular entrance 2·5 cm in diameter, protruding rim around entrance (but no porch), constructed from reddish vegetable down (not so compacted as nest of *Dicaeum*), lined with fine roots, and decorated with caterpillar excreta, lichen, moss, roots etc., external measurements 101 × 70 mm, internally 50 × 50 mm, upper end of structure drawn out and fastened to pendent twig 1·8 m above ground. Clutch 1 egg, pure white, or white with cap of purple-brown spots. No other information.

Movements. None recorded.

Status and Conservation. Not globally threatened. Uncommon to fairly common in S Myanmar and S Thailand; common in Peninsular Malaysia, but less common in N; rare in Sumatra and Java; rare generally in Borneo, but less so at higher altitudes. Occurs in several protected areas, e.g. Khao Pra Bang Wildlife Sanctuary, in Thailand, and Way Kambas National Park, in Sumatra.

Bibliography. Bennett & Bishop (1991), Cheke & Mann (2001), David & Gosselin (2002a), Hellebrekers & Hoogerwerf (1967), Holmes (1996), King *et al.* (1975), MacKinnon & Phillips (1993), Mann (1996, 2008), van Marle & Voous (1988), Medway & Wells (1976), Mees (1986), Meyer de Schauensee (1940), Nash & Nash (1988), Robson (2000b), Salomonsen (1960a), Sheldon *et al.* (2001), Smythies (1957, 1960), Smythies & Cranbrook (1981), Smythies & Davison (1999), Stuart Baker (1934), Verheugt *et al.* (1993), Wells (2007), Wilkinson *et al.* (1991).

4. Palawan Flowerpecker

Prionochilus plateni

French: Dicée de Palawan **German:** Palawanmistelfresser **Spanish:** Picaflor de Palawan
Other common names: Platen’s/Palawan Yellow-rumped Flowerpecker

Taxonomy. *Prionochilus Plateni* A. W. H. Blasius, 1888, Puerto Princesa, Palawan, west Philippines. Forms a superspecies with *P. percussus* and *P. xanthopygius*, although some range overlap between these two species in Borneo; present species (in both sexes) is intermediate between these two in plumage characters. Described form *johannae* considered indistinguishable from nominate. Two subspecies recognized.

Subspecies and Distribution.

P. p. culionensis (Rand, 1948) – Calamian Group (Calauit, Busuanga, Culion), in W Philippines.
P. p. plateni A. W. H. Blasius, 1888 – Palawan and Balabac, in W Philippines.



Descriptive notes. 9 cm; 8–9 g. Male nominate race is dark greyish-blue above, except for orange-red centre of crown and yellow rump; chin and malar stripe white, separated by greyish-blue line; throat and underparts yellow, red patch in middle of breast; iris dark red to dark brown; bill black, base of lower mandible grey; legs black. Female is olive-green to olive-grey above, with centre of crown and rump yellowish, whitish malar stripe separated from whitish chin and throat by grey line, side of neck and flanks grey, rest of underparts yellowish. Juvenile is similar to female but without white malar stripe, much greyer below, with almost no yellow, and has pale base of bill. Race *culionensis* male has orange-yellow rump, throat and breast to belly, female is deep yellow (instead of yellowish) below, with orange pectoral spot. VOICE. Repeated high-pitched metallic “seep-seep”.

Habitat. Forest, secondary growth, scrub and gardens, particularly around fruiting and flowering trees.
Food and Feeding. No information on diet, but probably includes fruit, nectar and pollen of mistletoes (Loranthaceae). Occurs in all storeys of forest. Usually forages singly; sometimes joins mixed-species flocks.

Breeding. Fledged young observed in Mar, and birds with active gonads in Apr, May and Aug. No other information.

Movements. No information.

Status and Conservation. Not globally threatened. Restricted-range species: present in Palawan EBA. Common in much of its range. Occurs in St Paul Subterranean River National Park.

Bibliography. Cheke & Mann (2001), Delacour & Mayr (1945), Dickinson *et al.* (1991), Hartley & McGowan (1991), Kennedy *et al.* (2000), McGregor (1909), duPont (1971b), Robson & Davidson (1996), Salomonsen (1960a), Sharpe (1888), Worcester (1898), Worcester & Bourns (1898).

5. Yellow-rumped Flowerpecker

Prionochilus xanthopygius

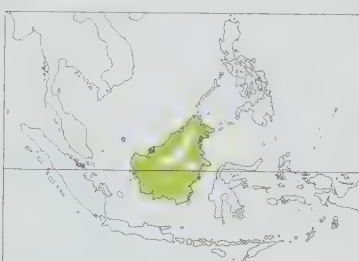
French: Dicée à croupion jaune **German:** Gelbbürzel-Mistelfresser **Spanish:** Picaflor Culigualdo

Other common names: Borneo (Yellow-rumped)/Bornean Flowerpecker

Taxonomy. *Prionochilus xanthopygius* Salvadori, 1868, Sarawak, Borneo.

Forms a superspecies with *P. percutus* and *P. plateni*, although distribution overlaps with that of former in parts of Borneo. Monotypic.

Distribution. Borneo; also N Natuna Is (one record).



Descriptive notes. 9 cm; male 6.5–8.6 g, female 6.9–8.6 g, unsexed juveniles 6.5–8.2 g. Male has slate-blue head, back, upperwing and tail, red patch on crown, yellow rump; yellow below, orange patch on upper breast, white pectoral tufts (concealed), flanks olive and grey, undertail-coverts yellowish-white, underwing-coverts white; iris brown; bill and legs black. Female is duller than male, has blue-grey crown with very small dull orange-red patch, greenish-olive back, yellow rump; throat whitish, side of face grey, flanks olive-grey, undertail-coverts whitish, rest of underparts yellow, some orange on upper breast. Juvenile

is similar to female, but more bluish-tinged grey above, uppertail-coverts olive, yellow of rump less distinct, upperwing and tail blackish-brown, wing feathers edged blue-grey; much greyer below, with almost no yellow; bill pale. VOICE. High-pitched chattering in flight; other calls are “tsee-oo”, first note rising and second one level, “ship-ship” or “ship-ship-ship”, “tsik-tsik”, which may be repeated rapidly, and 7–9 fast descending staccato notes.

Habitat. Dipterocarp forest, peatswamp-forest, heath and secondary forests, at forest edge, in plantations and clearings; sea-level to 1760 m.

Food and Feeding. Flowers, pollen, nectar, ripe fruit pulp, buds, also insects and spiders (Araneae). Frequently forages at low levels, but found in all storeys.

Breeding. Nesting in Apr in Kalimantan Barat and Jul and Aug in Kalimantan Tengah; in Sabah, nest-building in Feb, birds with enlarged gonads in Feb–Apr, Jun, Jul and Sept, and juveniles in Aug; fledgling in Oct in Sarawak. Nest a loosely felted pouch measuring c. 100 × 50 mm, lateral opening near top 35 × 18 mm, constructed from lichens and plant materials, including moss, attached to leaf stalk c. 1 m above ground. Eggs reddish-white with red, grey and purple markings. No other information.

Movements. No information.

Status and Conservation. Not globally threatened. Common and widespread throughout Borneo. Status in N Natunas uncertain; only one confirmed record. Occurs in several protected areas, e.g. Danum Valley Conservation Area, in Borneo.

Bibliography. Cheke & Mann (2001), Coomans de Ruiter (1936), Hartert (1895), MacKinnon & Phillips (1993), Mann (1996, 2008), Nash & Nash (1988), Salomonsen (1960a), Schönwetter & Meise (1980), Sheldon *et al.* (2001), Smythies (1957, 1960), Smythies & Cranbrook (1981), Smythies & Davison (1999).

6. Scarlet-breasted Flowerpecker

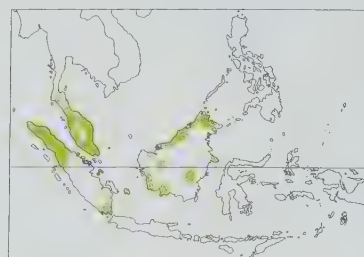
Prionochilus thoracicus

French: Dicée à poitrine écarlate **German:** Rubinkehl-Mistelfresser **Spanish:** Picaflor Pechiescarlata

Taxonomy. *Pardalotus thoracicus* Temminck, 1836, Borneo.

An undescribed race may exist in Riau Archipelago. Monotypic.

Distribution. S Thailand, Peninsular Malaysia, N & SE Sumatra (Aceh, Sumatera Utara, Lampung), Lingga Archipelago, Belitung and Borneo.



Descriptive notes. 9.5–10 cm; male 8.9–13 g. Male has black head, small red patch on crown, yellowish-green mantle and back, lesser and outer upperwing-coverts narrowly tipped yellow, rump and uppertail-coverts, rest of upperwing and tail black; throat and breast red, enclosed by broad black border, remainder of underparts yellow becoming whitish towards rear belly and more ashy olive on flanks; iris brown; bill dark brown to black; legs dark slate. Female is duller than male, has greyish head, with or without dull olive-yellow patch on crown, olive-green upperparts, yellowish uppertail-coverts, black tail; side of face grey,

throat paler grey, orange-yellow breast patch, rest of underparts greyish-olive, extensive area of yellow on belly and undertail-coverts. Juvenile is similar to female but greyer below, with base of bill pale; young male has some yellow and red on breast, and occasionally a tiny amount of red on crown.

VOICE. Metallic clicking twitter; c. 6 very high-pitched, insect-like “seek” notes; harsh “chink”.

Habitat. Peatswamp-forest, heath forest and secondary growth, at forest edge, in coastal vegetation, casuarina (*Casuarina*) groves, rubber plantations and in fire-cleared heath forest; lowlands to 1280 m.

Food and Feeding. Insects, spiders (Araneae), also fruits, including those of mistletoes (Loranthaceae), perhaps also pollen and nectar. Generally found at low levels. Sometimes climbs on tree trunks in manner of a nuthatch (*Sitta*). Picks invertebrates from spider webs.

Breeding. Juveniles recorded in Jan, May and Aug–Oct in Malay Peninsula; young in nest in Jan on Belitung; in Borneo, birds with enlarged testes in Mar (Sabah) and fledged young Jul–Sept (Kalimantan Tengah). Nest placed in low bush. No other information.

Movements. Thought to be nomadic in some areas.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Uncommon in Thailand and uncommon in Peninsular Malaysia; rare in Sumatra; uncommon in Borneo. Formerly occurred in extreme S Vietnam, but no records since 19th-century. This species could be at risk as a result of habitat destruction. In Malay Peninsula considered to be “vulnerable”, possibly “endangered”.

Bibliography. Anon. (2007e), Butchart & Stattersfield (2004), Cheke & Mann (2001), Collar *et al.* (2001), Holmes (1996), King *et al.* (1975), MacKinnon & Phillips (1993), Mann (1996, 2008), van Marle & Voous (1988), Medway & Wells (1976), Nash & Nash (1988), Parrott & Andrew (1996), Rajathurai (1996), Robson (2000b), Salomonsen (1960a), Sheldon *et al.* (2001), Smythies (1957, 1960), Smythies & Cranbrook (1981), Smythies & Davison (1999), Stattersfield & Capper (2000), Wells (2007), Wilkinson *et al.* (1991).

Genus DICAENUM Cuvier, 1816

7. Golden-rumped Flowerpecker

Dicaeum annae

French: Dicée de la Sonde **German:** Bartmistelfresser **Spanish:** Picaflor Culidorado

Other common names: Anna’s/Flores/Sunda Flowerpecker

Taxonomy. *Acmonorhynchus annae* Büttikofer, 1894, Flores, Lesser Sunda Islands.

Races not well differentiated. Two subspecies recognized.

Subspecies and Distribution.

D. a. sumbavense (Rensch, 1931) – Sumbawa.

D. a. annae (Büttikofer, 1894) – Flores.



Descriptive notes. 9.4–10 cm; female 10.3 g, unsexed 9.7 g. Male nominate race has crown and upperparts olive-green, rump yellow; throat and malar stripe white, underparts pale yellowish centrally, duller towards sides, and streaked olive-grey, with concealed white pectoral tufts; iris light brown; bill and legs blackish. Female differs from male in lacking yellow on rump. Juvenile is similar to female, but throat and belly greyer, malar stripe less distinct, bill paler, especially on lower mandible. Race *sumbavense* is slightly smaller than nominate, a little more olive above, with tips of flight-feathers duller and less green. VOICE. Re-

peated thin “see” notes on same pitch, terminal 3 notes longer and more widely spaced.

Habitat. Deciduous, semi-evergreen and secondary forest, woodland and cultivation; sea-level to 1530 m on Sumbawa, and to 1800 m on Flores.

Food and Feeding. No detailed information recorded; diet thought to include fruit, pollen and nectar of mistletoes (Loranthaceae). Forages singly, in pairs or in small groups.

Breeding. Laying in Jan and Mar–Oct (peak May) on Flores. Nest a thick oval pouch c. 130 × 65 mm, entrance hole in middle, constructed from felted plant material, spider webs and lichen, decorated with leaf fragments; one was attached at top directly to horizontal twig, another attached over a broad area directly to a twig at angle of 45 degrees. Clutch 2 eggs. No further information.

Movements. None recorded.

Status and Conservation. Not globally threatened. Restricted-range species: present in Northern Nusa Tenggara EBA. Locally common to rare.

Bibliography. Butchart *et al.* (1996), Cheke & Mann (2001), Coates & Bishop (1997), Mees (2006), Rensch (1931a), Salomonsen (1960b), Verhoye & Holmes (1999), White & Bruce (1986).

8. Thick-billed Flowerpecker

Dicaeum agile

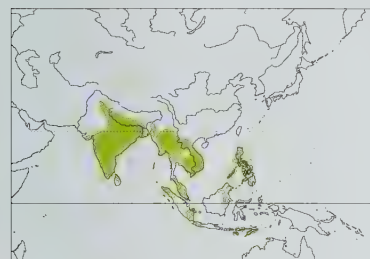
French: Dicée à bec épais **German:** Dickschnabel-Mistelfresser **Spanish:** Picaflor Picogrueso

Other common names: Streaky-breasted Flowerpecker; Ceylon Thick-billed Flowerpecker (*zeylonicum*); Striped/Fairy Flowerpecker (Philippine races)

Taxonomy. *Fringilla Agilis* Tickell, 1833, Borabhum and Dolbhum, Bengal, east India. Shares tongue morphology with *D. aureolimbatum*, *D. bicolor* and *D. celebicum*. Poorly known N Natuna race *bungurensis* of *D. everetti* (known only from the type specimen) possibly belongs with present species. Geographical variation complex, involving bill shape and various plumage characters (particularly colour of dorsal surface, pale spots on rectrices and ventral streaking), and with mosaic pattern of distribution among races. Philippine races (*striatissimum*, *affine* and *aeruginosum*) sometimes considered to represent a separate species; other races fall into two further groups, one in W (nominate and *zeylonicum*) and the other from NE India and SE Asia S to Sundas (remaining races), these groups possibly representing two additional species; moreover, *finschi* is perhaps sufficiently distinctive to be considered a separate species. Other proposed races are *degnani* (described from Kohima, in Assam) and *separabile* (from Dalat, in C Vietnam), both synonymized with *pallascens*, and *remotum* (from Negri Sembilan, in Peninsular Malaysia), considered indistinguishable from *modestum*. Eleven subspecies currently recognized.

Subspecies and Distribution.

D. a. agile (Tickell, 1833) – NE Pakistan E to W Bangladesh and S through peninsular India.
D. a. zeylonicum (Whistler, 1944) – Sri Lanka.
D. a. pallascens (Riley, 1935) – NE India (S Assam, Meghalaya), E Bangladesh, and Myanmar (except N, W & SW), Thailand (except S & E), Laos, Cambodia and Vietnam (except Tonkin); probably also S China (S Yunnan).
D. a. modestum (Hume, 1875) – S peninsular Thailand, Peninsular Malaysia and Borneo.
D. a. atjehense Delacour, 1946 – NE & S Sumatra.
D. a. finschi M. Bartels, 1914 – W Java.
D. a. tinctum (Mayr, 1944) – Lesser Sundas (Sumba, Flores and Alor).
D. a. obsoletum (S. Müller, 1843) – Timor.
D. a. striatissimum Parkes, 1962 – Luzon, Lubang, Romblon, Sibuyan and Catanduanes (N Philippines).
D. a. affine (J. T. Zimmer, 1918) – Palawan (W Philippines).
D. a. aeruginosum (Bourne & Worcester, 1894) – Mindoro, Negros, Cebu and Mindanao (S Philippines).



Descriptive notes. c. 9–10.4 cm; 7.5–11 g. A relatively dull flowerpecker with bill of variable thickness; has distinctive habit of jerking tail from side to side. Nominate race is grey-brown with variably intense olive or green tinge above, more olive tinge on rump (presumed male in display shows distinct white mesial stripe down crown and nape, and white flecking on centre of crown); tail and remiges brown, tail edged olive-green; white submoustachial streak, thin brown malar stripe; throat buffy white with faint brown streaking at sides, underparts buffy with obscure brown streaking, browner on flanks; concealed whitish pectoral tufts present;

undertail with large white tips on outer feathers, narrow white tips on adjacent pair; iris light brick red, sometimes dull orange or brown; bill bluish-black; legs slaty brown. Sexes similar. Juvenile is much less streaked than adult, and has yellowish wash on underparts, pale lower mandible. Races differ mainly in plumage coloration and markings and in bill shape, also races other than nominate have bill usually brownish with yellowish area on lower mandible (sometimes all black) and legs often black or grey; *zeylonicum* is smaller and darker than nominate, more olive-grey above, with more olive rump, and more heavily streaked below; *pallascens* is much greyer above, more heavily streaked below, with bill less deep than that of nominate; *modestum* is olive above, moderately streaked below, with tail spots faint; *finschi* is more olive above than nominate, greyish-white below, with more grey breast streaking, thin bill; *atjehense* is similar to previous in general coloration, but with slightly more prominent whitish tail tips, thicker bill; *tinctum* is brownish-olive above, greener-looking than nominate, has creamy underparts with less obvious streaking, faint spots on undertail; *obsoletum* is less olive above than nominate, browner on rump, almost pure unstreaked white below, has faint tail spots; *aeruginosum* is olive-green above, more greenish on lower back to uppertail-coverts, with whitish underparts heavily streaked brown, particularly on breast, has faint whitish patches on underside of outer rectrices, juvenile greyer and unstreaked; *affine* is smaller and more greyish-tinged olive than previous, has paler underparts with narrow more obscure streaking, white terminal spots on rectrices brighter, smaller and more sharply defined, has shorter and broader bill; *striatissimum* has darker, sootier (less greenish) upperparts than *aeruginosum*, underparts more heavily and extensively streaked, white spot on inner web of outer rectrix larger but fainter. **VOICE.** Loud “chik-chik-chik-chik”, rattling “titiititit”, and very high-pitched “chit-chit”; twittering call during display; sharp, cracked chirp “spick!”, likened to sound made by a small woodpecker (Picidae). Song of 6–8 notes at different pitches; described also as “spick!” call notes with short, dry, titting trills.

Habitat. Range of forest types, at forest edge, in secondary growth, plantations, coconut groves, orchards and gardens; particularly around flowering and fruiting trees and shrubs, and mistletoes (Loranthaceae). Lowlands to 3000 m.

Food and Feeding. Feeds on fruits, including those of mistletoes, lantana (*Lantana*) and figs (*Ficus*), also flowers; also takes insects, including caterpillars (Lepidoptera), and spiders (Araneae). Forages mainly in canopy and middle stratum; sometimes lower down in shrubs. Singly, in pairs or in small groups; joins mixed parties.

Breeding. Laying in Dec–Aug in India and Apr and May in Sri Lanka; nestlings found Jan in S Thailand; males with enlarged testes in Mar in Vietnam (S Annam). Nest a pear-shaped felted pouch with side entrance (apparently looking like a leaf), constructed of soft felted fibres, flower buds, cobweb and vegetable down, inconspicuously suspended 2–9 m above ground from twig of tree or bush; mango trees (*Mangifera indica*) and *Lantana* bushes recorded as used. Clutch 2–4 eggs, pale pinkish-white, blotched and speckled pale or deep brick red. No other information.

Movements. Resident in much of range. Seasonal altitudinal movement in Himalayas; in Nepal, found at 150–3000 m in summer, below 915 m in winter. Rare visitor in Singapore, where two records.

Status and Conservation. Not globally threatened. Generally fairly common throughout most of range; rare and local in Pakistan; widespread but not uncommon in India, widespread in Nepal, scarce in Sri Lanka, and local in Bangladesh; rare in Myanmar, but not uncommon in Thailand and locally common in S Laos; uncommon in Peninsular Malaysia, where assessed as being at best “near-threatened”; rare in Sumatra, Borneo, Java and Alor, and uncommon or rare on Sumba, Flores and Timor; uncommon in Philippines. Race *aeruginosum* possibly extinct on Cebu (Philippines), where no confirmed records since 1950s. Very local in Sumatra, where currently known from just four sites: Pendeng and Ketambe (in Aceh province, in N), Mt Sibayak (in Utara province, in N), and Padang-Sugihan Reserve (in Selatan province, in S). Occurs also in several other protected areas, e.g. Kaeng Krachan National Park and Khao Pra Bang Wildlife Sanctuary, in Thailand, and rare in Danum Valley Conservation Area, in Borneo.

Bibliography. Ali (1969), Ali & Ripley (1974), Cheke & Mann (2001), Cheng Tsohsin (1987, 2000), Coates & Bishop (1997), Corlett (1998), Deignan (1960), Dickinson *et al.* (1991), Evans *et al.* (2000), Fleming *et al.* (1976),

Grimmett *et al.* (1998), Hale (1996), Hellebrekers & Hoogerwerf (1967), Hellmayr (1914), Inskipp & Inskipp (1991), Kennedy *et al.* (2000), King *et al.* (1975), MacKinnon & Phillips (1993), Madge (1986), Mann (2002, 2008), van Marle & Voous (1988), Mayr (1944a), McGregor (1909), Medway (1972), Medway & Wells (1976), Mees (2006), Parkes (1962), Pearson, D.C. (1975), duPont (1971b), Rasmussen & Anderton (2005b), Rensch (1931a), Ripley (1982), Robson (2000b), Salomonsen (1960b), Santharam (1996a), Sheldon (1985), Thompson & Johnson (2003), Wait (1931), Wells (2007), Whistler & Kinnear (1949), White & Bruce (1986).

9. Brown-backed Flowerpecker

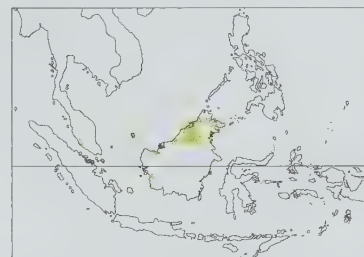
Dicaeum everetti

French: Dicée d'Everett **German:** Braunrücken-Mistelfresser **Spanish:** Picaflor de Dorsipardo
Other common names: Everett's Flowerpecker

Taxonomy. *Prionochilus everetti* Sharpe, 1877, Bintulu, Sarawak, western Borneo. Race *bungurensis* possibly belongs in *D. agile*. Described race *sordidum*, from Rawang, in C Selangor (W Peninsular Malaysia), is considered inseparable from nominate and therefore synonymized with it. Two subspecies recognized.

Subspecies and Distribution.

D. e. everetti (Sharpe, 1877) – Peninsular Malaysia (Selangor), Riau Archipelago (Bintan I) and N & W Borneo.
D. e. bungurensis (Chasen, 1935) – Bungan, in N Natuna Is.



Descriptive notes. 10 cm. A rather dull, pale-eyed flowerpecker with thick bill. Nominate race has most of head and all upperparts olive-brown, darker tail, edges of secondaries greenish; throat white, underparts grey-brown, with centre of breast and belly white; iris whitish to pale yellow or orange; bill grey or dark brown, or upper mandible grey and lower mandible brown with yellowish patch; legs grey or dark brown. Sexes similar. Juvenile undescribed. Race *bungurensis* differs from nominate in having underparts markedly streaked. **VOICE.** A sharp metallic “chip-chip” recorded.

Habitat. Heath forest, swamp-forest, secondary forest, mangroves, plantations and gardens, and at forest edge; sea-level to 1100 m.

Food and Feeding. Spiders (Araneae), insects and flowers taken; probably also nectar, pollen and fruits of mistletoes (Loranthaceae). Often forages at lower levels.

Breeding. In Borneo, laying in Feb and birds with active testes in Mar in Sabah. Nest a small, whitish felted pouch, probably made from grass and vegetable down such as kapok, suspended 5–6 m above ground from end of branch. No other information.

Movements. None recorded.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. May be at risk because of relatively small, fragmented known range, within which it is generally uncommon to rare. Thought to be possibly “endangered” in Peninsular Malaysia.

Bibliography. Anon. (2007e), Butchart & Stattersfield (2004), Chasen (1931), Cheke & Mann (2001), Collar *et al.* (2001), MacKinnon & Phillips (1993), Mann (2002, 2008), van Marle & Voous (1988), Pfeiffer (1961), Salomonsen (1960b), Sheldon (1985), Sheldon *et al.* (2001), Smythies (1957, 1960), Smythies & Cranbrook (1981), Smythies & Davison (1999), Stattersfield & Capper (2000), Wells (2007).

10. Whiskered Flowerpecker

Dicaeum proprium

French: Dicée à poitrine grise **German:** Graubrust-Mistelfresser **Spanish:** Picaflor Bigotudo
Other common names: Grey-breasted Flowerpecker

Taxonomy. *Dicaeum proprium* Ripley and Rabor, 1966, Mount Mayo, Limot, Mati, Davao Province, Mindanao, Philippines.

Relationships within genus uncertain. Monotypic.

Distribution. Mindanao, in S Philippines.



Descriptive notes. 9 cm; male 10.2 g. Male has crown and upperparts blue-black, glossed green, primaries dark brown; submoustachial stripe and chin greyish-white, separated by blue-black malar stripe; rest of underparts pale sepia-brown, darker and greyer on flanks, paler and greyer on undertail-coverts, pectoral tufts white; iris brown or reddish-brown; bill blackish or dark horn; legs black or dark brown. Female has crown and upperparts dark blackish-brown with slight gloss, throat whitish with pale brownish wash, and underparts darker, slightly reddish on breast, contrasting with paler belly and flanks. Juvenile undescribed. **VOICE.** Various raspy and snappy notes, e.g. “zaak”, and insect-like sounds; occasionally series of notes, as “zaach-zee-peew”.

Also, 4 or 5 high-pitched notes, first two higher; low “zenk”; high “swink” or “chenk” notes, rather buzzy, sometimes run into a song in which some notes rising and some falling.

Habitat. Forest, at forest edge and in secondary growth, particularly around flowering and fruiting trees; above 900 m.

Food and Feeding. No documented information; diet probably includes fruit, nectar and pollen of mistletoes (Loranthaceae).

Breeding. Carrying nest material to top of 20-m tree on 30th Apr–2nd May. No other information. **Movements.** No information.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species; present in Mindanao and the Eastern Visayas EBA. Generally uncommon to rare, but apparently locally common in a few areas. Sites where this species is known to occur include Mt Apo, Mt Matutum, Mt Mayo, Mt Piapayungan, Mt Kitanglad, Mt Sugarloaf, mountains of Lanao del Norte Province, and at Mainit, Manticao, Misamis Oriental, and L. Sebu.

Bibliography. Anon. (2007e), Butchart & Stattersfield (2004), Cheke & Mann (2001), Collar, Andreev *et al.* (2001), Collar, Crosby & Stattersfield (1994), Collar, Mallari & Tabaranza (1999), Dickinson *et al.* (1991), Kennedy *et al.* (2000), duPont (1971b), Ripley & Rabor (1966), Robson (1994a), Robson & Davidson (1996), Stattersfield & Capper (2000).



11

12

13

14

15

ssp nigilore

ssp diuatae

ssp anthonyi

16

ssp kampalili

ssp bicolor

17

ssp inexpectatum

18

19

20

21

PLATE 26

inches 3
cm 8

11. Yellow-vented Flowerpecker

Dicaeum chrysorrheum

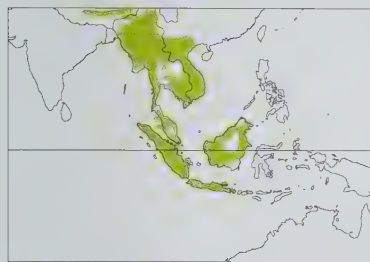
French: Dicée cul-d'or **German:** Gelbsteiß-Mistelfresser **Spanish:** Picaflres Pechiestradi

Taxonomy. *Dicaeum chrysorrheum* Temminck, 1829, Java. Proposed race *intensum* (from Sikkim, in N India) considered a synonym of *chrysochlore*. Two subspecies recognized.

Subspecies and Distribution.

D. c. chrysochlore Blyth, 1843 – Himalayan foothills from C Nepal E to NE India (Assam, S to Mizo Hills), E Bangladesh (Chittagong Hills), Myanmar, S China (W & SE Yunnan) and Indochina, and S to C peninsular Thailand (Isthmus of Kra).

D. c. chrysorrheum Temminck, 1829 – S Thailand (S of Isthmus of Kra) S to Peninsular Malaysia, Singapore, Sumatra, Borneo, Java (including Madura I) and Bali.



Descriptive notes. 9–10 cm; male 9.1–10.1 g, female 9 g. Greenish flowerpecker with striped underparts, large curved bill. Male nominate race has lores white, crown, side of neck and upperparts bright olive-green, upperwing and tail black; submoustachial stripe and throat white, greyish-black malar streak; breast and belly creamy white, streaked blackish, undertail-coverts yellow or orange; iris orange or orange-red; bill dark grey or blackish; legs dark grey. Sexes similar, female generally with less bright undertail-coverts. Juvenile differs from adult in having upperparts duller, underparts more greyish and with finer, less well-defined,

greyish-brown streaks, bill pale with black tip. Race *chrysochlore* has breast and belly yellowish-white and more heavily streaked greyish-black, and undertail-coverts bright golden-yellow. **VOICE.** A single “zeet”; flight call a repeated “zit-zit-zit”; also a repeated “chip-a-chip-tree”, and soft squeaks; contact notes loud, deep and hoarse.

Habitat. Lowland and hill dipterocarp forest, lower montane forest and secondary forest, moist deciduous and alluvial forests, peat swamp-forest, and highland heath forest, in open jungle, woodland, *Albizia* and old rubber plantations, gardens and orchards, and at forest edge; occurs particularly where mistletoes (Loranthaceae) present. To 245 m in Nepal, but to over 2000 m in Bhutan; to 1500 m in Myanmar, to 1300 m in Laos and to 870 m in Malay Peninsula; sea-level to 700 m in Sumatra and to 1700 m in Borneo.

Food and Feeding. Feeds on fruits of mistletoes and small figs (*Ficus*), berries of *Muntingia calabura*, nectar; also insects, including small beetles (Coleoptera). Forages at all levels of vegetation.

Breeding. Laying Apr–Aug in India, fledglings in Jan in S Thailand, and juveniles in May and Sept in Peninsular Malaysia. Nest built by both sexes, taking c. 4–5 days, a well-concealed pouch of moss, grass, fibre, cotton down (including of tree genus *Bombax*), fine grass-seed ends and spider webs, suspended usually below 8 m from bush or tree branch. Clutch 2–3 eggs, white; incubation by both sexes; no information on nestling period.

Movements. Sometimes makes dispersal movements. Apparently crosses to Singapore from Peninsular Malaysia more or less annually.

Status and Conservation. Not globally threatened. Common in India, but rare in Nepal, Bhutan and Bangladesh; uncommon in Myanmar and in Borneo; uncommon to common in Malay Peninsula; rare in Sumatra, Java and Bali. Only one confirmed record for Bali, from Bali Barat National Park. Occurs in several other protected areas, e.g. Kaziranga National Park, in India, Khao Yai National Park, in Thailand, and Cat Tien National Park, in Vietnam; rare in Danum Valley Conservation Area, in Borneo.

Bibliography. Ali & Ripley (1974), Cheke & Mann (2001), Cheng Tsohsin (1987), Fleming *et al.* (1976), Green (1991), Gretton (1990), Grimmett *et al.* (1998), Hellebrekers & Hoogerwerf (1967), Inskipp & Inskipp (1991), King *et al.* (1975), MacKinnon & Philipps (1993), Mann (1996, 2008), van Marle & Voous (1988), Medway & Wells (1976), Meyer de Schauensee (1984), Pfeffer (1961), Rasmussen & Anderton (2005b), Rheindt (2004a), Ripley (1982), Robson (2000b), Salomonsen (1960b), Sheldon *et al.* (2001), Smythies (1957, 1986), Smythies & Cranbrook (1981), Smythies & Davison (1999), Stressemann & Heinrich (1940a), Wells (2007).

12. Yellow-bellied Flowerpecker

Dicaeum melanoxanthum

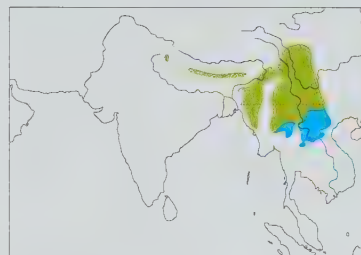
French: Dicée à ventre jaune **Spanish:** Picaflres Ventrigualdo **German:** Gelbbauch-Mistelfresser

Taxonomy. *Pachyglossa melanozantha* [error for *melanoxantha*] Blyth, 1843, Nepal.

The only member of its genus possessing a visible outermost primary, which is the character state in *Prionochilus*, but was placed in present genus owing to superficial resemblance to *D. vincens*; in tongue morphology, however, resembles *D. australe* and *D. hypoleucum*, and not *Prionochilus*. Monotypic.

Distribution. Himalayas from N India (E Uttaranchal) and N Nepal E discontinuously to Arunachal Pradesh, Nagaland and Manipur, NE Bangladesh, W & E Myanmar and S China (W & SW Sichuan S to W & NW Yunnan). Non-breeding also S to N Thailand, N Laos and extreme N Vietnam.

Descriptive notes. 11.5–13 cm. Male has head and upperparts slaty blue-black with slight gloss, upperwing and tail black, two outer pairs of tail feathers with large white patch on inner web (sometimes reduced or absent on penultimate feather); outermost primary (P10) not vestigial but short (as in *Prionochilus*); centre of throat and upper breast white, sides of neck and of breast dull greyish-black, rest of underparts bright yellow; iris red or chestnut; upper mandible black, lower mandible grey; legs black. Female is duller than male, has head, side of neck and upperparts, olive-grey, centre of throat and breast white, centre of belly and undertail-coverts pale yellow, flanks olive-yellow, less white on tail. Juvenile is mostly dull brown, with hint of white on throat and yellow on belly; immature male duller than adult, with brownish-grey upperparts. **VOICE.** Agitated “zit-zit-zit-zit”.



Habitat. Found in pine (*Pinus*) forest, in tall trees of open forest, clearings in rainforest and also at forest edge. Present at altitudes of 1400–3915 m in summer, and usually 775–1550 m (though has been recorded up to 2450 m) in winter.

Food and Feeding. Insects; probably also fruit, nectar and pollen, and in winter perhaps also leaves, of mistletoes (Loranthaceae). Solitary, elusive, generally more sluggish than smaller congeners. Sits upright on exposed perch often for lengthy periods. Sometimes flycatches by sallying.

Breeding. Nesting in Apr in Myanmar; juvenile in Jun in India, and males with enlarged testes in Jul in Nepal. Clutch 3 eggs, white. No other information.

Movements. Seasonal altitudinal movements recorded. Non-breeding visitor in winter months to N Thailand, SE Yunnan (S China) and N Indochina.

Status and Conservation. Not globally threatened. Scarce and local in India, local in Nepal and rare in Bhutan; only two records from Bangladesh, where possibly only a vagrant; in Myanmar, not uncommon in S Shan States. Rare non-breeding visitor in N Thailand. Occurs in several protected areas, e.g. rare in Namdapha National Park, in NE India, and scarce non-breeding visitor in Doi Inthanon National Park, in NW Thailand.

Bibliography. Ali & Ripley (1974), Cheke & Mann (2001), Cheng Tsohsin (1987), David-Beaulieu (1948), Davidson (1998), Dickinson (1970), Dickinson & Chaiyaphun (1973), Fleming (1968), Fleming *et al.* (1976), Fuchs *et al.* (2007), Grimmett *et al.* (1998), Inskipp & Inskipp (1991), Martens & Eck (1995), Meyer de Schauensee (1984), Rasmussen & Anderton (2005b), Ripley (1982), Robson (2000b), Robson *et al.* (1998), Salomonsen (1960b), Smythies (1986), Thompson & Johnson (2003).

13. White-throated Flowerpecker

Dicaeum vincens

French: Dicée de Ceylan **German:** Weißkeh-Mistelfresser **Spanish:** Picaflres Cingalés **Other common names:** Legge’s Flowerpecker

Taxonomy. *Prionochilus vincens* P. L. Slater, 1872, Sri Lanka. Monotypic.

Distribution. SW Sri Lanka.



Descriptive notes. 9–10 cm. Male has slaty-blue head and upperparts, paler on rump, black upperwing with narrow slaty-blue margins, black tail with large white terminal spots; throat to upper breast white, slaty-blue patches on sides of breast, lower breast and belly bright yellow, undertail-coverts white; iris brown or reddish-brown; bill black, blue-grey at base of lower mandible; legs black. Female is duller than male, has head grey, back dull olive, wing and tail brownish-black, outer rectrices with large white spots, throat whitish, belly pale yellow, flanks olive, undertail-coverts whitish, underwing-coverts white. Juvenile resembles

female, but with yellow wash on throat; pale lower mandible. **VOICE.** Calls include “tchip, tchip-two-see-see, tzee, tzee, tzee”, repeated high-pitched “tee-too”, weak “tze-tze-tze”, also “tsit; tsee-tsit(-tsit)” and “wheep-wheep-wheep”. Song said to be a series of 4–5 very high-pitched thin notes alternating in pitch, as “tink-tuk-tink”; ascending “keek-keek” ending with “tit-tiri-tit-tiri” and a rapid, irregular descending trill also described.

Habitat. Among tall trees and creepers in rainforest, at up to 1000 m. Has been recorded in drier forests and at higher altitudes; occasionally visits gardens and plantations near forest.

Food and Feeding. Fruits, probably including mistletoes (Loranthaceae), also nectar, spiders (Araneae) and small insects. Forages mostly at high levels, occasionally lower. Found singly, in pairs or in small family parties. Often joins mixed feeding flocks.

Breeding. Laying in Jan–Aug. Nest said to be typical of family, placed 18–38 m up in dipterocarp tree. Clutch 2 eggs, pinkish-white, speckled with pinkish-brown, more heavily at broad end. No other information.

Movements. No information.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Sri Lanka EBA. In some areas considered common, or even locally abundant, below 900 m. Potentially at risk because of its small range and highly fragmented habitat.

Bibliography. Ali & Ripley (1974), Anon. (2007e), Banks & Banks (1986), Butchart & Stattersfield (2004), Cheke & Mann (2001), Collar, Andreev *et al.* (2001), Collar, Crosby & Stattersfield (1994), Grimmett *et al.* (1998), Harrison (1999), Kazmierczak (2000), Kotagama & Goodale (2004), Rasmussen & Anderton (2005b), Ripley (1982), Stattersfield & Capper (2000).

14. Yellow-sided Flowerpecker

Dicaeum aureolimbatus

French: Dicée à flancs jaunes **Spanish:** Picaflres Flanquigualdo **German:** Gelbflanken-Mistelfresser

Other common names: Golden-edged/Golden-flanked/Minahassa/Sulawesi/Celebes Flowerpecker

Taxonomy. *Prionochilus aureolimbatus* Wallace, 1865, mountains of Minahassa, northern Sulawesi. Has been thought perhaps to form a superspecies with *D. nigrilore*, with which it shares some plumage resemblances, but differs markedly in bill shape and tongue structure. Tongue morphol-

On following pages: 15. Olive-capped Flowerpecker (*Dicaeum nigrilore*); 16. Flame-crowned Flowerpecker (*Dicaeum anthonyi*); 17. Bicoloured Flowerpecker (*Dicaeum bicolor*); 18. Cebu Flowerpecker (*Dicaeum quadricolor*); 19. Red-striped Flowerpecker (*Dicaeum australe*); 20. Black-belted Flowerpecker (*Dicaeum haematostictum*); 21. Scarlet-collared Flowerpecker (*Dicaeum retrocinctum*).

ogy of present species resembles that of *D. agile*, *D. bicolor* and *D. celebicum*. Races rather poorly differentiated. Two subspecies recognized.

Subspecies and Distribution.

D. a. aureolimbatum (Wallace, 1865) – Sulawesi and adjacent islands (including Bangka, Lembah, Togian Is, Kabaena, Muna, Butung).

D. a. laterale Salomonsen, 1960 – Sangihe I, N of Sulawesi.



Descriptive notes. 8.5 cm. Nominate race is bright olive-green above, duller on crown, brighter green on rump, with upperwing and tail blackish-brown; auriculars blackish-grey, cheek dark grey, moustachial stripe greyish-white; greyish-white below, tinged ashy on foreneck, with side of breast, flanks and undertail-coverts bright yellow; underwing-coverts white; iris reddish-brown to brown; bill and legs blackish. Sexes similar. Juvenile has side of chest yellow, less bright than adult, flanks grey, undertail-coverts whitish, bare parts pinkish-brown. Race *laterale* has flanks greyish-olive. Voice. Call “s-uit”, less high-pitched and less strident than that of *D. celebicum*, and given less frequently; also 5–6 “tuk” notes, rapid and staccato; sharp and clear “zit-zit-zit”, sometimes run together 5–6 times.

Habitat. Occurs in primary forest and tall secondary forest; also found at forest edge, in woodland, cultivation, plantations, scrub, *Lantana camara* thickets and gardens. Recorded from sea-level up to 2000 m.

Food and Feeding. Spiders (Araneae), insects, fruits of mistletoes (Loranthaceae), small figs (*Ficus*) and wild cherries (*Prunus*); possibly also nectar and pollen of mistletoes. Larger fruits squeezed before being swallowed, and bill wiped on a branch afterwards. Forages mostly in middle storey or in medium-sized trees. Displaced from feeding sites by *D. celebicum*. Occurs singly, in pairs or in small groups.

Breeding. Active nests Togian Is in Jun and Aug, and fledglings in Nov; immatures late Aug to early Sept on Kabaena. Nest pear-shaped, mainly of woven dry leaves and/oralang grasses, c. 15 cm above ground. Eggs white, spotted violet or red, or grey with dense purple-brown flecks. No other information.

Movements. No information.

Status and Conservation. Not globally threatened. Widespread and common in Sulawesi, including on Kabaena; rare on Sumpu (off SW Butung). Race *laterale* common on Sangihe I. Occurs in Lore Lindu National Park, in C Sulawesi.

Bibliography. van Bemmelen & Voous (1951), Blasius (1897), Cheke & Mann (2001), Coates & Bishop (1997), Coomans de Ruiter (1950, 1951), Holmes & Wood (1980), Indrawan *et al.* (2006), Meyer & Wigglesworth (1898a, 1898b), Riley, J. (1997), Riley, J.I. (1924), Salomonsen (1960b), Schönwetter & Meise (1980), Stressemann & Heinrich (1940b), Watling (1983), White & Bruce (1986).

15. Olive-capped Flowerpecker

Dicaeum nigrilore

French: Dicée à calotte olive

German: Olivkopf-Mistelfresser

Spanish: Picaflres de Mindanao

Taxonomy. *Dicaeum nigrilore* E. J. O. Hartert, 1904, Mount Apo, 3000 feet [c. 915 m], Mindanao, Philippines.

Has been thought perhaps to form a superspecies with *D. aureolimbatum*, with which it exhibits some plumage resemblances, but differs markedly in bill shape and tongue structure; indeed, tongue morphology of present species is unlike that of any other species examined. Two subspecies recognized.

Subspecies and Distribution.

D. n. nigrilore E. J. O. Hartert, 1904 – mountains of W, C & S Mindanao, in S Philippines.

D. n. diutae Salomonsen, 1953 – E Mindanao (Mt Hilong-Hilong, Mt Pasian and Mt Puting Bato).



Descriptive notes. c. 9.8 cm; 9.5–12.4 g. Fairly modest-looking flowerpecker with long, slender, curved bill. Nominate race has top of head light olive, mantle brown, back brownish, rump olive-green; upperwing and tail dark brown, wing feathers edged green; lores and patch under eye black, chin white, throat, breast and belly grey, flanks and undertail-coverts dull yellow, abdomen white; iris brown or blood-red; bill black; feet greyish-black. Sexes similar. Immature is duller than adult. Race *diutae* is distinctive, has top of head dark, dull green, mantle blackish-brown, back, flanks and undertail-coverts olive-green, abdomen suffused yellow. Voice. High-pitched, scratchy “zuti-zuti-zuti-zuti...” repeated 10–15 times; high (tseep-tseep...); also rapid rising and falling high-pitched trill of c. 30 notes, some rather sweet and atypical of a flowerpecker.

Habitat. Submontane and montane forests above 900 m; found particularly around flowering and fruiting trees.

Food and Feeding. No information; diet thought to include fruits, pollen and nectar of mistletoes (Loranthaceae).

Breeding. Nest-building observed in May; birds with active gonads in Jan, Apr and May. Nest, under construction, spherical, 15–18 cm in diameter, made of fibres and other dried plant material, woven together with moss; well-concealed at 15 m above ground, suspended by fibres from small twigs. No other information.

Movements. None recorded.

Status and Conservation. Not globally threatened. Restricted-range species; present in Mindanao and the Eastern Visayas EBA. Common. Nominate race occurs on Mt Malindang, Mt Kitanglad, Mt Apo, Mt McKinley, Mt Busa, Mt Matutum, Mt Mayo, and mountains in Misamis Oriental province. E race *diutae* is found on Mt Hilong-Hilong, Mt Pasian and Mt Puting Bato, where it appears not to be at any immediate risk.

Bibliography. Cheke & Mann (2001), Dickinson *et al.* (1991), Kennedy *et al.* (2000), McGregor (1909), duPont (1971b), Rand & Rabor (1960), Salomonsen (1953b, 1960b).

16. Flame-crowned Flowerpecker

Dicaeum anthonyi

French: Dicée couronné

German: Goldkronen-Mistelfresser

Spanish: Picaflres Coronado

Other common names: Anthony's Flowerpecker; Yellow-crowned Flowerpecker (nominate)

Taxonomy. *Prionochilus anthonyi* McGregor, 1914, Mount Polis, Ifugao Subprovince, 2000 m, Luzon, Philippines.

Nominate race particularly distinctive, possibly represents a separate species; study required. Three subspecies recognized.

Subspecies and Distribution.

D. a. anthonyi (McGregor, 1914) – N Luzon (Mt Polis, Mt Puguig, Mt Tabuan and Mt Dipalayag), in N Philippines.

D. a. masawani Rand & Rabor, 1957 – W Mindanao (Mt Malindang), in S Philippines.

D. a. kampilili Manuel & Gilliard, 1953 – N, C & SE Mindanao (Mt Kitanglad, Daggayan near Mt Balatukan, Mt Pasian, Mt Kampilili, Mt McKinley and Mt Apo).



Descriptive notes. 9.6 cm; male 9.6–13 g, female 11.7 g. Male nominate race has forehead and lores black, crown orange-yellow; hind-neck and upperparts black, glossed blue; chin and throat white, breast and belly pale yellowish, undertail-coverts yellow to orange-yellow; iris chestnut; bill black; legs black or blackish-slate, soles pale yellow. Female much duller; crown, side of head, side of neck and upperparts olive; lores and forehead grey, chin, throat and submoustachial area whitish, malar area and most of abdomen pale olivaceous buff mixed with some yellow, and a yellow stripe running down central abdomen to undertail-coverts; iris dark brown. Juvenile undescribed; immature paler and less glossy than adult of corresponding sex. Race *kampilili* male has crown glossy orange-red, breast and belly greyish-white and undertail-coverts orange, female brown below with buff undertail-coverts; *masawani* resembles previous, but male has much more yellow breast and belly. Voice. High-pitched, sharp “srreep”; no further details.

Habitat. Forest, particularly mossy forest, and at forest edge, around flowering and fruiting trees; usually above 800 m and to at least 2000 m.

Food and Feeding. No detailed information; diet presumably includes fruits, pollen and nectar of mistletoes (Loranthaceae). Occurs in all storeys; may feed close to ground. Forages singly and in pairs; may join mixed-species flocks.

Breeding. Birds with active gonads in May; fledged young seen in Mar on Mindanao.

Movements. No information.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species; present in Luzon EBA and in Mindanao and the Eastern Visayas EBA. Generally uncommon, occurring at low density; common on Mt Pasian, in E Mindanao.

Bibliography. Anon. (2007e), Butchart & Stattersfield (2004), Cheke & Mann (2001), Collar, Andreev *et al.* (2001), Collar, Crosby & Stattersfield (1994), Dickinson *et al.* (1991), Kennedy *et al.* (2000), Manuel & Gilliard (1952), McGregor (1927), duPont (1971b), Rand & Rabor (1957), Ripley & Rabor (1961), Robson & Davidson (1996), Salomonsen (1960b), Stattersfield & Capper (2000).

17. Bicoloured Flowerpecker

Dicaeum bicolor

French: Dicée bicolor

German: Zweifarben-Mistelfresser

Spanish: Picaflres Bicolor

Taxonomy. *Prionochilus bicolor* Bourns and Worcester, 1894, hills at back of Ayala, Zamboanga, Mindanao, Philippines.

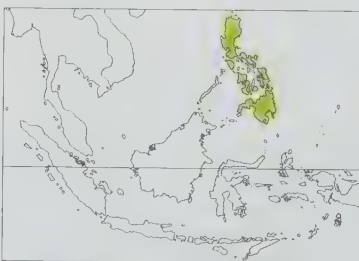
Forms a superspecies with *D. quadricolor*. Tongue morphology similar to that of *D. agile*, *D. aureolimbatum* and *D. celebicum*. Recent records on Panay probably refer to race *viridissimum*. Three subspecies recognized.

Subspecies and Distribution.

D. b. inexpectatum (E. J. O. Hartert, 1895) – Luzon, Mindoro and Catanduanes, in N Philippines.

D. b. viridissimum Parkes, 1971 – Guimaras, Negros and (probably this race) Panay, in C Philippines.

D. b. bicolor (Bourns & Worcester, 1894) – Samar, Leyte, Bohol, Dinagat and Mindanao, in EC & S Philippines.



Descriptive notes. c. 9 cm; male 7.8–8.5 g, female 8.6–10 g. Male nominate race has top of head (to below eye), upperparts, upperwing and tail black, glossed purple; mostly grey below, whitish on throat, submoustachial area and centre of belly and undertail-coverts; iris red; bill and legs black. Female is duller than male, dark glossy green above, browner on crown, greener on lower back, rump and upperpart-coverts, with black tail, grey underparts have olive-green wash and lighter streak down middle, whitish submoustachial area and whitish undertail-coverts, underwing-coverts white; iris chestnut, bill dark brown with pale

yellowish-brown or orange-flesh base of lower mandible, legs dark brownish-grey. Juvenile undescribed; immature as female, but greyer above. Race *inexpectatum* is slightly bigger than nominate, male has blue (not purple) gloss on upperparts, female is greyish-olive above, wing-coverts and remiges dark brown with olive-brown edging, tail blackish-brown, grey below with olive wash and lighter central streak; *viridissimum* also is slightly bigger than nominate, male has green gloss above, female has greyish-olive upperparts and olive-green wash below. Voice. “Swip-swip...” notes developing into rapid trill, becoming slower and lower-pitched towards end.

Habitat. Forest, at forest edge and in secondary growth, around flowering and fruiting trees; usually below 1000 m, but recorded to above 2250 m.

Food and Feeding. No detailed information; diet probably includes fruit, pollen and nectar of mistletoes (Loranthaceae). Spends most of time in canopy. Forages singly or in small groups; joins mixed-species flocks.

Breeding. Young fledglings observed in Mar and May on Luzon and in Apr on Mindanao; female with oviduct egg in Apr in S Luzon. No other information.

Movements. No information.

Status and Conservation. Not globally threatened. Uncommon in all parts of range. As a canopy-dweller, this species is possibly more numerous than it appears to be.

Bibliography. Cheke & Mann (2001), Dickinson *et al.* (1991), Goodman & Gonzales (1990), Kennedy *et al.* (2000), McGregor (1909), Parkes (1971), duPont (1971b), duPont & Rabor (1973b), Ripley & Rabor (1958), Robson & Davidson (1996), Salomonsen (1960b), Whitehead (1899), Worcester (1898).

18. Cebu Flowerpecker

Dicaeum quadricolor

French: Dicée quadricolore **German:** Vierfarben-Mistelfresser **Spanish:** Picaflor de Cebú
Other common names: Orange-backed/Four-coloured Flowerpecker

Taxonomy. *Prionochilus quadricolor* Tweeddale, 1878, Cebu, Philippines.

Forms a superspecies with *D. bicolor*. Monotypic.

Distribution. Cebu, in C Philippines.



Descriptive notes. 9 cm. Male has top and side of head and hindneck black, mantle and back black, feathers with extensively bright orange-red tips, lower back and rump greenish-yellow, upperwing and tail black; whitish submoustachial area, throat and centre of breast, rest of underparts grey; iris dark brown; bill and legs glossy black (legs bright pink in breeding season). Female has upperparts brownish olive-green, underparts greyish white. Juvenile is very similar to female, but is paler above, and has a pinkish lower mandible. **Voice.** Gives "seep-seep-seep tik-tik-tik-tik", the "tik" notes like sound made by striking

together two pebbles; also "tseep-tseep-tseep". Series of "tisp-tisp" or "trik-trik" notes, sometimes developing into trill; very high-pitched, sometimes repeated, insect-like "see-ip"; high-pitched "sit-sit-sit".

Habitat. Occurs around flowering and fruiting vines and trees in forest; found in both open-canopy and closed-canopy forests.

Food and Feeding. Small fruits of forest trees, and presumably also fruit, nectar and pollen of mistletoes (Loranthaceae). Attracted to red-flowered vines and also to vines with greenish-white flowers. Spends most of its time in forest canopy. Forages singly or in small groups.

Breeding. Nesting in Jun, juveniles observed in Jun, Jul and Dec; singing male in Mar. Nest observed but details not yet documented. No other information.

Movements. Presumed sedentary.

Status and Conservation. **CRITICALLY ENDANGERED.** Restricted-range species: present in Cebu EBA. Has tiny population, and equally tiny and fragmented range in danger from deforestation. Global population estimated at 85–105 individuals, and total range c. 8 km². Occurs at four localities: Tabunan, in Central Cebu National Park; Nug-as, part of which lies in the Watershed Reserve for Alcoy and Boljo-on municipalities; Mt Lantoy, within the Argao–Dalaguete Watershed Forest Reserve; and Dalaguete. Previously recorded from Toledo and near Cebu City, but believed now extinct there. Was considered to be not uncommon in 1890s; after a single individual was collected in 1906, however, the species was for long considered extinct, until its rediscovery in 1992, at Tabunan. In addition to extensive habitat loss, interspecific competition with the more aggressive *D. australe* may be a significant problem in areas where habitat modification favours latter species.

Bibliography. Anon. (2007c), Bourns & Worcester (1894), Butchart & Stattersfield (2004), Cheke & Mann (2001), Collar (1998b), Collar, Andreev *et al.* (2001), Collar, Crosby & Stattersfield (1994), Collar, Mallari & Tabaranza (1999), Delacour & Mayr (1945), Dickinson *et al.* (1991), Dutton (1993, 1997b), Dutton *et al.* (1993), Evans *et al.* (1993), Kennedy *et al.* (2000), Magsalay (1993, 1995), Magsalay *et al.* (1995), McGregor (1909), duPont (1971b), Salomonsen (1960b), Stattersfield & Capper (2000), Timmins (1992), Worcester (1898).

19. Red-striped Flowerpecker

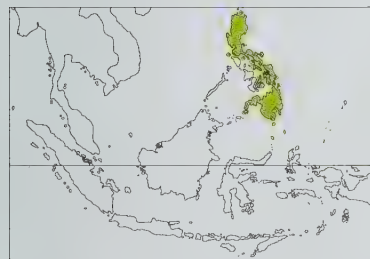
Dicaeum australe

French: Dicée des Philippines **German:** Rostbauch-Mistelfresser **Spanish:** Picaflor Filipino
Other common names: Red-keeled/Austral/Philippine Flowerpecker

Taxonomy. *Pipra australis* Hermann, 1783, New Guinea; error = Luzon, Philippines.

Forms a superspecies with *D. haematostictum*, and sometimes considered conspecific; *D. retrocinctum* possibly part of same superspecies, but differs in several characters. Tongue morphology of present species similar to that of *D. melanoxanthum* and *D. hypoleucum*. Geographical variation minor; birds from Cebu described as race *flaviventer*, but considered insufficiently distinct from those in rest of range to warrant recognition. Monotypic.

Distribution. Philippines (except islands from Mindoro S to Palawan, and E to Sibuyan, Panay and Negros).



Descriptive notes. 10 cm; male 9–11 g, unsexed 7.9–10.5 g. Mostly black-and-white flowerpecker with longish, stout, curved bill. Has top and side of head and upperparts black, glossed blue; chin and throat white, breast and belly grey, with scarlet stripe down middle; underwing and concealed pectoral tufts white; iris dark chestnut to dark brown; bill dark brown to black; legs greyish-brown or black. Sexes similar. Juvenile is unglossed blackish brown above to below cheek, underparts brownish olive-grey below, paler on side of throat, slightly buffy on centre of abdomen, axillaries whitish; base of upper mandible and

basal two thirds of lower mandible orange-red or brownish yellow, legs pale brown. **Voice.** Utters a high-pitched insect-like trilling "suit-sui...", and also a high-pitched rising and falling "tik-tik", becoming a trill.

Habitat. Forest and forest edge, secondary growth, coconut groves and in open country, generally around flowering and fruiting trees; below 1000 m.

Food and Feeding. No information on diet; probably includes fruit, nectar and pollen of mistletoes (Loranthaceae). Mostly in canopy. Forages singly, in pairs or in small groups; joins mixed-species flocks.

Breeding. Laying recorded in Jun and Aug, juveniles observed in Aug and birds with active gonads in Aug; fledged young observed in Apr on Mindanao and in May on Luzon. No other information available.

Movements. None recorded.

Status and Conservation. Not globally threatened. Common throughout most of range. Ability to adapt well to secondary habitats favours this species. In view of its relative abundance, this flowerpecker's ecology and biology are surprisingly poorly known.

Bibliography. Cheke & Mann (2001), Delacour & Mayr (1945), Dickinson *et al.* (1991), Eritzee (1995), Gilliard (1950a), Kennedy *et al.* (2000), Kraus (1986b), Mann (2002), McGregor (1909), duPont (1971b), duPont & Rabor (1973b), Robson & Davidson (1996), Salomonsen (1960b), Whitehead (1899), Worcester (1898).

20. Black-belted Flowerpecker

Dicaeum haematostictum

French: Dicée à poitrine noire **Spanish:** Picaflor Pechinegro

German: Schwarzgürtel-Mistelfresser

Other common names: Visayan/Guimaras/Red-keeled Flowerpecker

Taxonomy. *Dicaeum haematostictum* Sharpe, 1876, Guimaras, Philippines.

Forms a superspecies with *D. australe*, and sometimes considered conspecific; *D. retrocinctum* possibly part of same superspecies, but differs in several characters. Proposed race *whiteheadi* (described from Mt Canlaon, on Negros) considered not distinguishable from birds elsewhere in range. Monotypic.

Distribution. Panay, Guimaras and Negros, in WC Philippines.



Descriptive notes. 10 cm. Plumage above is black, glossed blue; chin and throat white, black band across upper breast, rest of breast and belly grey with broad scarlet stripe down middle; underwing and concealed pectoral tufts white; iris dark brown or black; bill dark brown to black; legs greyish-brown or black. Sexes similar. Juvenile is dark greyish-brown above and on sides of neck and cheek, grey below, with iris hazel, and proximal half of lower mandible and base of upper mandible cream; transitional plumage is blackish-brown above and down to cheek and malar region, unglossed (except for shoulder), with much less red and

black than adult on underparts, which chiefly grey, becoming slightly buffy on centre of abdomen, and with yellow base of lower mandible. **Voice.** Call "seet-seet", sometimes becoming a trill; also "chip", and rapid tinkling notes; also "chip-seet-seet" followed by short trill.

Habitat. Occurs in forest and at forest edge, also in open country, secondary growth, cultivation, coconut groves and gardens, usually around fruiting and flowering trees. Present from sea-level up to 1250 m.

Food and Feeding. Insects, spiders (Araneae); figs (*Ficus*); also fruits, flowers and possibly nectar and pollen from mistletoes (Loranthaceae). Forages singly, in pairs or in small groups; joins mixed-species flocks.

Breeding. Nests found in Mar, Aug and Sept, and juveniles observed in Aug; males with enlarged testes in Dec–Mar and May. Nest 7–11 m above ground suspended from end of branch, or in tree-fern. Clutch 1 egg, very pale greenish-white, heavily clouded lilac, profusely spotted at broader end, and with olive-brown speckles all over. No other information.

Movements. None recorded.

Status and Conservation. **VULNERABLE.** Restricted-range species: present in Negros and Panay EBA. Has small, extremely fragmented range, severely affected by clearance of lowland forest and scrub, resulting in rapid decline of population. Estimated global population 10,000–19,999 individuals and decreasing, and total range c. 24,000 km². Probably extinct on Guimaras as a result of almost complete clearance of forest. Was previously considered common in some areas, e.g. on Negros; on latter island, was abundant on Mt Talinis in secondary forest in early 1990s. On Negros, occurs in Mt Canlaon National Park, North Negros Forest Reserve (only nominally protected) and Mt Talinis and Twin Lakes area (proposed for receipt of funding for protection). On Panay, found at various sites within proposed Central Panay Mountains National Park, also in Sampunong Bolo National Park (protection only nominal).

Bibliography. Anon. (2007c), Brooks *et al.* (1992), Butchart & Stattersfield (2004), Cheke & Mann (2001), Collar, Andreev *et al.* (2001), Collar, Crosby & Stattersfield (1994), Collar, Mallari & Tabaranza (1999), Dickinson *et al.* (1991), Kennedy *et al.* (2000), Mann (2002), McGregor (1909), Ogilvie-Grant & Whitehead (1898), duPont (1971b), Salomonsen (1960b), Schönwetter & Meise (1980), Stattersfield & Capper (2000), Whitehead (1899).

21. Scarlet-collared Flowerpecker

Dicaeum retrocinctum

French: Dicée de Mindoro **German:** Mindoromistelfresser **Spanish:** Picaflor de Mindoro
Other common names: Red-collared/Mindoro Flowerpecker

Taxonomy. *Dicaeum retrocinctum* Gould, 1872, Manila and Mindanao; error = Mindoro, Philippines.

Possibly part of the superspecies formed by *D. australe* and *D. haematostictum*, but differs from those in several characters. Monotypic.

Distribution. Mindoro, Panay and Negros, in WC Philippines.

Descriptive notes. 10 cm. Black, white and red flowerpecker with rather slender and decurved bill. Most of head and upperparts, including tail, are blue-black, with scarlet collar (sometimes incomplete) on hindneck; remiges blackish-brown; chin and throat to upper breast black, red patch in centre of throat, scarlet stripe on centre of breast and belly, rest of underparts (lower breast, belly and undertail-coverts) grey-white, underwing-coverts white; iris dark red-brown; bill and legs black. Sexes similar. Juvenile undescribed; immature dark grey above, greyish-white with yellow wash below. **Voice.** Continuous sharp "tipk-tipk-tipk-tipk", like sound produced when two pebbles struck together; occasionally "tip-chik, zeet-zeet-zeet".



Habitat. Closed-canopy forest, forest edge, secondary growth, including on limestone, open country, in coconut groves and cultivation, usually around flowering or fruiting trees; sea-level to 1000 m, and once recorded in montane forest at 1200 m.

Food and Feeding. Feeds on fruit, and presumably berries, nectar and pollen of mistletoes (Loranthaceae). Visits epiphytes, figs (*Ficus*) and *Muntingia* trees. Generally found in higher storeys, often in canopy, but occasionally close to ground. Forages singly, in pairs or in small groups; joins mixed-species flocks.

Breeding. Nesting recorded in Apr; males with enlarged testes in Feb and Apr–Jun and females with active ovaries Apr–May; family parties with immatures in Sept.

Movements. None recorded.

Status and Conservation. **VULNERABLE.** Restricted-range species: present in Mindoro EBA and in Negros and Panay EBA. Small population rapidly declining, and small, severely fragmented range being reduced by forest clearance. Its decreasing population is estimated at 10,000–19,999 individuals and its total range at 9900 km². Was thought to be confined to Mindoro, but recently found farther S, on Panay and Negros. Considered common, even abundant, through much of 20th century, and still common in a few areas, but unable to persist in highly degraded habitat. On Mindoro, occurs within Mount Iglit–Baco National Park, where scattered forest patches present, and in Lake Naujan National Park, where little forest remains; smaller protected areas include the MUFRC Experimental Forest (7853 ha), in E Mindoro. Conservation funding proposed also for the Baloy/Madja-as mountain range (forming part of proposed Central Panay Mountains National Park), on Panay, and Mount Talinis and Twin Lakes area, on Negros; the species occurs also in nominally protected North Negros Forest Reserve.

Bibliography. Anon. (2007e), Butchart & Stattersfield (2004), Catibog-Sinha (1982), Cheke & Mann (2001), Collar, Andreev *et al.* (2001), Collar, Crosby & Stattersfield (1994), Collar, Mallari & Tabaranza (1999), Curio (1994), Curio *et al.* (1996), Dickinson *et al.* (1991), Dutson *et al.* (1992), Evans *et al.* (1993), Kennedy *et al.* (2000), Mann (2002), McGregor (1909), duPont (1971b), Ripley & Rabor (1958), Salomonsen (1960b), Stattersfield & Capper (2000), Whitehead (1899), Worcester (1898).



22. Orange-bellied Flowerpecker

Dicaeum trigonostigma

French: Dicée à ventre orange **Spanish:** Picaflores Ventrinaranja
German: Orangebauch-Mistelfresser

Other common names: Orange-breasted Flowerpecker (“*dorsale* subgroup”); Sulu Flowerpecker (“*sibutuense* subgroup”)

Taxonomy. *Certhia trigonostigma* Scopoli, 1786, China [i.e. Malaysia] = Malacca, Peninsular Malaysia.

Tongue morphology similar to that of *D. erythrothorax*, *D. pygmaeum*, *D. aeneum*, *D. sanguinolentum* and *D. cruentatum*, although one specimen exhibits a unique variation. Geographical variation considerable, some of it well marked. Races fall into two groups, “*dorsale* group” in Philippines and “*nominate* group” in rest of range; former can be divided into four subgroups, namely “*dorsale* subgroup” (from Luzon to W Visayan Is, excluding islands in Sibuyan Sea), “*sibuyanica* subgroup” (islands in Sibuyan Sea), “*cinereigulare* subgroup” (E Visayan Is S to Mindanao), and “*sibutuense* subgroup” (Sulu Archipelago). *Nominate* race intergrades with *rubropygium* in S peninsular Thailand. Race *cnecolaemum* doubtfully distinct from *intermedium*, and *antiopectum* possibly better subsumed in *nominate*. Other proposed races are *croceiventre* (described from Sumatra), *melanthe* (Lasia I, off NW Sumatra), *lyprum* (Nias I, off W Sumatra), *tanamassae* (Tanahmasa, in Batu Is, off W Sumatra), *pagense* (South Pagai I, off W Sumatra) and *hypochlous* (Siantan, in Anamba Is, E of Peninsular Malaysia), all synonymized with *nominate*, and *hanadori* (Siasi, in Sulu Archipelago), merged with *assimile*. Seventeen subspecies currently recognized.

Subspecies and Distribution.

D. t. rubropygium Stuart Baker, 1921 – NE India (E Assam), Bangladesh (including Sundarbans), SW, SE & S Myanmar S to S peninsular Thailand.

D. t. trigonostigma (Scopoli, 1786) – S peninsular Thailand (S from Trang) and Peninsular Malaysia, Anamba Is, Riau Archipelago, Lingga Archipelago, Sumatra and satellites (except Simeulue) and Karimata I (off SW Borneo).

D. t. antiopectum Oberholser, 1912 – Simeulue I, off NW Sumatra.

D. t. dayakanum Chasen & Kloss, 1929 – Borneo (including islands off N coast).

D. t. megastoma E. J. O. Hartert, 1918 – Natuna Is.

D. t. flaviplum E. J. O. Hartert, 1918 – Java, Bali and Krakatau.

D. t. xanthopygium Tweeddale, 1877 – Luzon, Polillo Is, Mindoro and Marinduque, in N Philippines.

D. t. dorsale Sharpe, 1876 – Panay, Masbate and Negros, in WC Philippines.

D. t. cnecolaemum Parkes, 1989 – Tablas (NC Philippines).

D. t. intermedium Bourns & Worcester, 1894 – Romblon (NC Philippines).

D. t. sibuyanica Bourns & Worcester, 1894 – Sibuyan (NC Philippines).

D. t. pallidus Bourns & Worcester, 1894 – Cebu (Nug-as), in EC Philippines.

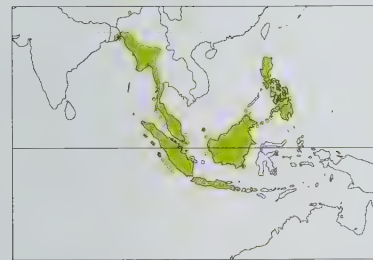
D. t. cinereigulare Tweeddale, 1878 – Samar, Calicoan, Biliran, Leyte, Bohol and Mindanao, in E & S Philippines.

D. t. besti Steere, 1890 – Siquijor (S of Bohol).

D. t. isidroi Rand & Rabor, 1969 – Camiguin Sur (N of Mindanao).

D. t. assimile Bourns & Worcester, 1894 – C Sulu Archipelago (Jolo, Siasi, Tawi-Tawi).

D. t. sibutuense Sharpe, 1893 – SW Sulu Archipelago (Sipangkot, Omapoy, Sibutu).



Descriptive notes. 8–9 cm; male 5–7.9 g, female 5–8.7 g, unsexed 5.9–8.4 g. Male *nominate* race has head to below eye, neck, upper mantle, upperwing and tail dark slate-blue, somewhat glossed, with triangular orange patch on upper back, orange lower back and rump; lores and side of head blue-grey or slaty; throat to upper breast pale grey, rest of underparts bright orange, becoming more yellow on belly; iris chestnut or brown; bill blackish, paler on lower mandible; legs dark grey, indigo or blackish. Female is greyish to olive-brown above, with rump olive-yellow, throat, breast and flanks grey-brown, belly yellow,

becoming orange on lower belly and undertail-coverts; iris pale to dark brown. Juvenile is similar to female, but throat, breast and flanks greyish-olive, usually lacking all yellow or orange, upperparts olive-green, wings and tail black, remiges edged blue, tertials edged green, and light olive below, washed greenish on chin, centre of breast and abdomen; iris dark brown, bill bright yellow with light brown tip, legs pale slate-blue. Races differ mainly in plumage coloration and pattern, all members of “*nominate* group” having rump patch continuous in colour with back, whereas those in “*dorsale* group” have rump patch separated from back or sometimes (*besti* and *cinereigulare*) absent: *antiopectum* is very like *nominate*, but female more greenish, with less olive rump and less olive underparts; *dayakanum* is blacker above than *nominate*, with more extensive orange on back, darker grey on throat to breast, female has more greenish-tinged orange rump, yellowish-white throat, grey breast with some orange, yellow abdomen; *flaviplum* male has purer yellow rump than *nominate*, female has brighter yellow rump, is more yellow below, becoming orange on centre of breast, juvenile is browner, lacking all yellow and orange; *megastoma* differs from *nominate* in having much larger bill; *rubropygium* male is more orange below, has blackish tail, female more orange on uppertail-coverts than *nominate* and with whitish throat; *dorsale* male is less orange above than *nominate*, has dark blue rump, is more orange on breast and belly, female is yellow below, more orange on centre of breast; *pallidus* male is paler blue above than previous and uniform yellow below, with only trace of orange on breast; *xanthopygium* male has top of head and upperparts dark slaty blue, bright orange-red patch on middle of back, yellow uppertail-coverts and rump, blue-black tail, black lower face, yellow underparts, orange on centre of breast and belly, female differs from *nominate* in being olive (not grey) below; *cinereigulare* male differs from *nominate* in having small triangular orange patch on back, no yellow on rump, has greyish band across centre of yellow throat, orange breast and belly, female has yellow throat and more orange in centre of breast; *besti* male is larger than previous, and has less yellow on throat; *isidroi* male is larger than last, with chin and throat much paler yellow, lacks yellowish wash on greyish-white side of throat; *assimile* male differs from *cinereigulare* in having yellow rump, dark grey chin and throat, paler orange breast and belly; *sibutuense* male has less orange on back than *nominate*, little yellow on rump, rest of upperparts more bluish, very

dark blue-grey throat, female is much greener than *nominate*, tending to greenish-yellow on rump, with throat to breast greyer, some orange on upper breast; *sibuyanica* male differs from *nominate* in having very dark olive-green rump with no yellow, grey chin and throat, underparts more greenish-yellow (less orange), female lacks yellow on rump; *intermedium* male differs from previous in much paler grey chin and throat washed pale yellow, olive-green rump patch very small or absent, female is duller below; *cnecolaemum* male differs from last in having yellow wash on throat, deeper orange-yellow on breast, and being less blackish-blue above (but variable, differences may not be constant). Voice. Continuous shrill chirp, also “swit” or “swit-zee”, long drawn-out “zeeee”, and series 5–6 seconds long of twittering and wheezy notes; repeated rapid “chit-it-chit-it-chit”; repeated “zit-zit-zit” by male in flight or perched; prolonged buzzing “brrr-brrr”; high-pitched “zeeeeep zeeeep” with notes well spaced. Song a high-pitched rapid “sissip” series, also described as evenly rising series of rapid, very high upslurred notes, “psee-psee-psee-psee-psee...”, followed by sharp, high, metallic “ptit-ptit-ptit-ptit-ptit” and high, slightly descending “tsi-si-si-si-sew...”; other song types include slower version of last, an evenly descending series, and a 3-note version with middle note lowest.

Habitat. Various forest types, including dipterocarp, lower montane, lowland and highland heath, peat-swamp-forest, alluvial forest, paperbark (*Melaleuca*) forest and mangroves, more frequent at forest edge than in interior; also in scrub, plantations, secondary growth, cultivation and gardens; usually around flowering and fruiting trees. From sea-level to 1800 m; below 1500 m in Philippines.

Food and Feeding. Recorded foods include fruits of *Eugenia*, *Dillenia suffruticosa*, *Melastoma malabathricum*, *Muntingia calabura*, *Breynia*, mistletoes (*Loranthaceae*), figs (*Ficus*), plantains (*Musa*), mangrove trees, rubber trees and coffee bushes; also seeds of sedges (*Cyperaceae*), flowers of rubber trees, nectar, pollen; also spiders (*Araneae*) and small insects. Takes nectar from, and pollinates, a species of durian tree (*Durio*) in Borneo. Spends much time in tops of trees.

Breeding. At least Apr–May in Bangladesh, Jan–May and Jul in Peninsular Malaysia, Jul and Sept–Dec (and enlarged gonads Feb–Apr, Jun and Aug) in N Borneo (Sabah), Feb–May, Oct and Dec in W Java, and Feb, Apr and Jun–Aug in Philippines; laying in Jul in Sumatra and in Mar in NW Borneo (Sarawak); juveniles in Jan, Mar and May–Sept in Peninsular Malaysia and in Aug in Riau Archipelago; fledglings in May in Philippines. Nest the size and shape of a goose (*Anser*) egg, or pocket-shaped and felt-like, with side entrance, made from lichen, fine green moss, clubmoss (*Lycopodiaceae*), ferns, *Imperata* pappus, plant fibres, rootlets and spider webs, lined with white fibres, down from fern fronds and small feathers, decorated on outside with caterpillar frass and plant material, and suspended by small end 1.5–13 m above ground from slender twig. Clutch 2–3 eggs, bluish-white, finely speckled brown, with larger dark brown spots at broader end, or pure white; no information on incubation and nestling periods.

Movements. Few data. Ringing recoveries at Gombak Valley (Selangor), in Peninsular Malaysia, imply some mobility.

Status and Conservation. Not globally threatened. Locally common in Bangladesh; rare in Myanmar outside S Tenasserim; common and widespread in Malay Peninsula; common in Borneo; generally common in Philippines, except on Cebu and Tawi-Tawi. Possibly present in NE India, where one report from Arunachal Pradesh. Previously occurred in extreme S Vietnam. Race *pallidus*, confined to Cebu (Philippines), was thought extinct, but recently rediscovered; nevertheless, is probably close to extinction. Race *assimile* probably now extinct on Tawi-Tawi, but survives on two other small islands in C Sulu Archipelago. Species occurs in many protected areas, e.g. Khao Pra Bang Wildlife Sanctuary, in Thailand, Way Kambas National Park, in Sumatra, Kinabalu Park, in Borneo, and Rajah Sikatuna National Park, in Philippines.

Bibliography. Booth (1969), Brooks *et al.* (1992), Cheke & Mann (2001), Dickinson *et al.* (1991), Dutson *et al.* (1993), Grimmett *et al.* (1998), Hartert (1895), Hellebrekers & Hoogerwerf (1967), Holmes (1996), Hoogerwerf (1949), Jakobsen *et al.* (2002), Kennedy *et al.* (2000), MacKinnon & Phillips (1993), Mann (2008), van Marle & Voous (1988), McGregor (1905a, 1909), Medway & Wells (1976), Mees (1986), Nash & Nash (1985), Ogilvie-Grant & Whitehead (1898), Parkes (1989), Pfeiffer (1961), duPont (1971b), Rand & Rabor (1967, 1969), Rasmussen & Anderton (2005b), Richardson & Baker (1981), Ripley (1982), Ripley & Rabor (1958), Robson (2000b), Robson & Davidson (1996), Salomonsen (1960b), Sheldon *et al.* (2001), Singh (1995), Smythies (1957, 1960, 1986), Smythies & Cranbrook (1981), Smythies & Davison (1999), Wells (2007), Worcester (1898), Yumoto (2000).

23. Buzzing Flowerpecker

Dicaeum hypoleucum

French: Dicée à ventre blanc **German:** Weißbauch-Mistelfresser **Spanish:** Picaflores Zumbador
Other common names: White-bellied Flowerpecker

Taxonomy. *Dicaeum hypoleucum* Sharpe, 1876, Basilan, Philippines.

Tongue morphology similar to that of *D. melanoxanthum* and *D. australe*. Variation between some races quite well marked, and this species could perhaps be split into two or even three species. Proposed race *lagunae*, from Pangil (Laguna Province), in SC Luzon, insufficiently distinct from *obscurum* to warrant recognition. Five subspecies recognized.

Subspecies and Distribution.

D. h. obscurum Ogilvie-Grant, 1894 – NW, C & S Luzon and Catanduanes, in N Philippines.

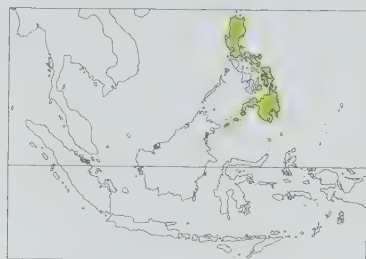
D. h. cagayanense Rand & Rabor, 1967 – Sierra Madre Mts (including Mt Cagua), in NE Luzon.

D. h. pontifex Mayr, 1946 – Samar, Biliran, Leyte, Panaon, Bohol, Dinagat, and Mindanao (except Zamboanga Peninsula), in EC & S Philippines.

D. h. mindanense Tweeddale, 1877 – Zamboanga Peninsula, in W Mindanao.

D. h. hypoleucum Sharpe, 1876 – Sulu Archipelago (Malamaui, Basilan, Jolo, Siasi, Tawi-Tawi, Bongao, Sanga Sanga and Manuk Manka).

Descriptive notes. 8–9 cm; 6.9–9.6 g. A simple-patterned flowerpecker with long, thin, slightly decurved bill. Male *nominate* race has top and side of head, upperparts, including tail and primaries, blackish-brown, throat white, underparts greyish-white; axillaries and underwing-coverts white; iris brown to reddish-brown; bill dark horn to black, sometimes paler at base; legs dark brown, greyish or black. Female is generally dark olivaceous above. Juvenile is dark olive-grey above, grey with greenish-yellow tinge below, bill paler. Races differ mainly in tone of plumage above: *obscurum* has olive-brown upperparts, with tail and primaries dark brown edged olive, underparts grey washed olive, with paler, yellow line down centre of abdomen and on undertail-coverts, sexes alike; *cagayanense* is similar to previous, but underparts more yellow; *pontifex* is dark greenish brown above, sexes alike; *mindanense* is fuliginous olive-green above, with olive-green edging on tail and primaries, greyish-white below, brightest on breast, sexes alike. Voice. High-pitched buzzing “bzeeeppp”, singly or as long series, and sometimes followed by rapid trilled “cheenjet”; very metallic “chimp chimp”, finally running into a trill.



Habitat. Forest, forest edge, cultivation and scrub, around flowering and fruiting trees, particularly figs (*Ficus*); from sea-level up to 1500 m, but up to 1800 m in NC Mindanao (Kitanglad range).

Food and Feeding. Known to eat fig fruits; probably also fruit, nectar and pollen of mistletoes (Loranthaceae), and probably also insects. Occurs in all storeys; hovers at flowers on outer branches. Forages singly, in pairs or in small groups; joins mixed-species flocks.

Breeding. Birds with active gonads in Jan, Mar–Jun, Aug and Sept. No other information.

Movements. None recorded.

Status and Conservation. Not globally threatened. Common throughout most of range.

Bibliography. Cheke & Mann (2001), Delacour & Mayr (1945), Dickinson *et al.* (1991), Kennedy *et al.* (2000), McGregor (1909), Mendoza (1987), Ogilvie-Grant (1894), Parkes (1962, 1971), duPont (1971b), Salomonsen (1960c), Worcester (1898).

24. Pale-billed Flowerpecker

Dicaeum erythrorhynchos

French: Dicée à bec rouge

German: Lachsschnabel-Mistelfresser

Spanish: Picaflor Piquirrojo

Other common name: Tickell's/Small Flowerpecker; Ceylon Small Flowerpecker (*ceylonense*)

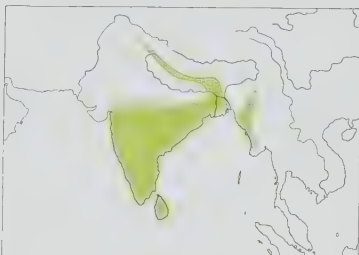
Taxonomy. *Certhia erythrorhynchos* Latham, 1790, Bombay, India.

Two subspecies recognized.

Subspecies and Distribution.

D. e. erythrorhynchos (Latham, 1790) – India, S Nepal, W Bhutan, Bangladesh and W & C Myanmar.

D. e. ceylonense Babault, 1920 – Sri Lanka.



Descriptive notes. 8 cm; 4–8 g. Plain-looking flowerpecker with markedly downcurved pale bill. Nominative race is plain greyish-brown or olive-brown above, remiges dark brown with pale edging, rectrices dark brown with pale tips; lores and side of face paler; sandy grey to greyish-white below, sometimes tinged greyish-brown on sides of breast, and often more buffy on belly and flanks, whitish underwing-coverts; iris hazel-brown; bill pale horn-brown, pinkish-flesh at gape and on lower mandible except tip, mouth pale pink; legs dark slate-coloured. Sexes similar. Juvenile is greyer above and below than adult, with shorter bill

orange-yellow at gape and on lower mandible (except tip). Race *ceylonense* is smaller, darker, more olive above and below, than nominate, with bill plumbeous-brown, or silvery or pinkish with dark culmen, lower mandible dark brown, and iris yellowish-brown. Voice. High-pitched, repeated “pit”, and incessant sharp “chik-chik-chik”. Two songs recorded: one a series of twittering notes; the other an orthopteran-like reel said to be either a rather slow even-tempo reel or starting much faster but abruptly becoming a slow trill at mid-point.

Habitat. Deciduous forest, mangroves, cultivation, plantations and orchards, and fig trees (*Ficus*) in open country; particularly near mistletoes (Loranthaceae) in canopy. To 1400 m in Nepal (in summer), and to 2100 m in Sri Lanka.

Food and Feeding. Mainly fruits of mistletoes; also nectar, spiders (Araneae) and small insects. Forages mostly in canopy. Forages singly and in pairs; also in groups in non-breeding season. May join mixed-species feeding flocks in Sri Lanka.

Breeding. Egg-laying in Jan–Jun in N India and Nepal and Feb–May, Aug and Sept in S India; Jan–Jul (peak in Mar), Sept and Nov in Sri Lanka. Nest-building, care of young, and probably incubation, by both sexes. Nest a small pinkish-brown, felted, oval purse of fine grass, vegetable down, bark, moss, cocoons and caterpillar frass, lined with soft, silky down and fibres, decorated with berries, lichen and flat white material resembling shed reptile skin, suspended from twig among leaves 1.5–12 m above ground, sometimes secured to supporting branch at back and often well concealed by surrounding foliage, or may be supported at each end by twigs in hammock-like fashion. Clutch 1–3 eggs, usually unmarked white, but in Sri Lanka may be spotted; no information on duration of incubation and nestling periods.

Movements. Seasonal altitudinal movements in Himalayas.

Status and Conservation. Not globally threatened. Widespread and locally abundant in India; widespread and frequent in Nepal; common in Bangladesh; common at all altitudes in Sri Lanka; not uncommon in Myanmar. Occurs in several protected areas, e.g. Nagarhole National Park, in India, and Chitwan National Park, in Nepal.

Bibliography. Ali (1932, 1969), Ali & Ripley (1974), Cheke & Mann (2001), Fleming *et al.* (1976), Grimmett *et al.* (1998), Inskipp & Inskipp (1991), Kotagama & Goodale (2004), Rasmussen & Anderton (2005b), Ripley (1982), Robson (2000b), Salomonsen (1960c), Smythies (1986), Stuart Baker (1926), Wait (1931), Whistler & Kinnear (1949).

25. Plain Flowerpecker

Dicaeum concolor

French: Dicée concolore

German: Einfarb-Mistelfresser

Spanish: Picaflor Sencillo

Other common names: Plain-coloured Flowerpecker; Olivaceous Flowerpecker (“*minullum* group”); Nilgiri Flowerpecker (*concolor*); Andaman Flowerpecker (*virescens*)

Taxonomy. *Dicaeum concolor* Jerdon, 1840, Malabar Coast, India.

Nominative race and *virescens* sometimes treated as two distinct species, with remaining races (“*minullum* group”) as a third species, on basis of markedly distinct morphological and, apparently, vocal differences. Geographical variation, however, generally rather subtle; *uchidai* could perhaps be included in *olivaceum*. Other proposed races are *subflavum* (described from Karnataka, in SW India) and *unicolor* (Palni Hills, in S India), both treated as synonyms of nominate, and *inornatum* (Nepal) and *sinense* (foothills of Omei Shan, Sichuan, in S China), both subsumed within *olivaceum*. Seven subspecies currently recognized.

Subspecies and Distribution.

D. c. concolor Jerdon, 1840 – SW India (in Western Ghats).

D. c. olivaceum Walden, 1875 – Himalayan foothills from C Nepal E to NE India (Arunachal Pradesh, S to Assam, Nagaland and Manipur), E Bangladesh (Chittagongs), Myanmar, S China (Sichuan S to SE Xizang, Yunnan and Guangdong), Thailand and Indochina.

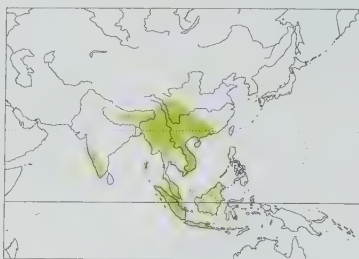
D. c. virescens Hume, 1873 – Andaman Is (Middle and South).

D. c. borneanum Lönnerberg, 1925 – Peninsula Malaysia (S from N Perlis and Penang), Sumatra, N Natuna Is and Borneo.

D. c. minullum Swinhoe, 1870 – Hainan Is.

D. c. uchidai Nagamichi Kuroda, 1920 – Taiwan.

D. c. sollicitans E. J. O. Hartert, 1901 – Java (including Madura) and Bali.



Descriptive notes. 7.5–9 cm; 4–8 g. Nominative race is greyish olive-brown above, more olive on rump, with dark centres of crown feathers, pale forehead, lores and supercilium; wings and tail darker; yellowish-white below, axillaries white; iris brown to dark brown; bill black-tipped bluish-grey or black, dark horn-brown on culmen; legs brownish-black or plumbeous. Sexes similar. Juvenile is browner, duller and less olive than adult, with underparts more ashy, also lacks dark feather centres on crown; part of lower mandible yellowish, or bases of both mandibles pale. Races vary mainly in tone of plumage: *olivaceum* is

slightly more olive-green above than nominate, has duller, ashier underparts with buffy yellow tinge; *uchidai* is similar to previous but slightly darker, and tail shorter; *minullum* is slightly smaller and smaller-billed than nominate, also slightly greener above, with less white on supercilium, brownish on head, back and scapulars, yellow on rump, tail tipped white, throat and belly dusky yellow, vent yellow; *borneanum* is green above, brighter on rump, with throat to breast grey, centre of belly buffish-white, flanks yellowish-green; *sollicitans* is similar to nominate but greener above, brighter on rump, and differs from *olivaceum* in having larger, more distinct buff patch on lores; *virescens* is much greener above than others, has speckled crown, pale lores but no white on forehead, almost no supercilium, and has glossy black tail, yellow belly and vent. Voice. Calls “tik-tik-tik” or “chirp-chirp-chirp”, sharp “chek”, very short staccato ticking “chrik”, various twittering calls; also short, piercing high-pitched “zink!” and shrill, hard, emphatic “tzit!, tzit!...”. Song a high-pitched trill; other songs described as very high, thin “tsit-tsit-tsit-si-si-si-si” repeated every few seconds (Laos), very high, thin, short “tseep-tsip-tsip-tsip” trill, and very short, strongly descending “tse-e’e’ep” trill (SW India), extremely high musical “sit-sew, sit-sew, sit-sew...”, and buzzier, very short notes mixed with calls (Andamans).

Habitat. Various forest types, including evergreen, moist deciduous, submontane heath and montane forests, chiefly at edge; also secondary growth, plantations and other cultivation, groves of trees in open country, and trees around habitation; appears to be dependent on mistletoes (Loranthaceae), and often around flowering and fruiting vines. From sea-level to 3660 m.

Food and Feeding. Insects, spiders (Araneae), figs (*Ficus*); in particular, fruits and nectar of mistletoes, especially those of small-flowered *Scurrula* species (e.g. *Scurrula rhododendricolus*). Forages in all storeys, but most frequently in canopy. Occurs singly, sometimes in pairs or in small groups.

Breeding. Egg-laying in Mar–Sept in Nepal and NE India, Jan–May and Sept in S India, and chiefly May–Jun in Andamans (breeding condition in Mar); laying in Mar and males with enlarged testes Jun and Jul in N Borneo (Sabah); nestlings in late Mar and fledglings early Aug in Malay Peninsula, and juveniles in Jun in Taiwan. Both sexes build nest, incubate eggs, tend nestlings and care for young. Nest a very small hanging purse, 70 × 50 mm, made chiefly of floss of *Bombax malabarica*, and other fibres and vegetable down, 6–12 m above ground in tree or tall bush, sometimes much lower among nettles and briars. Clutch 2–3 eggs, usually unmarked white, but those from Sabah (Borneo) pale orange-pink, thickly flecked with burnt sienna at broad end, and finely and sparsely spotted chestnut; food delivered to chicks by adults every 2–5 minutes; no information on duration of incubation and nestling periods.

Movements. Probably seasonal altitudinal movements in higher parts of range. Vagrant in Hong Kong (SE China).

Status and Conservation. Not globally threatened. Local to common in Indian Subcontinent; widely but sparsely distributed in Myanmar, but common on coastal islands of Arakan; common in many parts of Thailand; uncommon to common in Malay Peninsula; very uncommon on Borneo; not rare on Java. Considered to be, at best, “near-threatened” in Peninsular Malaysia. Occurs in several protected areas, e.g. Mudumalai National Park, in SW India, Dibru-Saikhowa National Park, in NE India, Khao Yai National Park, in Thailand, and Cuc Phuong National Park, in Vietnam.

Bibliography. Ali (1969), Ali & Ripley (1974), Atyeo (1971), Cheke & Mann (2001), Cooper (1991), Davidar (1985a), Grimmett *et al.* (1998), Hellebrekers & Hoogerwerf (1967), Hoogerwerf (1949), Inskipp & Inskipp (1991), King *et al.* (1975), Lim Hsing-yu (1995), MacKinnon & Phillips (1993), Mann (2008), van Marle & Voous (1988), Medway & Wells (1976), Meyer de Schauensee (1984), Pfeiffer (1961), Rasmussen & Anderton (2005b), Ripley (1982), Robson (2000b), Salomonsen (1960c), Sheldon *et al.* (2001), Smythies (1957, 1960), Smythies & Cranbrook (1981), Smythies & Davison (1999), Wells (2007).

26. Pygmy Flowerpecker

Dicaeum pygmaeum

French: Dicée pygmée

German: Zwergmistelfresser

Spanish: Picaflor Pigmeo

Other common names: Palawan Flowerpecker

Taxonomy. *Nectarinia pygmaea* Kittlitz, 1835, Manila, Luzon, Philippines.

Tongue morphology similar to that of *D. trigonostigma*, *D. erythrorhox*, *D. aeneum*, *D. sanguinolentum* and *D. cruentatum*. Original description contained spellings “*pygmaea*” and “*pygmea*”; former adopted by same author acting as First Reviser in 1858. Five subspecies recognized.

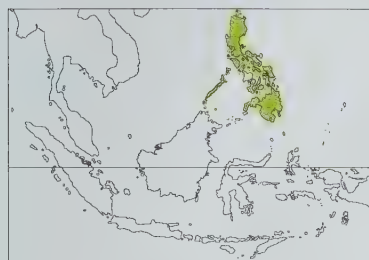
Subspecies and Distribution.

D. p. fugaense Parkes, 1988 – Calayan and Fuga (N of Luzon), in extreme N Philippines.

D. p. salomonseni Parkes, 1962 – NW Luzon, in N Philippines.

D. p. pygmaeum (Kittlitz, 1835) – NC & C Philippines (C and S Luzon, Corregidor, Lubang, Poilolo Is, Mindoro, Marinduque, Maestre de Campo, Semirara, Sibay, Boracay, Romblon, Sibuyan, Ticao, Masbate, Samar, Gigantes, Calagna-an, Sicogon, Guimaras, Negros, Cebu, Bohol, Siquijor, Leyte).

D. p. palawanorum Hachisuka, 1926 – Calauit, Culion, Palawan and Balabac, in W Philippines.
D. p. davao Mearns, 1905 – Camiguin Sur and Mindanao, in S Philippines.



Descriptive notes. 8.4 cm; 4.5–5.6 g. Rather plain-looking flowerpecker with relatively short, thin bill. Male nominate race has top of head, back, upperwing and tail olive-black, glossed green, rump dull olive-yellow, upper-tail-coverts dull olive-green; chin, centre of throat and pectoral tufts white, face, side of throat and flanks grey becoming olive-yellow towards rear, rest of underparts buffy white, mottled grey; iris dark brown; bill black to dark horn; legs brownish-black. Female has head grey, often tinged olive, mantle and back olive, lores, anterior supercilium and narrow eyering pale olive to buff-white, face drab grey; underparts drab grey variably tinged olive-yellow, most markedly so on flanks, white pectoral tufts, whitish chin, throat and median line down centre of abdomen to undertail-coverts. Juvenile is greyer than female, and has greenish rump. Races vary mostly in colour of dorsal gloss, and rump colour of male: *palawanorum* male has gloss more blue-green and confined to shoulders, is generally slightly

lighter above than nominate and with duller olive-yellow rump and paler underparts; *davao* differs from nominate in having greenish-blue gloss above, darker face and sides of throat and breast, more yellow belly and undertail-coverts; *fugaense* is much blacker above, with more restricted greenish rump, greyish flanks, female and immature male have greyer flanks and much smaller greenish rump patch than nominate; *salomonseni* is larger and slightly paler than nominate, and has duller olive-yellow rump. Voice. Loud, sharp, almost continuous, irregularly spaced “tip tip...” during foraging; also high “schenk-schenk...”; and double notes “zip-zip...zip-zip...zip-zip”.

Habitat. Forest, forest edge and secondary growth, around flowering and fruiting trees, and *Loranthus* mistletoes; usually below 1000 m, but to over 2000 m on Luzon.

Food and Feeding. *Loranthus* mistletoes, and probably eats fruit, nectar and pollen of other mistletoes. Forages in canopy, or high in understorey. Forages singly or in small groups; joins mixed-species flocks.

Breeding. Dependent fledgling in May, and birds with active gonads in Feb, Apr, Jul and Dec. No other information.

Movements. No information.

Status and Conservation. Not globally threatened. Common through most of its range, which covers most islands of Philippines.

Bibliography. Allen *et al.* (2006), Cheke & Mann (2001), Delacour & Mayr (1945), Dickinson *et al.* (1991), Gilliard (1950a), Kennedy *et al.* (2000), McGregor (1909), Ogilvie-Grant (1894), Parkes (1962), duPont (1971b), Salomonsen (1960c), Worcester (1898), Worcester & Bourns (1898).



27. Crimson-crowned Flowerpecker

Dicaeum nehrkorni

French: Dicée à tête rouge **German:** Nehrkorntistelfresser **Spanish:** Picaflor de Nehrkor
Other common names: Celebes/Crimson-crested/Nehrkor's/Red-headed Flowerpecker

Taxonomy. *Dicaeum nehrkorni* A. W. H. Blasius, 1886, Rurukan, northern Sulawesi.
Forms a superspecies with *D. erythrothorax*, *D. vulneratum*, *D. pectorale*, *D. geelvinkianum*, *D. nitidum*, *D. eximium* and *D. aeneum*. Monotypic.
Distribution. Mountains of Sulawesi.



Descriptive notes. 8.5 cm. Male has crown and rump bright crimson, forehead and supercilium to hindneck and rest of upperparts glossy blue-black; throat, breast and flanks grey, small crimson spot on breast, white pectoral tufts, abdomen white with blackish-brown median line; iris dark; bill dark brown to black; legs blackish. Female is duller than male, with little or no red on crown; also lacks the breast spot and the abdominal stripe. Juvenile is similar to female, but has no red on rump. Voice. A short, sharp double note, "zit-zit", and a repeated hard "tit"; also a high-pitched insect-like trill.

Habitat. Hill and montane forest, and forest edge; 200–2400 m.

Food and Feeding. Wild cherries (*Prunus*) and other fruits, including berries and perhaps also nectar and pollen of mistletoes (Loranthaceae). Occurs mostly in canopy. Forages singly or in pairs; joins mixed-species flocks.

Breeding. No information.

Movements. None recorded.

Status and Conservation. Not globally threatened. Restricted-range species: present in Sulawesi EBA. Widespread but generally uncommon; commoner at higher altitudes. Occurs in several protected areas, including Lore Lindu National Park.

Bibliography. Blasius (1897), Bostock & Sujatika (1993), Cheke & Mann (2001), Coates & Bishop (1997), Coomans de Ruiter (1950), Holmes & Philipps (1996), Meyer & Wigglesworth (1989a, 1989b), Riley (1924), Rozendaal & Dekker (1989), Salomonsen (1960c), Stresemann & Heinrich (1940b), Watling (1983), White & Bruce (1986).

28. Flame-breasted Flowerpecker

Dicaeum erythrothorax

French: Dicée à gorge blanche **German:** Burumistelfresser **Spanish:** Picaflor Pechirrojo
Other common names: Flame-chested/White-throated/Buru/Indonesian Flowerpecker

Taxonomy. *Dicaeum erythrothorax* Lesson and Garnot, 1828, Buru, southern Moluccas.
Forms a superspecies with *D. nehrkorni*, *D. vulneratum*, *D. pectorale*, *D. geelvinkianum*, *D. nitidum*, *D. eximium* and *D. aeneum*. Tongue morphology similar to that of *D. trigonostigma*, *D. pygmaeum*, *D. aeneum*, *D. sanguinolentum* and *D. cruentatum*. Two subspecies recognized.

Subspecies and Distribution.

D. e. schistaceiceps G. R. Gray, 1861 – Morotai, Halmahera, Bacan, Bisa and Obi.

D. e. erythrothorax Lesson & Garnot, 1828 – Buru.



Descriptive notes. 9 cm. Male nominate race has head grey, glossed green, throat white; upperparts olive, rump yellowish-green, upperwing-coverts and remiges dark brown with broad olive edging; breast grey, orange-red patch in centre, flanks olive-yellow, middle of abdomen whitish-yellow; iris brown; bill and legs black. Female is similar to male but lacks red. Juvenile is similar to female, but less green on rump, greyer below, less olive on flanks. Race *schistaceiceps* has a more golden rump than nominate, lacks olive edging on wing-coverts, has grey throat and olive-green flanks. Voice. Single, repeated, high note,

"tcheep tcheep tcheep".

Habitat. Inhabits forest, scrub and riverine areas; in lowlands, generally up to 800 m, but to 950 m on Bacan.

Food and Feeding. No information; diet probably includes fruit, and perhaps also nectar and pollen of mistletoes (Loranthaceae). Forages in canopy. Occurs in pairs or in small groups; joins mixed-species flocks.

Breeding. Laying: Oct or Nov, and nestling found in Nov. Nest an unlined oval pouch, 90 × 55 mm, entrance just above centre, made of plant fibres and dried grass, giving felted appearance, suspended by broad attachment from twig, partly concealed by large leaves. Clutch 2 eggs. No other information.

Movements. None recorded.

Status and Conservation. Not globally threatened. Restricted-range species: present in Buru EBA and in Northern Maluku EBA. Common to uncommon on Halmahera; common on Buru.

Bibliography. Bishop (1992), Cheke & Mann (2001), Coates & Bishop (1997), Jepson (1993a), Salomonsen (1960c), Schönwetter & Meise (1980), Siebers (1930), White & Bruce (1986).

29. Ashy Flowerpecker

Dicaeum vulneratum

French: Dicée cendré **German:** Seranmistelfresser **Spanish:** Picaflor Cenizo
Other common names: Ashy-fronted/Ceram/Moluccan Flowerpecker

Taxonomy. *Dicaeum vulneratum* Wallace, 1863, Seram, Moluccas.

Forms a superspecies with *D. nehrkorni*, *D. erythrothorax*, *D. pectorale*, *D. geelvinkianum*, *D. nitidum*, *D. eximium* and *D. aeneum*. Monotypic.

Distribution. Seram, Ambon, Saparua and Seram Laut (Gorong and Manawoka).



Descriptive notes. 8–8.5 cm. Male is dark brownish-grey above, with scarlet rump; face ashy brown, underparts ashy grey with large scarlet patch in centre of upper breast, white vent and undertail-coverts; iris brown; bill and legs black. Female is similar to male but lacks red on chest, has white throat and centre of breast and abdomen. Juvenile resembles female, but rump yellowish-green, not red. Voice. A hard, staccato "tst", given while perched and also in flight. Song consists of 3 high-pitched metallic, disyllabic notes (Seram), or thin, very high-pitched trisyllabic notes (Ambon).

Habitat. Hill and coastal forest, old gardens, and at forest and plantation edges; sea-level to 2100 m, mainly below 1000 m.

Food and Feeding. Only nectar recorded, but diet thought also to include fruits and pollen of mistletoes (Loranthaceae). Forages in tops of trees and lower, in shrubs. Occurs singly and in pairs; joins mixed-species flocks.

Breeding. Nest globular, 100 × 55 mm, entrance hole closer to top and 50 mm from bottom, made from plant fibres and decorated with a few leaves, attached by suspensor of same material. No further information.

Movements. Nothing recorded.

Status and Conservation. Not globally threatened. Restricted-range species: present in Banda Sea Islands EBA and in Seram EBA. Common; more abundant in hills.

Bibliography. Bowler & Taylor (1989a), Cheke & Mann (2001), Coates & Bishop (1997), Robson (1988), Salomonsen (1960c), White & Bruce (1986).

30. Olive-crowned Flowerpecker

Dicaeum pectorale

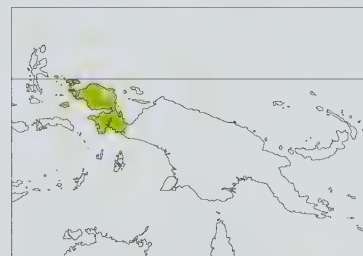
French: Dicée à plastron **German:** Papuamistelfresser **Spanish:** Picaflor Pectoral
Other common names: Pectoral/Shining/Papuan Flowerpecker

Taxonomy. *Dicaeum pectorale* S. Müller, 1843, Lobo, Triton Bay, New Guinea.
Forms a superspecies with *D. nehrkorni*, *D. erythrothorax*, *D. vulneratum*, *D. geelvinkianum*, *D. nitidum*, *D. eximium* and *D. aeneum*. Could perhaps be considered conspecific with *D. geelvinkianum* and/or *D. nitidum*. Race *ignotum*, although geographically situated between nominate race and *D. erythrothorax*, is not intermediate in plumage, suggesting that treatment of latter and present species as two distinct species is appropriate. Two subspecies recognized.

Subspecies and Distribution.

D. p. ignotum Mees, 1964 – Gebe I, between Halmahera and NW New Guinea.

D. p. pectorale S. Müller, 1843 – West Papuan Is (Waigeo, Batanta, Salawati, Misool) and NW New Guinea (E to neck of Vogelkop).



Descriptive notes. 9 cm; 7–7.8 g. Male nominate race has crown and upperparts olive, yellowish on rump; side of head greyer, throat white; large scarlet patch on breast, yellowish or whitish centre of abdomen and undertail-coverts, rest of underparts grey; iris brown; bill and legs dark brown or black. Female differs from male in having no red on breast, centre of abdomen and undertail-coverts yellowish. Juvenile is similar to adult female, but more olive, less grey, below. Race *ignotum* is more olive above than nominate, paler, less yellowish, on centre of belly and undertail-coverts, and has slightly larger wing and bill. Voice.

Short, dry, insect-like, buzzing note; single high, upslurred note; also single drawn-out "chew", repeated at short intervals.

Habitat. Occurs in forest canopy, and in secondary growth; sea-level to 1500 m, rarely to 2350 m.

Food and Feeding. Unprotected fruits, including figs (*Ficus*) and presumably those of mistletoes (Loranthaceae); also spiders (Araneae). Forages in canopy, singly or in pairs.

Breeding. No information.

Movements. No information.

Status and Conservation. Not globally threatened. Restricted-range species: present in West Papuan Lowlands EBA. Not uncommon. Very poorly known species.

Bibliography. Bechler *et al.* (1986), Brown & Hopkins (2002), Cheke & Mann (2001), Diamond (1972a), Greenway (1966), Iredale (1956), LeCroy (2000), Mees (1964a), Mitchell (1996), Rand & Gilliard (1967), Salomonsen (1960c).

31. Red-capped Flowerpecker

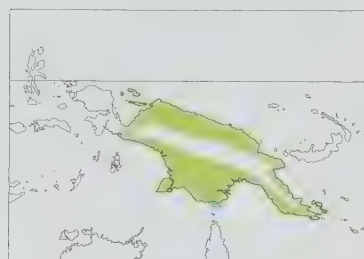
Dicaeum geelvinkianum

French: Dicée de Geelvink **German:** Rotkappen-Mistelfresser **Spanish:** Picaflor Capirrojo
Other common names: Geelvink/Papuan Flowerpecker

Taxonomy. *Dicaeum geelvinkianum* A. B. Meyer, 1874, Yapen Island, Geelvink Bay, New Guinea.
Forms a superspecies with *D. nehrkorni*, *D. erythrothorax*, *D. vulneratum*, *D. pectorale*, *D. nitidum*, *D. eximium* and *D. aeneum*. Could perhaps be treated as conspecific with *D. pectorale* and/or *D. nitidum*. Other proposed races include *simillimum* (described from Hollandia, on N New Guinea coast) included in *diversum*, *jobiense* (Yapen I) merged into nominate, and *pulchrum* (Astrolabe Mts, in SE), merged with *rubrocoronatum*. Eleven subspecies recognized.

Subspecies and Distribution.

D. g. majorensis Salvadori, 1876 – Numfor I (Geelvink Bay), in NW New Guinea.
D. g. misoriensis Salvadori, 1876 – Biak I (Geelvink Bay).
D. g. geelvinkianum A. B. Meyer, 1874 – Yapen I and Kurudu I (Geelvink Bay).
D. g. diversum Rothschild & E. J. O. Hartert, 1903 – N New Guinea (Mamberano R to Humboldt Bay).
D. g. setekwa Rand, 1941 – SW New Guinea (S slopes of Snow Mts E to Noord R).
D. g. obscurifrons Junge, 1952 – WC New Guinea (Wissel L. to NE of Etna Bay).
D. g. centrale Rand, 1941 – WC New Guinea (Balim R Valley in Nassau Mts and Oranje Mts).
D. g. rubrigularis D'Alberty & Salvadori, 1879 – S New Guinea (Palmer Junction to mouth of Fly R).
D. g. albobunctatum D'Alberty & Salvadori, 1879 – lowlands of SC New Guinea (Merauke and Dagul R E to Daru I and Orioma R).
D. g. rubrocoronatum Sharpe, 1876 – SE New Guinea (W to upper Sepik R and Purari R, including Karkar I and Manam I).
D. g. violaceum Mayr, 1936 – D'Entrecasteaux Archipelago (Fergusson, Goodenough, Dobu), off SE New Guinea.



Descriptive notes. 9 cm; 5.3–7.5 g. Male nominate race has bright red crown, rump and uppertail-coverts, rest of upperparts very dark greenish, upperwing and tail dark brown, shoulder darker with slight bluish gloss; throat white; red patch on chest, rest of underparts olive-grey, pectoral tufts white, centre of belly yellowish-buff, vent and undertail-coverts yellowish; iris brown; bill and legs blackish. Female is similar to male, but lacks red on chest, is paler on belly. Juvenile is similar to female, but little or no red above, bill mostly pale. Races differ mainly in shade of red on dorsal surface, and extent of red below on male (following details refer to male unless otherwise stated): *rubrocoronatum* has vermilion crown and rump, rest of upperparts blackish, glossed purple and blue, with dark olive lower back, is more yellow below than nominate, has very small red pectoral patch, female slightly glossed blue on dark greenish-brown upperparts; *rubrigularis* differs from previous in having foreneck entirely red; *albobunctatum* differs from last in having white areas between red tip and dusky base of feathers of head, rump and uppertail-coverts, and red pectoral patch extends over chin, throat and side of breast; *setekwa* is very dark olive-green above, with vent and undertail-coverts white or pink; *majorensis* differs from previous in having dull dark red crown, rump and uppertail-coverts, and yellowish vent and undertail-coverts; *misoriensis* has much less red on breast than previous, and is duller above, with bright carmine rump; *diversum* has lighter, more scarlet, crown and uppertail-coverts than *rubrocoronatum*, is more steel-blue on upper surface (which has more of an olive tinge); *centrale* is larger than preceding race, slightly darker above, has more greyish breast and lighter flanks; *obscurifrons* is similar in size to last, but is greener on upperparts, darker below, and red on head and uppertail-coverts duller, more brownish-tinged; *violaceum* is similar to *rubrocoronatum*, but duller and lighter above, with purple-violet gloss, and red of crown, rump and breast darker, underparts more grey, with greyish-olive abdomen. Voice. Single buzzing note, a downslurred “bszzt”.

Habitat. Forest canopy and edge, particularly around flowering and fruiting trees, also secondary growth, dense savanna, plantations and gardens. From sea-level to 1500 m, rarely to 2350 m; race *centrale* above 1600 m.

Food and Feeding. Fruits, and possibly nectar and pollen, of mistletoes (Loranthaceae), and probably of other plants; large seeds also taken; also spiders (Araneae). Forages in canopy and upper levels.

Breeding. Laying recorded in Mar, Nov and Dec. Nest pear-shaped, c. 100 mm long and 45 mm across, with side entrance 17 mm wide near top, made from grey animal silk and reddish-brown strips from ferns, felted and well camouflaged; one recorded as suspended from short, slender *Croton* tree. Clutch 2–3 eggs, white. No other information.

Movements. Few data; mainly resident. Recorded several times from islands of Saibai and Boigu, in N Torres Strait, suggesting possible regular dispersal from New Guinea mainland or a resident population on islands.

Status and Conservation. Not globally threatened. Common at lower altitudes in much of New Guinea. Possibly a small resident population on Saibai I, in N Torres Strait; adult female with recently fledged juvenile recorded on island in Feb 2002.

Bibliography. Beehler (1978a), Beehler *et al.* (1986), Cheke & Mann (2001), Diamond (1972a), Gilliard & LeCroy (1967a, 1968), Lansley (2004), Mayr (1936), Mayr & Gilliard (1954), Higgins *et al.* (2006), Rand (1936b, 1938, 1941), Rand & Gilliard (1967), Rothschild & Hartert (1896b), Salomonsen (1960c), Schönwetter & Meise (1980), Sharpe (1885).

32. Louisiade Flowerpecker*Dicaeum nitidum*

French: Dicée des Louisiade **Spanish:** Picaflores de las Luisiade

German: Louisiadenmistelfresser

Other common names: Papuan Flowerpecker

Taxonomy. *Dicaeum nitidum* Tristram, 1889, Sudest (= Tagula) Island, Louisiade Archipelago, New Guinea.

Forms a superspecies with *D. nehrkorni*, *D. erythrothorax*, *D. vulneratum*, *D. pectorale*, *D. geelvinkianum*, *D. eximium* and *D. aeneum*. Could perhaps be considered conspecific with *D. pectorale* and/or *D. geelvinkianum*. Two subspecies recognized.

**Subspecies and Distribution.**

D. n. nitidum Tristram, 1889 – Louisiade Archipelago (Misima I, Tagula I), off SE New Guinea.

D. n. rosseli Rothschild & E. J. O. Hartert, 1914 – Rossel I, in E Louisiades.

Descriptive notes. 9 cm. Male nominate race has dull red cap, brighter red rump, rest of upperparts dark brownish-grey, glossed blue and green (particularly on mantle and upperwing-coverts); remiges blackish-brown, edged greenish, tail glossy blackish; side of head greyish; chin and throat whitish, bright red patch on breast, rest of underparts yellowish-

olive, paler on central belly and undertail-coverts, pectoral tufts white; iris brown; bill black, base of lower mandible whitish; legs black. Female differs from male in lacking red breast patch. Juvenile differs from adult female in lacking red on upperparts. Race *rosseli* male has shoulders glossed blue-green, and is more dark olive-green, less blackish-looking, above than nominate. Voice. Short, dry, buzzing insect-like note; single high-pitched upslurred note.

Habitat. Forest and secondary growth.

Food and Feeding. Fruits, presumably including those of mistletoes (Loranthaceae), and spiders (Araneae). Forages in canopy, singly or in pairs.

Breeding. No information.

Movements. No information.

Status and Conservation. Not globally threatened. Restricted-range species: present in Louisiade Archipelago EBA. Very poorly known species. Appears not to be at any risk.

Bibliography. Beehler *et al.* (1986), Cheke & Mann (2001), Iredale (1956), Rand & Gilliard (1967).

33. Red-banded Flowerpecker*Dicaeum eximium*

French: Dicée des Bismarck

Spanish: Picaflores de las Bismarck

German: Bismarckmistelfresser

Other common names: Beautiful/New Ireland/Bismarck Flowerpecker

Taxonomy. *Dicaeum eximium* P. L. Sclater, 1877, New Ireland, Bismarck Archipelago.

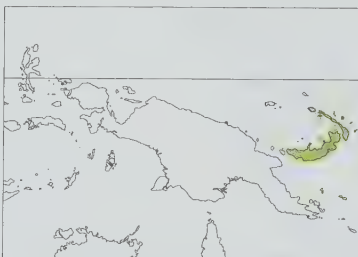
Forms a superspecies with *D. nehrkorni*, *D. erythrothorax*, *D. vulneratum*, *D. pectorale*, *D. geelvinkianum*, *D. nitidum* and *D. aeneum*. Three subspecies recognized.

Subspecies and Distribution.

D. e. eximium P. L. Sclater, 1877 – New Hanover and New Ireland (including Selapiu and Lihir Group), in N Bismarck Archipelago.

D. e. phaeopygium Salomonsen, 1964 – Dyaul I (off W New Ireland).

D. e. layardorum Salvadori, 1880 – New Britain (including islands of Lolobau and Watom), in S Bismarck Archipelago.



Descriptive notes. 8–9.5 cm; 7–9.5 g. Male nominate race has brownish crown and side of head, contrasting olive-brown and bronze-green upperparts, rump scarlet, tail blackish, glossed blue; white below, narrow scarlet breastband, dark grey sides of breast also forming irregular band, flanks greenish-tinged olive-brown and abdomen whitish with darkish slate central line; iris dark brown; bill black; legs blackish-slate. Female is dark grey above, rump crimson, throat, chest, centre of belly and vent isabelline-white, flanks yellowish-olive. Juvenile is similar to female, but greyer below, and white on throat slightly narrower.

Race *phaeopygium* male has head, back and rump dark brown; *layardorum* male is blackish above, with grey head, red spot on breast, below this grey, then yellowish-green, with thin blackish stripe down centre of abdomen, iris brownish-red or reddish-brown. Voice. A single “tzick”; various single high-pitched squeaky notes.

Habitat. Forest, including degraded forest and forest edge, but rarely coastal or montane forest; also tall bushes and isolated trees on edges of native gardens. To 1000 m, rarely to 1500 m.

Food and Feeding. Insects recorded as taken. Few other data, but recorded as foraging for fruits and around flowers in canopy.

Breeding. Birds with enlarged ovaries in Jul and Aug; thought to be possibly double-brooded. Nest with overhanging roof, but no porch, usually below 2 m, often in ferns. Eggs elongated, white. No other information.

Movements. None recorded.

Status and Conservation. Not globally threatened. Restricted-range species: present in New Britain and New Ireland EBA. Poorly known. Although large areas of lowland forest have been or are being cleared for oil-palm (*Elaeis guineensis*) plantation and logged, this species is secure in logged forest and hill forest. Common in canopy in C New Britain; noted as being locally abundant on that island in 1960s.

Bibliography. Cheke & Mann (2001), Gilliard & LeCroy (1967b), Gould (1878), Hartert (1924b, 1926b), Heinroth (1903), Mayr (1955), Mayr & Diamond (2001), Meyer (1933), Orenstein (1976), Salomonsen (1960c, 1964, 1965), Schönwetter & Meise (1980).

34. Midget Flowerpecker*Dicaeum aeneum*

French: Dicée des Salomon **German:** Bronzemistelfresser **Spanish:** Picaflores de las Salomón

Other common names: Solomon (Islands) Flowerpecker

Taxonomy. *Dicaeum aeneum* Pucheran, 1853, San Jorge, near Santa Isabel, Solomon Islands.

Forms a superspecies with *D. nehrkorni*, *D. erythrothorax*, *D. vulneratum*, *D. pectorale*, *D. geelvinkianum*, *D. nitidum* and *D. eximium*. Up to 8% difference found between subspecies using mtDNA markers. Three subspecies recognized.

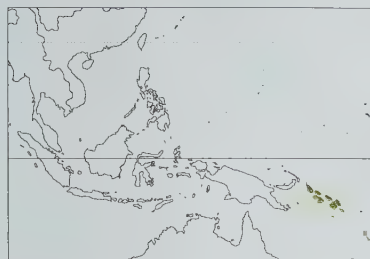
Subspecies and Distribution.

D. a. aeneum Pucheran, 1853 – N & C Solomons (Buka, Bougainville, Fauro, Shortland, Choiseul, Santa Isabel, New Georgia Is, Buena Vista, Florida Is).

D. a. becki E. J. O. Hartert, 1929 – Guadalcanal, in SW Solomons.

D. a. malaitae Salomonsen, 1960 – Malaita I, in E Solomons.

Descriptive notes. 8 cm; male 7.1–8.8 g, one female 8.5 g. Male nominate race has crown and upperparts, including upperwing, slaty grey with metallic blue gloss, side of head grey, tail black; middle of upper throat whitish, sides of throat and breast grey, bright scarlet patch on breast, flanks citrine-olive, middle of upper abdomen dark grey, middle of lower abdomen and undertail-coverts buffy white; iris brown or dark brown; bill and feet black. Female differs from male in lacking red below and having olive flanks; supraloral and submoustachial stripes white, middle of throat, breast and abdomen buffy white. Juvenile lacks metallic blue gloss above, and is more greyish on throat than female. Races differ mainly in colour of gloss on dorsal surface: *becki* male has greenish gloss above, rather than the blue of nominate; *malaitae* male has gloss reduced to faint blue tinge, slate on underparts slightly paler, and both sexes have bill much thinner and longer than other two. Voice. Rapid “tik-tik-tik-tik”, short, high-pitched squeaks, and very high-



pitched "sweet sweet"; a brief trisyllabic call; and a very high-pitched chipping which develops into a trill. Also twittering notes resembling sound of snapping twigs; weak spitting note, sometimes rapidly repeated, and a sibilant note.

Habitat. Recorded in all available forest and scrub habitats, usually in canopy but also frequently in undergrowth and lower parts of the forest; from coast to highest mountains.

Food and Feeding. Insects and fruits. Forages usually in canopy, but frequently also in undergrowth and lower parts of forest. Often hovers to feed. Generally seen in pairs or family groups.

Breeding. Laying in Nov, and females with enlarged ovaries in Jul. Nest oval in shape, with side entrance, constructed of grass and fine vegetable material, suspended from twig or poorly concealed on horizontal branch 1–2 m above ground in bush. Both sexes feed nestlings and remove faecal sacs. No other information.

Movements. None recorded.

Status and Conservation. Not globally threatened. Restricted-range species: present in Solomon Group EBA. Common.

Bibliography. Cain & Galbraith (1956), Cheke & Mann (2001), Diamond (1975a), Donaghy (1950), Doughty *et al.* (1999), Hadden (1981, 2004), Kratter, Steadman, Smith & Filardi (2001), Mayr (1945a, 1945b, 1955), Mayr & Diamond (2001), Pucheran (1853), Salomonsen (1960c), Schodde (1977), Smith & Filardi (2007).

35. Mottled Flowerpecker

Dicaeum tristrami

French: Dicée de San Cristobal

German: Tristrammistelfresser

Spanish: Picaflres de San Cristóbal

Other common names: San Cristobal (Midget)/Tristram's Flowerpecker

Taxonomy. *Dicaeum tristrami* Sharpe, 1884, San Cristobal Island [Makira], Solomon Islands.

A very distinctive species, with no obvious close relatives. Monotypic.

Distribution. San Cristobal, in SE Solomons.



Descriptive notes. 8–9 cm; male 11–13 g, female 10–12.5 g. Male has top of head and upperparts brown, paler on mantle, head mottled profusely blackish and irregularly whitish, especially on forehead and ear-coverts; upperwing brown, tail blackish; throat to upper breast brown with pale edges of feathers (giving mottled or scaled effect), rest of underparts pale brownish-white; iris dark brown; bill black, may have paler base of lower mandible (especially in some females); legs dark slate or black. Female differs from male in having most of face whitish, blackish-brown area around base of bill; whitish below, some brown

on throat. Juvenile differs from adult in having pale bill and less well-marked scaling below. **VOICE.** High-pitched, emphatic, metallic "tsch-p-tsch-p".

Habitat. Primary forest, and more commonly in secondary growth and at forest edge; in highlands and lowlands, chiefly in former.

Food and Feeding. Insects and spiders (Araneae); food probably includes also fruits, and nectar and pollen of ant-plants (*Myrmecodia* and *Hydnophytum*), and perhaps gingers (*Alpinia*). Forages chiefly by hovering in front of dense foliage, especially tree-ferns; picks small invertebrates from spider webs.

Breeding. Females with enlarged ovaries in Oct–Dec. No other information.

Movements. No information.

Status and Conservation. Not globally threatened. Restricted-range species: present in Solomon Group EBA. Abundant in mountains, uncommon in lowlands. Occurs in Hauta Conservation Area.

Bibliography. Cain & Galbraith (1956), Cheke & Mann (2001), Doughty *et al.* (1999), Mayr (1945a, 1945b, 1955), Mayr & Diamond (2001), Salomonsen (1960c).

36. Black-fronted Flowerpecker

Dicaeum igniferum

French: Dicée porte-flamme

German: Rotkehl-Mistelfresser

Spanish: Picaflres Encendido

Other common names: Black-banded/Fire-tailed/Rusty Flowerpecker, Lesser Sunda Flowerpecker

Taxonomy. *Dicaeum igniferum* Wallace, 1864, Flores, Lesser Sunda Islands.

Forms a superspecies with *D. maugei*. Races poorly differentiated; species perhaps better considered monotypic. Two subspecies tentatively recognized.

Subspecies and Distribution.

D. i. igniferum Wallace, 1864 – Sumbawa, Komodo and Flores, in W Lesser Sundas.

D. i. cretum Rensch, 1929 – Pantar and Alor, in EC Lesser Sundas.

Descriptive notes. 9 cm. Male has whole upperside from crown to rump dull scarlet, glossed violet on back; forehead, face, side of neck, scapulars, upperwing and tail purplish-black; chin white,



throat and uppermost breast scarlet, pectoral band purplish-black, rest of underparts white, black central band down abdomen; iris dark; bill blackish; legs black. Female is duller above than male, with less gloss, forehead greyish-brown, crown to upper back, and rump, scarlet, rest of upperparts brown; greyish-brown side of face, lower throat and pectoral band, rest of underparts whitish. Juvenile is similar to female, but red above confined to rump, bill entirely pale, darkening towards tip. Race *cretum* is slightly larger than nominate, and male has broader black line below. **VOICE.** Rapidly repeated, thin, high-pitched "see-saw".

Song a very rapid, descending series, c. 6 seconds long, consisting of short, thin, dry notes.

Habitat. Semi-deciduous, degraded or secondary forest, coastal monsoon scrub-forest, lightly wooded cultivation and clearings; sea-level to 1730 m, usually below 800 m.

Food and Feeding. No information; diet probably includes fruit, pollen and nectar of mistletoes (Loranthaceae). Forages singly, in pairs or in small groups; joins mixed-species flocks.

Breeding. No information.

Movements. No information.

Status and Conservation. Not globally threatened. Restricted-range species: present in Northern Nusa Tenggara EBA. Widespread and generally common.

Bibliography. Cheke & Mann (2001), Coates & Bishop (1997), Mees (2006), Rensch (1931a), Salomonsen (1961a), White & Bruce (1986).

37. Red-chested Flowerpecker

Dicaeum maugei

French: Dicée de Mauge

German: Blauwangen-Mistelfresser

Spanish: Picaflres de Mauge

Other common names: Blue-checked/Mauge's/Timor Flowerpecker, Lesser Sunda Flowerpecker

Taxonomy. *Dicaeum maugei* Lesson, 1830, Timor.

Forms a superspecies with *D. igniferum*. Proposed race *mariae* (from Nusa Penida, off SE Bali) synonymized with *neglectum*; *romae* (from Roma I) considered indistinguishable from nominate. Four subspecies recognized.

Subspecies and Distribution.

D. m. splendidum Büttikofer, 1893 – Salayar and Tanahjampea, S of Sulawesi.

D. m. neglectum E. J. O Hartert, 1897 – Nusa Penida (off SE Bali) and Lombok, in W Lesser Sundas.

D. m. maugei Lesson, 1830 – Romang, Damar, Timor, Sawu, Roti, Semau and perhaps Wetar, in E Lesser Sundas.

D. m. salvadorii A. B. Meyer, 1884 – Moa and Babar, in extreme E Lesser Sundas.



Descriptive notes. 8–9.5 cm. Male nominate race is glossy dark purplish-blue above, face blackish, rump scarlet; chin whitish, scarlet patch on throat and uppermost breast bordered blackish at side and below, rest of underparts creamy, blackish central stripe on abdomen; iris dark; bill and legs black. Female has scarlet rump and uppertail-coverts, rest of upperparts grey-brown, black tail, side of neck, face and partial pectoral band greyish-brown, rest of underparts white. Juvenile is similar to female but with paler bill. Race *neglectum* has slightly longer and more slender bill than nominate, male darker red below, with slightly

broader black band; *salvadorii* male has more extensive red below, with much narrower black border; *splendidum* has slightly smaller bill than last, male with lighter red below and black breastband almost absent, female with some reddish on upper back. **VOICE.** A high-pitched "tsit"; high-pitched whistle of 2–3 notes.

Habitat. Usually around mistletoes; occurs in primary forest, secondary forest and degraded forest, woodland, plantations, wooded cultivation and bamboos; generally below 1200 m, but up to 2000 m on Lombok.

Food and Feeding. Feeds on figs (*Ficus*) as well as flowering tamarind (*Tamarindus*); diet thought also to include the fruits, pollen and nectar of mistletoes (Loranthaceae). Forages singly and in pairs.

Breeding. Laying in May on Lombok; on Timor, laying in Mar, Apr and Nov, chicks being fed in early Dec, juveniles recorded in Apr–May. Nest a compact oval purse-like structure with large entrance hole near apex and a short "tail", consisting of thick layer of pappus with loose covering of fine vegetable fibre, dead leaves and lichen, attached to palm frond. Clutch 2 eggs; white. No other information.

Movements. Nothing recorded.

Status and Conservation. Not globally threatened. Restricted-range species: present in Northern Nusa Tenggara EBA, in Timor and Wetar EBA and in Banda Sea Islands EBA. Generally common throughout range.

Bibliography. Cheke & Mann (2001), Bruce (1987), Coates & Bishop (1997), Hartert (1904), Hellmayr (1914), MacKinnon & Phillips (1993), Mason (1997), Mayr (1944a), Meyer & Wigglesworth (1898a, 1898b), Noske (2003), Rensch (1931a), Salomonsen (1961a), Trainor (2007a, 2007b), Trainor & Soares (2004), White & Bruce (1986).

inches 3
cm 8



38. Fire-breasted Flowerpecker

Dicaeum ignipectus

French: Dicée à gorge feu **German:** Feuerbrust-Mistelfresser **Spanish:** Picaflor de Pechofuego
Other common names: Buff-bellied Flowerpecker, Fire-throated/Scarlet-breasted/Green-backed/Bronze-backed Flowerpecker; Cambodian Flowerpecker (*cambodianum*); Sumatran Flowerpecker (*beccarii*); Luzon Flowerpecker (*luzoniense*)

Taxonomy. *Myzanthus ignipectus* Blyth, 1843, Nepal and Bhutan.

Forms a superspecies with *D. monticulum*, *D. celebicum*, *D. sanguinolentum* and *D. hirundinaceum*; all sometimes treated as conspecific. Has hybridized with *D. cruentatum* in SE China (Fujian). Some races, e.g. *beccarii*, distinctive and possibly approaching species level, but linked to other races through intermediate forms. Race *formosum* somewhat variable, not well differentiated from nominate and possibly better merged with it. Other proposed races are *pulchellum* (described from Lushan Hills, in Assam) and *cyanonotum* (from Ichang, in Hubei, China), both subsumed in nominate, and *vanheysti* (from Brastagi, in N Sumatra), merged with *beccarii*; *umbratile* (from Kao Kuap, in SE Thailand) is a synonym of *cambodianum*. Birds on Panay (Mt Madja-as), in Philippines, apparently belong to an as yet undescribed race. Eight subspecies currently recognized.

Subspecies and Distribution.

D. i. ignipectus (Blyth, 1843) – Himalayas from Kashmir E to NE India (Arunachal Pradesh, Assam S to Mizo Hills), SE Bangladesh, and S & SE China (S Shaanxi S to SE Xizang, Yunnan, Hainan, Guangdong and Fujian) S to Myanmar, N Thailand, Laos, Vietnam (except C Annam and Cochinchina) and E Cambodia (Phumi Dak area).

D. i. formosum Ogilvie-Grant, 1912 – Taiwan.

D. i. dolichorhynchum Deignan, 1938 – Malay Peninsula.

D. i. cambodianum Delacour & Jabouille, 1928 – SE Thailand and Cambodia.

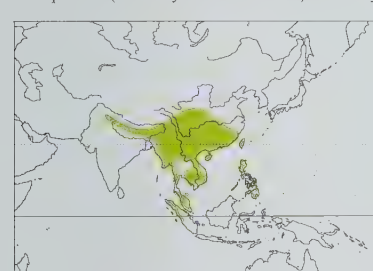
D. i. beccarii Robinson & Kloss, 1916 – N to WC Sumatra.

D. i. luzoniense Ogilvie-Grant, 1894 – N & C Luzon (N Philippines).

D. i. bonga E. J. O. Hartert, 1904 – Samar (EC Philippines).

D. i. apo E. J. O. Hartert, 1904 – Negros and Mindanao (Mt Malindang, Mt Kitanglad, Mt Hilong-Hilong, Mt Apo, Mt Puting Bato), in S Philippines.

Also present (race as yet undetermined) on Panay, in C Philippines.



Descriptive notes. 7–9 cm; male 4–8 g, female 5.5–6.1 g. Male nominate race has crown and upperparts metallic greenish blue-black; face black; throat buffy white (sometimes with red feather tips), side of breast black, scarlet patch on breast, rest of underparts rich buff, black stripe in centre of belly, flanks olive, lower belly and undertail-coverts yellow; iris brown or black; bill black, sometimes whitish patch at base of lower mandible; legs dark horn-coloured or black. Female has crown greyish-olive, upperparts olive-green, more yellow on rump and uppertail-coverts, lores buffy white, narrow pale eyering; underparts

pale buff to cinnamon-buff, with olive wash on flanks; bill black, yellow to orange patch at base of lower mandible. Juvenile is similar to female but greyer above, chin and throat white, buff on underparts paler and duller. Races differ mainly in extent of red and black below on male, also in tone of gloss above: *formosum* is hardly distinguishable from nominate, male bluish-tinged bottle-green above, red below extending variably onto chin; *dolichorhynchum* male has narrower red chestband than nominate, female is greyer above and browner below than nominate; *cambodianum* male is distinctive, metallic blue-green or green above, lacks scarlet below, has throat, breast and centre of belly rich buff; *beccarii* male is distinctive, glossy blue-green above, darker rusty-buff and lacking red below, with cinnamon breastband and narrow black stripe down centre of belly; *luzoniense* male is dark glossy green above, dull blackish on sides of head and neck, has more extensive red on breast than nominate (extending to throat, but not chin), olivaceous-grey flanks, female differs from nominate in darker upperparts with slight greenish gloss, greyish-white underparts washed olive on flanks, orange-yellow undertail-coverts; *apo* male differs from previous in having slightly glossy green sides of head and neck, darker olive-green flanks, lighter and brighter yellow undertail-coverts; *bonga* is smaller than preceding two, male has side of head as dark as or darker than last race, and upperparts more steel-blue. **VOICE.** Calls include high-pitched buzzing “zeep” or “bzeep”, sharp metallic “chip” (which may be repeated), repeated high-pitched “tsik” or “tsit”, repeated high-pitched “see”, twittering trill, also a rising, rattling trill, “dit di-di-di-di-di-di...”. Song, from perch or in flight, high-pitched, strident “see-bit, see-bit, see-bit, see-bit”, followed by long series of clicks; another song is a shrill “titty-titty-titty” or “tissit-tissit-tissit”, rather like sound made by rapid opening and closing of scissors.

Habitat. Montane forest, hill forest, subtropical evergreen and deciduous oak (*Quercus*) forests, disturbed forest, forest edge, and in rhododendrons (*Rhododendron*), secondary growth, orchards, plantations and other cultivations, around flowering and fruiting trees, and particularly around mistletoes (Loranthaceae). In Himalayas of China and India, 900–3950 m in summer and down to 300 m in winter; in Nepal, 1830–2700 m in summer and 915–2285 m in winter; in Taiwan, to 2135 m in summer and down to 900 m in winter; in Myanmar, to 2600 m; in Malay Peninsula and Sumatra, 800–2200 m; and in Philippines, above 1000 m.

Food and Feeding. Fruits and nectar, particularly of mistletoes (including *Scurrula rhododendricolus*), figs (*Ficus*); also spiders (Araneae) and insects. Forages generally in canopy or middle storey. Forages singly and in pairs; outside breeding season sometimes in small groups and in mixed-species flocks.

Breeding. Laying Mar–Jun in India, Mar–Apr and possibly May in Nepal (where also fledgling in May), Feb and Apr–Jun in Myanmar, and mostly Oct–Mar in Hong Kong (SE China); nest in Mar in Sumatra (Batak Highlands); nestlings mid-Aug in Peninsular Malaysia; birds with active gonads in Jan and May in Philippines. Nest an oval purse, 90 × 60 mm, entrance hole on side near top, with or without porch, constructed from soft vegetable down held together with rootlets, spider webs and grass, sometimes decorated with moss, suspended 3–9 m above ground from branch of small tree. Clutch 2–3 eggs, white. No other information.

Movements. Seasonal altitudinal movements; post-breeding descent in Himalayas, China and Taiwan, possibly also elsewhere in range.

Status and Conservation. Not globally threatened. Generally common throughout much of its range; considered uncommon in Philippines. Occurs in many protected areas in all parts of range.

Bibliography. Ali & Ripley (1974), Birand & Pawar (2004), Cheke & Mann (2001), Cheng Tsohsin (1987), Corlett (1998), Dickinson *et al.* (1991), Duckworth & Hedges (1998), Fleming *et al.* (1976), Inskipp & Inskipp (1991), Kennedy *et al.* (2000), Khan (2004), King *et al.* (1975), Kuroda (1920), Lim Hsingyu (1995), MacKinnon & Phillips (1993), van Marle & Voous (1988), Martens & Eck (1995), McCarthy (2006), McGregor (1909), McWay & Wells (1976), Meyer de Schauensee (1984), Ogilvie-Grant (1894), duPont (1971b), Rasmussen & Anderton (2005b), Ripley (1982), Ripley & Rahor (1961), Robson (2000b), Salomonsen (1961a), Smythies (1986), Stresemann & Heinrich (1940a), Viney & Phillips (1988), Wells (2007), Worcester (1898).

39. Black-sided Flowerpecker

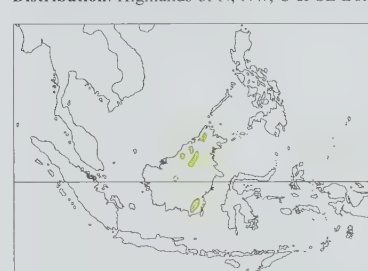
Dicaeum monticulum

French: Dicée de Bornéo **German:** Borneomistelfresser **Spanish:** Picaflor de Borneo
Other common names: Bornean (Fire-breasted)/Mountain Flowerpecker

Taxonomy. *Dicaeum monticulum* Sharpe, 1887, Mount Kinabalu, northern Borneo.

Forms a superspecies with *D. ignipectus*, *D. celebicum*, *D. sanguinolentum* and *D. hirundinaceum*; all sometimes treated as conspecific. Particularly close to *D. celebicum*. Proposed race *zita* (from Mt Dulit, in Sarawak) considered undiagnosable. Monotypic.

Distribution. Highlands of N, NW, C & SE Borneo.



Descriptive notes. 8 cm. Male has top of head and upperparts glossy bluish-black, face black, malar region and side of neck sooty black; central chin white, throat and breast scarlet, bordered greyish-black, upper flanks and upper belly dark grey, central lower belly white, lower flanks and side of belly olive, vent and undertail-coverts buffy yellow; underwing-coverts and pectoral tufts white; iris brown or black; bill black; legs brown to black. Female is olive-green above, with buffy wash on rump, grey face, whitish on throat, pale greyish below, some whitish mottling on breast, creamy on centre of belly, buffy on lower flanks, and

with white pectoral tufts. Juvenile is similar to female but darker below, with some fine dark streaking on chin to breast. **VOICE.** Sharp, piercing, metallic “zit”, a repeated “tit-tit”, also “tsweet-tsweet”, with second note slurred up and down; also a rapid ticking.

Habitat. Hill dipterocarp forest, montane forest and heath forest, also scrub; at 460–2540 m.

Food and Feeding. Fruits, particularly of mistletoes (Loranthaceae), seeds, probably also pollen and nectar of mistletoes; also aphids (Aphidoidea), flies (Diptera), leafhoppers (Homoptera) and other insects. Forages at lower levels, at times ascending to canopy.

Breeding. Males with enlarged testes in Dec in N Borneo (Sabah) and young observed in Nov–Feb in NW (Bario, in Sarawak). Nest a suspended purse of moss, lined with tree-fern pith and decorated with lichens. Clutches of 3 eggs reported. Female recorded feeding fledgling. No other information.

Movements. None recorded.

Status and Conservation. Not globally threatened. Restricted-range species: present in Bornean Mountains EBA. Local and uncommon. Very patchily distributed; occurs in highlands in Sarawak (Mt Penrissen, Mt Dulit, Mt Mulu and Bario), Sabah (Crocker Range, Mt Kinabalu and Mt Trus Madi), Kalimantan Barat (Mt Liang Kubung) and Kalimantan Selatan (Muratus Mts). Resident in Kinabalu Park.

Bibliography. Cheke & Mann (2001), Davison (1992), MacKinnon & Phillips (1993), Mann (2008), Salomonsen (1961a), Sheldon *et al.* (2001), Smythies (1957, 1960), Smythies & Cranbrook (1981), Smythies & Davison (1999).

40. Grey-sided Flowerpecker

Dicaeum celebicum

French: Dicée des Célèbes **German:** Schwarzwangen-Mistelfresser **Spanish:** Picaflor de Célebes
Other common names: Black-sided Flowerpecker(!)

Taxonomy. *Dicaeum celebicum* S. Müller, 1843, Sulawesi.

Forms a superspecies with *D. ignipectus*, *D. monticulum*, *D. sanguinolentum* and *D. hirundinaceum*; all sometimes treated as conspecific. Particularly close to *D. monticulum*. Race *talautense* very distinctive and may warrant treatment as a separate species. Five subspecies recognized.

Subspecies and Distribution.

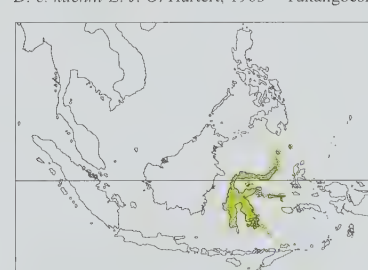
D. c. sanghirense Salvadori, 1876 – Sangihe Archipelago (Sangihe, possibly also Siau).

D. c. talautense A. B. Meyer & Wiglesworth, 1895 – Talaud.

D. c. celebicum S. Müller, 1843 – Sulawesi, including Manadotua, Bangka, Lembah, Togian Is, Muna and Butung.

D. c. sulaense Sharpe, 1884 – Banggai I and Sula Archipelago.

D. c. kuehni E. J. O. Hartert, 1903 – Tukangbesi Archipelago.



Descriptive notes. 9 cm. Male nominate race has crown and upperparts black, glossed dull purplish, face sooty; throat white, scarlet patch on lower throat and breast, abdomen creamy white with black central line, flanks sooty olive, undertail-coverts whitish; iris dark; bill dark brown; legs blackish. Female is greyish-brown above, whitish-grey on throat and breast, with flanks olive-grey, centre of belly and vent buffy white. Juvenile is similar to female but darker below, more greenish on upper breast, and darker, greyer, on throat; bill paler. Race *kuehni* male is more bluish-purple above than nominate, with paler

greyish-white abdomen and lighter, greyer-tinged flanks; *sulaense* male is lighter and more purplish-blue above than previous, has dark grey-olive flanks, greyish (not black) central stripe on abdomen; *sanghirense* male has dark inky blue gloss above, more greyish-white abdomen, purer dark grey (less olivaceous) flanks; *talautense* male is lighter, less glossy and more blue above than nominate, with uniformly greyish-black abdomen and flanks, female is generally darker below. Voice. Repeated, thin, upslurred "seei", short repeated "tjiti", short, dry, muted "trri-trri", and high-pitched "tsip"; flight call a sharp "chip, chip, chip...".

Habitat. Montane, lowland primary forest and tall secondary forest, forest edge, and plantations, cultivation, gardens and secondary scrub; sea-level to 1200 m.

Food and Feeding. Fruits, nectar and pollen of mistletoes (Loranthaceae), wild cherries (*Prunus*) and *Lantana camara*; small spiders (Araneae) and insects. Forages mostly in outer canopy. Gleans bare outer twigs. Forages singly and in pairs.

Breeding. No information on laying season. Nest a pear-shaped purse with entrance slit on side near top, or pendant-shaped ball, with or without porch, woven from fine grasses and down, decorated with twigs, spider webs and leaf debris, suspended 1.5–2 m above ground from outer branch. Clutch 3 eggs, white. No other information.

Movements. No information.

Status and Conservation. Not globally threatened. Widespread and generally common. Occurs in Lore Lindu National Park, in Sulawesi.

Bibliography. Atyeo (1971), van Bemmelen & Voous (1951), Blasius (1897), Cheke & Mann (2001), Coates & Bishop (1997), Coomans de Ruiter (1950, 1951), Holmes & Wood (1980), Meyer & Wigglesworth (1898a, 1898b), Riley, J. (1997), Riley, J.H. (1924), Salomonsen (1961a), Schönwetter & Meise (1980), Stones *et al.* (1997), Stresemann & Heinrich (1940b), White & Bruce (1986).

41. Blood-breasted Flowerpecker

Dicaeum sanguinolentum

French: Dicée sanglant **German:** Purpurnistelfresser **Spanish:** Picaflores Sangrante
Other common names: Javan Fire-breasted Flowerpecker

Taxonomy. *Dicaeum sanguinolentum* Temminck, 1829, west Java.

Forms a superspecies with *D. ignipectus*, *D. monticolum*, *D. celebicum* and *D. hirundinaceum*; all sometimes treated as conspecific. Particularly close to some forms of *D. ignipectus* and *D. celebicum*. Proposed race *ablutum*, described from Tamansari (Banjoevangi), in E Java, subsumed within nominate. Four subspecies recognized.

Subspecies and Distribution.

D. s. sanguinolentum Temminck, 1829 – S Sumatra (Lampung, two records), Java and Bali.

D. s. wilhelminae Büttikofer, 1892 – Sumba, in Lesser Sundas.

D. s. rhodopygiale Rensch, 1928 – Flores.

D. s. hanieli Hellmayr, 1912 – Timor.



Descriptive notes. 8–9.5 cm. Male nominate race has top of head and upperparts dark glossy blue, narrow white tips on tail feathers; throat and belly pinkish to creamy buff, breast scarlet, broad black stripe down centre of lower breast to belly, white pectoral tufts, flanks extensively smudged blackish-grey; iris blue or brown; bill black; legs dark grey. Female is dull olive-brown above, with scarlet rump and upperpart-coverts, throat and underparts ochre or orange-buff, streaked olive-grey, side of breast greyish, white pectoral tufts. Juvenile is similar to female but greyer, with bill paler. Race *hanieli* male has creamy-white throat and

chin, only small red patch, abdomen white, flanks yellowish; *rhodopygiale* has much thinner bill than others, male differs from nominate in having orange-pink (not buff) undertail-coverts, from other races in buff (not whitish) abdomen, blackish flanks; *wilhelminae* has thicker bill than others, male differs from nominate in being more violet above, in having white chin, scarlet throat to breast, grey belly and flanks, female is olive-grey above and pale buff-white and grey below, juvenile as female but olive-suffused white and grey below. Voice. Various sharp, high-pitched clicks; hard, sharp, buzzing double note. Song, lasting 1–2 seconds, a rather jerky series of 4–5 thin, very-high-pitched but sweet notes.

Habitat. Montane forest, hill forest and secondary forest, forest edge, casuarina (*Casuarina*) groves, open and degraded woodland, and lightly wooded cultivation. At 800–2400 m in Java and Bali; lowlands to 1000 m in Lesser Sundas, but higher on Timor and Flores.

Food and Feeding. Chironomid larvae, and spiders (Araneae); presumably also fruit, nectar and pollen of mistletoes (Loranthaceae). Forages usually in canopy, particularly near mistletoes. Forages singly and in pairs.

Breeding. Laying in Jan, Aug and Oct in W Java. Eggs described as lustreless white. No other information.

Movements. None recorded. Records from Sumatra possibly indicative of vagrancy.

Status and Conservation. Not globally threatened. Widespread in Java and Bali; common and widespread on Sumba and Flores; uncommon and apparently found only at high elevations on Timor. Status in Sumatra unclear; only two records, and perhaps only a vagrant there, but possibility that a small resident population exists merits investigation. Occurs in Gunung Gede-Pangrango National Park, in Java.

Bibliography. Cheke & Mann (2001), Coates & Bishop (1997), Hellebrekers & Hoogerwerf (1967), Hellmayr (1914), Hoogerwerf (1949, 1950), MacKinnon & Phillips (1993), Mayr (1944a), Mees (2006), Rensch (1928, 1931a), Robinson & Kloss (1923), Salomonsen (1961a), Schönwetter & Meise (1980), White & Bruce (1986).

42. Mistletoebird

Dicaeum hirundinaceum

French: Dicée hirondelle **German:** RotsteiB-Mistelfresser **Spanish:** Picaflores Golondrina
Other common names: Fire-breasted(!)/Australian/Mistle(toe) Flowerpecker, Australian Flower Swallow, Wallacean Flowerpecker (*ignicolle*)

Taxonomy. *Motacilla hirundinacea* Shaw, 1792, New Holland = Australia.

Forms a superspecies with *D. ignipectus*, *D. monticolum*, *D. celebicum* and *D. sanguinolentum*; all sometimes treated as conspecific. Race *fulgidum* perhaps sufficiently distinctive to warrant consideration as a separate species. Nominant race exhibits some clinal variation in size and colour, being

smaller in N, also females in N paler and whiter below, compared with greyer and browner in S and more variable in W. Proposed races *tormenti*, described from Point Torment (King Sound), in N Western Australia, and *yorki*, from Cape York, in N Queensland, considered insufficiently distinct from nominate to warrant subspecific separation. Four subspecies recognized.

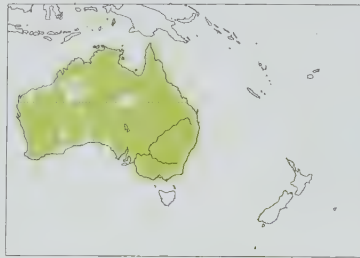
Subspecies and Distribution.

D. h. keiense Salvadori, 1874 – Watubela Is, Tayandu Group and Kai Is, in E Indonesia.

D. h. ignicolle G. R. Gray, 1858 – Aru Is.

D. h. fulgidum P. L. Selater, 1883 – Tanimbar Is.

D. h. hirundinaceum (Shaw, 1792) – Australia (including islands in Torres Strait and Great Barrier Reef), except Tasmania.



Descriptive notes. 9 cm; male 7.5–11 g, female 7.5–10 g. Male nominate race has head and upperparts violet-glossed blue-black; throat and breast scarlet, broad blackish streak on centre of lower breast and belly, flanks grey, rest of abdomen greyish-white, undertail-coverts scarlet; iris grey, light brown, red or deep brown; upper mandible blackish or dark grey, lower mandible dark grey to brown, mouth salmon-pink (flesh-coloured in centre); legs dark grey, dark brown or black. Female is greyish-brown above, greyish-white below, with some darker mottling on throat and breast, pale scarlet undertail-coverts with whitish tips

(scaled effect); some individuals have a dark grey-brown central stripe on abdomen. Juvenile differs from female in having pink (not blackish) bill, and slightly rufous, indistinct scaling on throat. Race *keiense* male is purple-blue above, has narrow red band on breast, pale pink-orange below and lacking central belly stripe, pale grey-green flanks, whitish lower abdomen, female differs from nominate in being olive-brown above with reddish rump; *fulgidum* male differs from previous in paler pink underparts, white replaced by buffy yellow, reduced grey-green on side of abdomen, female differs in having deep crimson rump; *ignicolle* male differs from nominate in having dull yellowish underparts with olive-green flanks. Voice. Has wide vocabulary. High-pitched double and triple notes, various sibilant calls, a dry "tic", a "pretty-sweet", "tsew" and similar; sharp "dzee" in flight; contact call "see" or "seep"; soft buzzing warble during courtship by male, perhaps also by female; distress trill and "trrit-trrit" and "krik-krik" alarm calls described, also harsh or shrill scolding calls. Subsong a continuous stream of buzzing warbles, sometimes with mimicry. Song, by both sexes, a strident, whistled "wissweet...wissweet..." or repeated (usually) "wit-wissweet"; also high-pitched, clear, penetrating "wait-a-bit wait-a-bit zipp!" and variations on this; territorial song by male, from high perch, a clear, penetrating "kinsey kinsey kinsey" or "wicky wicky wicky" or "swizit swizit, weet weet swizit" or "witsoo witsoo witsoo...", wiss wiss wiss", or rapid "tang-tang-tang-tang" or "tar-tar-tar"; also a soft warbling song which includes much mimicry. Imitated bird species are Mulga Parrot (*Psephodes varius*) and 28 species of passerine, including White-throated Treecreeper (*Cormobates leucophaeus*), Rufous Whistler (*Pachycephala rufiventris*), Grey Fantail (*Rhipidura fuliginosa*), Weebill (*Smicrornis brevirostris*), Striated Pardalote (*Pardalotus striatus*), Silvereye (*Zosterops lateralis*) and New Holland Honeyeater (*Phylidonyris novaehollandiae*).

Habitat. Almost anywhere where mistletoes (Loranthaceae) are found, and often in areas of high mistletoe infestation. Forest, forest edge, sclerophyll and open savanna woodlands, and eucalypt (*Eucalyptus*) woodland, including low mallee; also mulga and other acacias (*Acacia*), mangroves, scattered trees, riparian zones in arid areas, and secondary growth. Lowland and middle elevations, and rare above 1000 m in Snowy Mts of Australia; sea-level to 250 m on Tanimbar.

Food and Feeding. Moths (Lepidoptera), syrphids and other insects, spiders (Araneae); fruits, particularly of mistletoes, also nectar and pollen. Fruits include those of pepper tree (*Schinus molle*), saltbushes (*Enchylaena tomentosa* and *Rhagodia spinescens*), figs (*Ficus*), African boxthorn (*Lycium ferocissimum*), native bryony (*Diplocyclos palmatus*), hawthorns (*Crataegus*), *Comprosmia lucida*, blackberry nightshade (*Solanum nigrum*), and the mistletoes *Amyema cambagei*, *Amyema quandong* and *Notoxizos*, among others. Young fed with spiders and other small arthropods. Deposits seeds of the mistletoe *Amyema miquelii* up to 500 m or more from parent tree. Forages mostly in upper levels of vegetation, often in canopy; sometimes lower down. Main techniques are gleaning and aerial sallying; frequently hovers, and sometimes probes in flowers. Usually singly or in pairs, occasionally in small groups; rarely in larger flocks, especially in areas of abundant food. Very occasionally joins mixed-species flocks.

Breeding. Laying in Australia mostly Aug–Apr (but also May–Jul), when mistletoes fruiting, but may occur also when fruits not abundant. Nest, built by female, a neat pear-shaped purse 75–114 mm long and 38–64 mm in diameter, with entrance slit on side, made from matted plant down, debris, lichen, feathers, wool, dried blossom, spider egg sacs and webs, sometimes decorated with brown or grey matter (including excreta of insect larvae) or faded wattle (*Acacia*) blossom, suspended 0.5–1.5 m up from thin leafy twig or frond of tree-fern, and often concealed among foliage. Clutch 3–4 eggs, white; incubation by female, period c. 10–12 days; chicks brooded by female, fed by both sexes, mostly by female, nestling period 15 days. Nest parasitism by Horsfield's Bronze-cuckoo (*Chrysococcyx basalus*), Shining Bronze-cuckoo (*Chrysococcyx lucidus*) and Fan-tailed Cuckoo (*Cacomantis flabelliformis*).

Movements. Non-breeding birds highly nomadic in some areas, in association with fruiting of mistletoes.

Status and Conservation. Not globally threatened. Common in mainland Australia, and moderately common on Tanimbar Is (Yamdena) and Kai Is. Widespread in Australia, where occupies home range of c. 20 ha; in one study, five pairs along a transect of 3.3 km. An important agent in dispersal of mistletoe seeds; in studies in Australia, it was found that 95% of mistletoe seeds defecated by this species germinated, and survival rates of seedlings was also high. In the past was sometimes persecuted because of its role in spreading mistletoe, which was regarded by some farmers and others as a serious pest.

Bibliography. Attenborough (1995), Atyeo (1971), Ballingall (1990), Beecher *et al.* (1986), Bellchambers *et al.* (1994), Blakers *et al.* (1984), Cheke & Mann (2001), Close (1991), Coates & Bishop (1997), Cowles (1974), Davis (1993), Eck (1976), Frith, H.J. (1969, 1984), Higgins *et al.* (2006), Keast (1995), Liddy (1982a, 1984), Longmore (1991a), Murphy *et al.* (1993), Pizzey (1980), Pizzey & Knight (1997), Reid (1983, 1987, 1989, 1990, 1997), Richardson & Wooller (1988), Salomonsen (1961a), Serventy (1970), Simpson (1997), Simpson & Day (1984), Ward & Paton (2007), White & Bruce (1986), Yan (1993).

43. Scarlet-backed Flowerpecker

Dicaeum cruentatum

French: Dicée à dos rouge **German:** Scharlachmistelfresser **Spanish:** Picaflores Dorsirrojo

Other common names: Pryer's Flowerpecker (black-breasted morph "pryeri")

Taxonomy. *Certhia cruentata* Linnaeus, 1758, Bengal, India. Sometimes considered to form a superspecies with *D. trochileum*. Has hybridized with latter in E Borneo (Samarinda), and a hybrid between present species and *D. ignipectus* recorded in SE China (Fujian). Some races well differentiated, but situation complicated by presence of non-geographical colour morphs "pryeri" (mainly Malay Peninsula and N Borneo) and "hosii" (Borneo); race *ignitum* poorly differentiated, possibly better merged with nominate; in addition, named races *erythronotum* (China), *siamense* (from Lat Bua Kao, in E Thailand), *coccinea* (China) and *hainanum* (Hainan I) all subsumed in nominate. Population in N Borneo (Sabah) possibly represents an as yet undescribed race. Seven subspecies currently recognized.

Subspecies and Distribution.

D. c. cruentatum (Linnaeus, 1758) – E Nepal, NE India, Bangladesh, Myanmar and S China (SE Xizang, S Yunnan E, including Hainan I, to Fujian), S to Thailand and Indochina.

D. c. ignitum (Begg, 1834) – Peninsular Malaysia and Riau Archipelago.

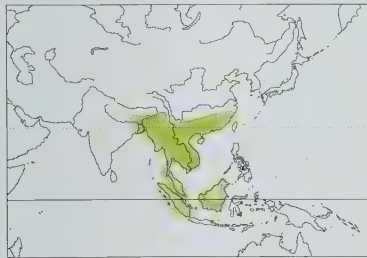
D. c. sumatranum Cabanis, 1878 – Sumatra and some satellites.

D. c. simalurensis Salomonsen, 1961 – Simelue I, off NW Sumatra.

D. c. niasensis Meyer de Schauensee & Ripley, 1940 – Nias I, off W Sumatra.

D. c. batuensis Richmond, 1912 – Batu Is and Mentawai Is, off SW Sumatra.

D. c. nigrimentum Salvadori, 1874 – Borneo.



Male is similar to female, but more buffish below, lacks red on rump (which may have orange tinge), and has orange bill with paler base. Race *ignitum* is very like nominate, but male slightly darker on flanks, in morph "pryeri" (less than 25% of population) male has black of throat sides extending to centre and onto breast; *sumatranum* is smaller than nominate, male has lighter red upperparts, black forehead, duller wings, greenish gloss on scapulars, smoky-grey throat (centre paler), side of neck, side of breast and flanks; *batuensis* male differs from previous in having centre of chin, throat and breast buffy white (as nominate, but area not so broad), and sides of head, neck and body slightly darker, female differs from nominate in having narrower white central line on underparts; *niasensis* male is similar to last, but wing-coverts purplish-blue (rather than greenish-blue), throat darker grey, buff central area of underside reaching only to upper chest, female as *sumatranum* but back brighter, more yellowish-green, and bill stouter; *simalurensis* is larger than *batuensis*, male differs further in being darker, more scarlet, above, with deeper blue gloss on wing-coverts; *nigrimentum* male is quite variable, has black throat and upper breast (morph "pryeri", less than 25% of population in NE Sabah) and much black on flanks, or may have creamy or buffy line of variable thickness through throat, and sometimes also breast, with variable amount of scarlet on breast, and some have chin and upper throat black, buffy white centre of lower throat and breast (morph "hosii"). Voice. Call "chip-chip", sometimes repeated; also a loud, staccato, clicking "tchik-tchik-tchik", high-pitched "chizee", thin metallic "tizz" and "tsi"; also much twittering, squeaks and shrill notes. Song a rising and falling "see-sip-see-sip-see-sip", a repeated "see-bit see-bit see-bit", a shrill, ringing "chipi-chipi-chipi dzee-dzee-dzee", or "zeekit-zeekit-zeekit-zeekit-zee"; another song described as short, high, buzzy rattles made up of rapidly delivered call notes.

Habitat. Variety of forest types, including mangroves, heath forest and alluvial forest, regenerating forest, forest edge, coastal scrub, secondary growth, open scrub, orchards, plantations and other cultivation, and gardens; generally below 1000 m, but to 1200 m in China and 2135 m in Nepal.

Food and Feeding. Fruits, including berries of *Muntingia calabura* and *Melastoma malabathricum*, figs (*Ficus*) and mistletoes (Loranthaceae), green seeds, nectar; also insects and spiders (Araneae). Forages at all heights. Hawks flying insects by sallying from perch and hovering. Occurs in pairs and family parties.

Breeding. Mar–Aug (chiefly May and Jun) in Nepal and India, Feb–Apr in Myanmar, Jan–Apr and Jul in Thailand, Jan–Jun in Peninsular Malaysia, Nov–Jan, Apr and May (also enlarged testes in Mar and Jun) in N Borneo (Sabah), and Jun–Aug in SE China (Hong Kong); nest-building Nov and Dec in Sumatra, mid-Dec, Feb, Jun and early Aug in Malay Peninsula; adult with noisy juvenile in Feb, in Cambodia; in Singapore, begging juvenile in Oct, and nest-building and nestlings in Nov.

Descriptive notes. 7–9 cm; male 5.5–8 g, one female 6 g. Male nominate race has crown to back and rump deep red, side of head black, upperwing and tail glossy blue-black; sides of throat and upper breast black, flanks grey, centre of throat, breast and belly pale buff, white pectoral tufts; iris brown; bill and legs black or blackish-green. Female is olive-brown to grey-brown above (with orange tinge on back), except for scarlet uppertail-coverts, black tail, dark brown wing; throat greyish-white, rest of buff underparts pale buff to whitish, sometimes with slight olive wash, sides and flanks usually greyer, narrow white central stripe. Juvenile is similar to female, but more buffish below, lacks red on rump (which may have orange tinge), and has orange bill with paler base. Race *ignitum* is very like nominate, but male slightly darker on flanks, in morph "pryeri" (less than 25% of population) male has black of throat sides extending to centre and onto breast; *sumatranum* is smaller than nominate, male has lighter red upperparts, black forehead, duller wings, greenish gloss on scapulars, smoky-grey throat (centre paler), side of neck, side of breast and flanks; *batuensis* male differs from previous in having centre of chin, throat and breast buffy white (as nominate, but area not so broad), and sides of head, neck and body slightly darker, female differs from nominate in having narrower white central line on underparts; *niasensis* male is similar to last, but wing-coverts purplish-blue (rather than greenish-blue), throat darker grey, buff central area of underside reaching only to upper chest, female as *sumatranum* but back brighter, more yellowish-green, and bill stouter; *simalurensis* is larger than *batuensis*, male differs further in being darker, more scarlet, above, with deeper blue gloss on wing-coverts; *nigrimentum* male is quite variable, has black throat and upper breast (morph "pryeri", less than 25% of population in NE Sabah) and much black on flanks, or may have creamy or buffy line of variable thickness through throat, and sometimes also breast, with variable amount of scarlet on breast, and some have chin and upper throat black, buffy white centre of lower throat and breast (morph "hosii"). Voice. Call "chip-chip", sometimes repeated; also a loud, staccato, clicking "tchik-tchik-tchik", high-pitched "chizee", thin metallic "tizz" and "tsi"; also much twittering, squeaks and shrill notes. Song a rising and falling "see-sip-see-sip-see-sip", a repeated "see-bit see-bit see-bit", a shrill, ringing "chipi-chipi-chipi dzee-dzee-dzee", or "zeekit-zeekit-zeekit-zeekit-zee"; another song described as short, high, buzzy rattles made up of rapidly delivered call notes.

Nest a very small oval or pear-shaped purse, 90 × 60 mm, entrance near top, with or without porch, consisting of vegetable down bound together with grass, rootlets and spider webs, lined with downy fibre, decorated externally with spider webs and bark fragments, suspended from terminal twig 2–15 m (usually 6–9 m) above ground. Clutch 2–4 eggs, unglossed greyish-white, unmarked or faintly and sparsely flecked brownish; incubation by both sexes, period 10–11 days; both also provision nestlings and tend fledglings; no information on duration of nestling period.

Movements. Probably makes seasonal altitudinal movements in higher parts of range.

Status and Conservation. Not globally threatened. Rare in Nepal and Bhutan; locally common, or common to very common, in NE India (especially in Calcutta area and Assam), Bangladesh, plains and hills of Myanmar, Thailand, lowland Malay Peninsula, and in Sumatra and Borneo; generally rather uncommon in China. Occurs in numerous protected areas, e.g. Dibru-Saikhowa National Park, in India, Khao Pra Bang Wildlife Sanctuary, in Thailand, and Cat Tien National Park, in Vietnam.

Bibliography. Ali & Ripley (1974), Attyeo (1971), Birand & Pawar (2004), Chasen & Kloss (1930), Cheke & Mann (2001), Corlett (1998), Davidson (1945), Farrow (2008), Fleming *et al.* (1976), Gretton (1990), Grimmett *et al.* (1998), Inskipp & Inskipp (1991), King *et al.* (1975), MacKinnon & Philipps (1993), Mann (2008), van Marle & Voous (1988), McCarthy (2006), McClure (1998), Medway & Wells (1976), Meyer de Schauensee (1940, 1984), Moulton (1914), Rasmussen & Anderton (2005b), Redman *et al.* (1984), Ripley (1982), Robson (2000b, 2005a), Salomonsen (1961a), Sheldon *et al.* (2001), Smythies (1957, 1960, 1986), Smythies & Cranbrook (1981), Smythies & Davison (1999), Stresemann & Heinrich (1940a), Wells (2007).

44. Scarlet-headed Flowerpecker

Dicaeum trochileum

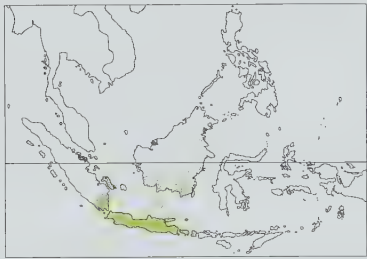
French: Dicée à tête écarlate **German:** Feuerkopf-Mistelfresser **Spanish:** Picaflores Cabecirrojo

Taxonomy. *Certhia trochilea* Sparman, 1789, "America?"; error = Java. Sometimes considered to form a superspecies with *D. cruentatum*. Hybrid between present species and *D. cruentatum* recorded in E Borneo (Samarinda). Race *stresemanni* only weakly differentiated from nominate. Two subspecies recognized.

Subspecies and Distribution.

D. t. trochileum (Sparman, 1789) – Bangka, S Sumatra (Lampung), S & E Borneo, Java (including Madura), Karimunjawa Is and Bawean (both N of Java), Kangean Is and Bali.

D. t. stresemanni Rensch, 1928 – Lombok.



Descriptive notes. 8–9 cm. Male nominate race has head, upper back, rump, uppertail-coverts and chin to upper breast scarlet, upperwing and tail black; flanks and lower breast grey, belly greyish-white, white pectoral tufts and underwing-coverts; iris brown; bill and feet black. Female has crown and upperparts brown, washed red on head and mantle, rump scarlet; throat and underparts dull white. Juvenile is greenish-brown above, orange patch on rump, greyish below, paler on throat and centre of belly. Race *stresemanni* has shorter bill than nominate, female generally paler, particularly on head and flanks. VOICE.

Short, high-pitched "zit-zit-zit", and buzzing "seeeeeep...seeeeeep". Song a series of sweet, high-pitched double notes abruptly rising and falling, duration 2–3.5 seconds.

Habitat. Woodland, cultivation, mangroves, open areas and gardens; sea-level to 600 m.

Food and Feeding. Insects, small spiders (Araneae), also fruits, nectar and/or pollen of mistletoes (Loranthaceae). Occurs at high or low levels in vegetation, around mistletoes. Forages singly and in pairs.

Breeding. Laying Feb–Jul in W Java. Nest a globular mass 70–80 × 30–35 mm, large entrance hole stretching from top to middle point of side (finishing 25–30 mm from bottom), made from fine twigs and plant fibres, lined with plant down; one was suspended beneath a horizontal twig by an attachment broader than nest (but of same material), another was attached to vertical twigs in cluster of large leaves. Eggs white, glossed or unglossed, some with a few markings, one red-brown at pointed end. No other information.

Movements. None recorded.

Status and Conservation. Not globally threatened. Common in Java, on its outlying islands, and in Bali; uncommon in Sumatra and Lombok. Occurs in Bogor Botanical Gardens, in Java.

Bibliography. Bishop (1985), Cheke & Mann (2001), Coates & Bishop (1997), Hellebrekers & Hoogerwerf (1967), Hoogerwerf (1949, 1950), Hoogerwerf & Rengers Hora Siccama (1938), MacKinnon & Philipps (1993), Mann (2008), van Marle & Voous (1988), McCarthy (2006), Mees (1986), Rensch (1931a), Smythies (1957, 1960), Smythies & Cranbrook (1981), Smythies & Davison (1999), White & Bruce (1986).

Class AVES
Order PASSERIFORMES
Suborder OSCINES
Family PARDALOTIDAE (PARDALOTES)



- Very small, plump passerines with short square tail and short bill, typically with loud but simple calls; some brightly coloured.
- 8.5–12 cm.



- Australia.
- Forests and woodlands, especially those dominated by eucalypts.
- 1 genus, 4 species, 12 taxa.
- 1 species threatened; none extinct since 1600.

Systematics

The family Pardalotidae consists of four species, all within a single genus, *Pardalotus*, confined to Australia and its islands. The genus is homogenous: the four pardalotes are united by distinctive morphological and ecological features. The family affiliation of the genus and the systematic treatment of some species within it have, however, varied over the years. For a long time, the pardalotes were placed with the mostly Oriental flowerpeckers (Dicaeidae), largely because of the shared features of small size, dumpy shape, bright coloration, and loss or diminution of the outermost, tenth, primary feather. More recent genetic and other evidence has indicated that this matching is simply a case of superficial resemblance.

Instead, the pardalotes appear to be taxonomically far closer to a set of small Australasian insectivores, the Acanthizidae, which includes the thornbills (*Acanthiza*), the scrubwrens (*Sericornis*), the *Gerygone* warblers, the Weebill (*Smicrorhynchus brevirostris*) and the heathwrens (*Hylacola*), among others. Indeed, some recent taxonomic treatments have combined the Acanthizidae and the Pardalotidae, the latter family name then taking precedence. The two groups, the pardalotes and the acanthizids, are, however, more homogenous when separated; the genomic distance between these two groups is sufficiently large to warrant separation, and there are substantial differences between them in mitochondrial DNA sequences. Further, the pardalotes and acanthizids differ in a range of anatomical features. R. Schodde and I. J. Mason, in their 1999 *Directory of Australian Birds*, list several distinctive features of the Pardalotidae. These include well-ossified narial apertures, a constricted palate with attenuately subulate transpalatine processes, a deeply bifid vomer with developed round-tipped horns, vestigial maxillo-palatine processes, ossified and thickened hinges of the pterygoids with the medio-palatine processes, temporal fossae nearly occluded by thickened zygomatic processes, more or less vestigial postorbital processes, undeveloped alae tympanicae, and a humeral fossa that is of the acanthizid type but with particularly deep twin furrows.

Within the family's sole genus there are two well-defined largely invariant species, the Red-browed Pardalote (*Pardalotus rubricatus*), the two subspecies of which are based largely on nuanced plumage differences, and the monotypic Forty-spotted Pardalote (*Pardalotus quadragintus*). In addition to these two species, the genus contains two distinct species groups, each with a varied history of taxonomic treatments. The Striated Pardalote (*Pardalotus striatus*) exhibits some geographical variation in

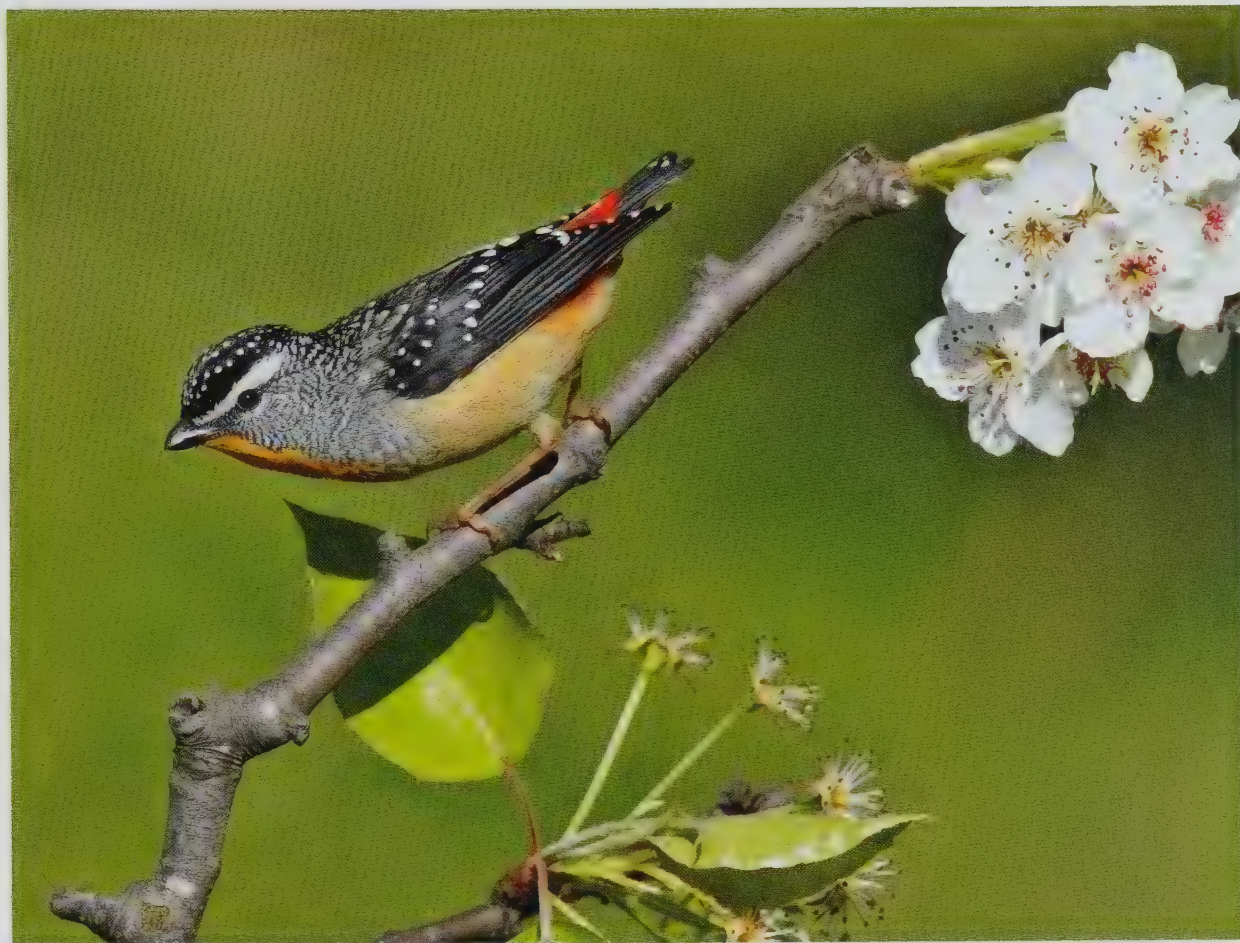
plumage patterning and, less markedly, in vocalizations, and this has resulted in several races at times being elevated to the rank of species. Thus, the name of "Striated Pardalote" has sometimes been reserved for the subspecies *substriatus*, with the nominate race treated as a separate species, the "Yellow-tipped Pardalote", and *ornatus* as a further species, the "Eastern Striated Pardalote"; the three northern subspecies, *uropygialis*, *melvillensis* and *melanocephalus*, are then combined as the "Black-headed Pardalote". Indeed, the complex geographical pattern of variation in these striated pardalotes has excited considerable debate and some significant biogeographical studies. This debate has now, it seems, largely settled, with general recognition of a single species containing six subspecies.

The fourth member of the genus in the current treatment, the Spotted Pardalote (*Pardalotus punctatus*), shows a somewhat similar, but simpler, geographical variation in plumage patterning. The inland subspecies, *xanthopyge*, has at times been elevated to full species rank, as the "Yellow-rumped Pardalote". In the far north of the Spotted Pardalote's range, in north-eastern Queensland, a probably disjunct population is generally recognized also as being subspecifically distinct, under the name *militaris*. The small size of this far northern isolate is consistent with Bergmann's Rule, which states that there is a tendency for body size to increase in cooler areas.

Relationships within the genus are somewhat obscure. The two most closely related species are evidently the Spotted Pardalote and the Forty-spotted Pardalote. The latter is an Endangered species (see Status and Conservation), now restricted to a few localities in Tasmania. It has been argued that the Forty-spotted Pardalote evolved from a previously isolated population of the Spotted Pardalote, and that its relatively dull plumage is neotenuous, meaning that immature features are retained in the adult plumage.

Morphological Aspects

The pardalotes are characteristically small, compact birds, often little larger than the leaves in which they forage. The Striated Pardalote is the largest of the genus, weighing an average of about 12 g. The average weight of the Spotted Pardalote is 8.5 g, and that of both the Forty-spotted Pardalote and the Red-browed Pardalote is 11 g. In the case of the widespread Spotted and Striated Pardalotes, size increases from the north to the south. There is no sexual size dimorphism.



The family Pardalotidae was until quite recently thought to be most closely related to the Oriental flowerpeckers (Dicaeidae) because of superficial similarities in pattern and structure. The evidence of genetic analyses places it much closer to other Australian insectivores, especially the thornbills (Acanthizidae). The four pardalotes form a well-defined group, as they are all rather stocky, with short, square-cut tails and stubby bills. Most are also strikingly marked, the most vividly patterned of all being the **Spotted Pardalote**. The bright male is distinguished by its rich yellow throat and breast, red uppertail-coverts, and white supercilium, whereas the fine white dotting on the dark crown and wings reappears to varying extents in other species. Female and juvenile present much more subdued versions of the male, with cream spots on a dark grey crown.

[*Pardalotus punctatus*.]

Above: Hawkesbury River, north of Sydney, Australia. Photo: Nevil Lazarus.

Below: Murray-Sunset National Park, Victoria, Australia. Photo: Peter Fuller]



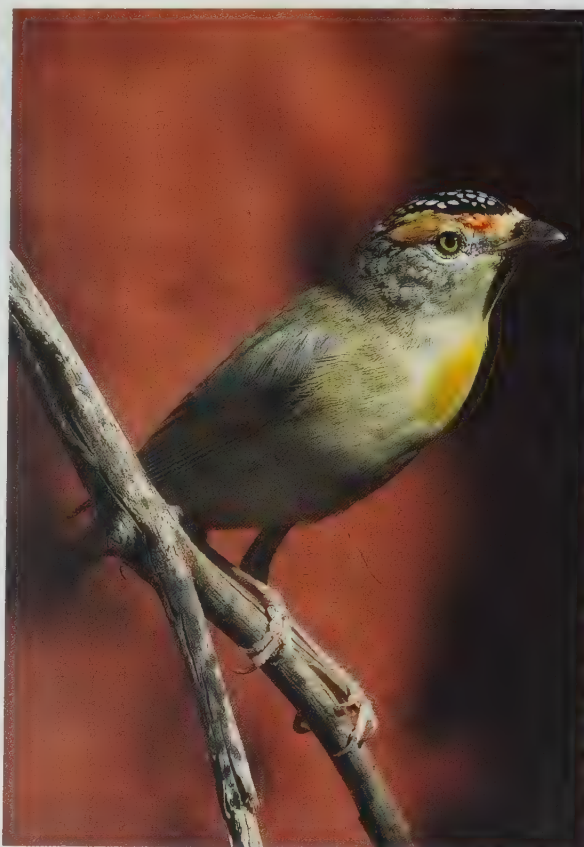
In body form, the four species are very similar to one another. Their profile is distinctive, with a notably short square-cut tail 2.5–3.5 cm in length, and a short but deep and robust bill measuring 0.65–1.1 cm. The wing length and shape vary among the species. The wings of the largely sedentary Forty-spotted Pardalote are relatively short, 5.5–6 cm, and rounded, whereas the far more dispersive Striated Pardalote has the most elongate wing, its length being 6–7 cm.

The bill shape, as well as an absence of rictal bristles, contrasts markedly with the long pointed bill more typical of small insectivorous birds, and it may be particularly suited for applying a powerful force to remove their main food item, lerp, from its attachment to eucalypt (*Eucalyptus*) foliage (see Food and Feeding). Their legs of pardalotes are reasonably long, with a tarsus measurement of 1.6–2.1 cm.

In contrast to the majority of arboreal insectivorous birds of Australia, which have a mostly sombre plumage in subdued greens and browns, the pardalotes are typically vividly coloured and/or strikingly marked. This patterning and colour are reflected in a common general vernacular name for this group of species, which are often referred to as “diamond-birds”.

The most brilliantly coloured member of the family is the male Spotted Pardalote, which has a rich bright yellow throat and breast, a finely vermiculated blue-grey face and neck side, a black crown with white spots, a white eyebrow, a black wing marked with a delicate line of white spots, red uppertail-coverts, and a rump that is either yellow or chestnut. The female of this species is duller, with paler yellow and less conspicuous throat markings; her eyebrow is less distinct and is creamy, rather than white, and the crown markings are less obvious, consisting of creamy spots on a dark grey background. There is no seasonal variation in plumage. Juvenile Spotted Pardalotes are similar in pattern to the female, but duller still, for example having the crown spotting far less distinct.

The Forty-spotted Pardalote is the least colourful of the pardalotes, but it retains a subdued beauty. It sports an unusual mix of lemon-yellow, present on the face and undertail-coverts, and pale olive-green plumage, with numerous distinct white spots on the blackish wing; there are, indeed, about 40 such spots. When the bird is viewed closely, it displays a delicate pattern of dark scalloping on the olive crown and neck. The sexes are alike, and the juveniles are duller than the adults.



The **Red-browed Pardalote** has the classic pale-marked crown characteristic of the family, but it also possesses features of its own. These include a distinct yellow panel on the wings, a yellow splash on the chest, a broad buffy eyebrow and a conspicuous fiery patch between the eye and the bill. This species is sexually monochromatic, but juveniles are considerably duller than adults. It is widespread in Australia, occurring in a wide variety of wooded habitats, especially where eucalypts (*Eucalyptus*) are abundant.

[*Pardalotus rubricatus rubricatus*, Lajamanu, Tanami Desert, Northern Territory, Australia. Photo: Don Hadden]

Striated Pardalotes are predominantly fawn-brown in appearance, with a distinct pale eyebrow that is yellow or orange closest to the bill and white behind the eye, and a black crown that is streaked white on some subspecies and unpatterned on others. The throat is yellow, the belly pale, and the black wings are marked with variably broad white edging and a white patch distal to a small set of single red, orange or yellow spots at the terminal end of each primary covert. The sexes are similar to each other. Juve-

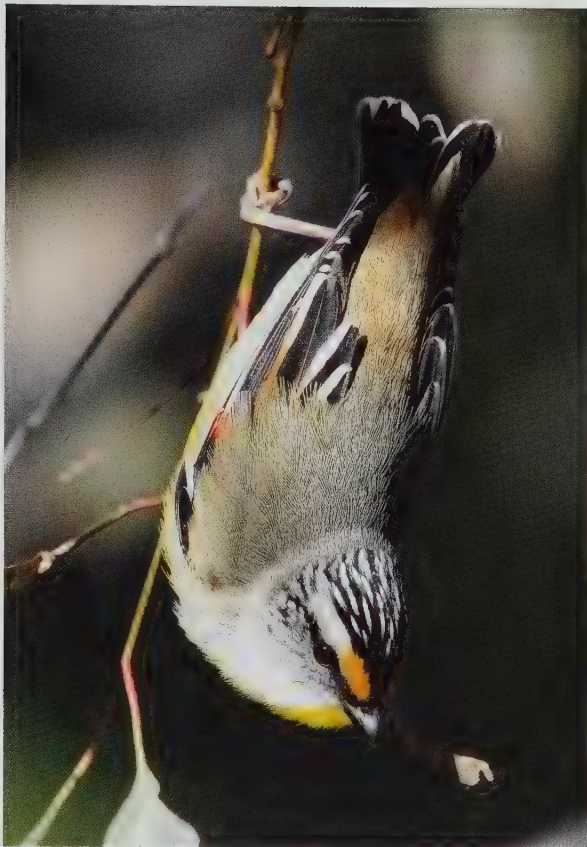


For their size, pardalotes have very loud songs, usually consisting of a rich phrase, constantly repeated. In many areas of forest and woodland, these songs are amongst the most familiar sounds, and they often provide the first clue to the presence of pardalotes, which can otherwise remain inconspicuous in high foliage. The song of the **Spotted Pardalote** is typically ringing and persistent.

[*Pardalotus punctatus*, Murray-Sunset National Park, Victoria, Australia. Photo: Peter Fuller]

Pardalotes are insectivores that tend to glean their food directly from foliage, rather than hunting close to the ground or sallying after aerial prey. They often forage in eucalypts, and are particularly specialized in feeding on the exudates which form on their foliage, such as "lerps", or the "manna" of the manna gum. Lerps are protective shells made from carbohydrates in the leaf by nymphal stages of psyllid insects. They may offer particularly rich food resources, and the **Striated Pardalote** regularly snips them from eucalypt leaves with an audible clicking of the mandibles. Some pardalotes also consume manna, another solidified sugar-rich exudate found on the foliage of eucalypts, particularly where they have been damaged by herbivorous insects.

[*Pardalotus striatus*,
You Yangs,
Victoria, Australia.
Photo: Peter Fuller]



niles are duller than adults, with a paler yellow throat and a paler crown and ear-coverts.

Finally, the Red-browed Pardalote is mostly olive-brown above and pale below. Its most obvious features are a white-spotted black crown, broad yellow edging on the primaries forming a distinct yellowish panel on the otherwise black wings, and a broad cream-coloured to yellow eyebrow with a conspicuous red spot or splotch on the brow between the eye and the bill. The sexes are alike in plumage. Juveniles are much duller and less patterned than the adults, with a paler and less pronouncedly marked crown and a less distinct eyebrow, and they have a yellowish wash on the underbody.

Pardalotes typically moult after the breeding season. Most moult records are from southern Australia and refer to Spotted and Striated Pardalotes. For adults of these species, the moult of the primaries takes place mainly from December to May. The primaries are replaced outwards, beginning at the innermost, P1. There are few available data on the time taken for completion of the moult, but the duration of the primary moult is approximately three months.

Habitat

Pardalotes are generally tightly associated with forests and woodlands dominated by eucalypts, and almost all of their foraging occurs among eucalypt foliage. Such habitats include a broad range of structural formations, from tall forest with a canopy height exceeding 30 m to sparse low mallee woodland with a canopy height of less than 3 m. The dominant trees can include a very wide range of eucalypt species. Indeed, at least 50 different species of eucalypt have been recorded as dominant in vegetation types occupied by pardalotes.

Of the four species in the family, the Forty-spotted Pardalote has by far the most narrow ecological range. It is typically associated with forests dominated by the manna gum (*Eucalyptus viminalis*).

Eucalypt-dominated vegetation types encompass a broad range of environmental settings, including alpine, coastal and inland areas, and pardalotes occur across this wide range. Eucalypts are less dominant across large tracts of arid and semi-arid

Australia, and the pardalote species characteristic of arid Australia, the Red-browed Pardalote, accordingly has a patchy and discontinuous range, typically occurring in the narrow band of eucalypts fringing inland waterways.

Pardalotes have been recorded also in vegetation types dominated by trees other than eucalypts, including some acacia (*Acacia*) woodlands and rainforests. Such habitats appear, however, to be suboptimal and their use by this family largely incidental and infrequent. Pardalotes may occur in urban and suburban areas, but typically only where there is an adequate cover of planted or retained eucalypt trees.

As is clear from the preceding paragraphs, this family, despite its paucity of species and their small size and general unobtrusiveness, is a characteristic feature of the diverse eucalypt-dominated forests and woodlands that typify large parts of Australia. Almost any such eucalypt formation can be expected to support at least one pardalote species, and the co-existence of two ecologically very similar species, the Spotted and Striated Pardalotes, is a feature of much of Australia. The pardalotes may, indeed, be the most eucalypt-specialized of any Australian vertebrate group, other eucalypt-specialist species, such as the koala (*Phascolarctos cinereus*), not extending across the full gamut of eucalypt formations. This tight association with eucalypts appears to be determined by a similar habitat specialization exhibited by the principal food source of pardalotes, lerp-forming psyllid insects (see Food and Feeding). The genetic evidence suggests that the specialized family of pardalotes derives from far more typically generalist insectivores, the Acanthizidae (see Systematics).

General Habits

Through a series of studies involving the three species occurring in south-eastern Australia, the Spotted, Forty-spotted and Striated Pardalotes, many aspects of the life history of these pardalotes are now tolerably well known. In contrast, the ecology and life history of the Red-browed Pardalote is far less well known. While there is much similarity in morphology and general ecology among the four species, there are also some interesting, if subtle, differences among them in breeding behaviour, foraging and social dispersion.

Although the evidence is meagre, pardalotes probably share with other Australian insectivorous birds a life history that contrasts sharply with that of European avian insectivores. The Australian insectivores typically have long lives, although, with few long-term studies, the longest interval between ringing and recapture for a pardalote is only 6.5 years; they also have a relatively small clutch size but an extended breeding season, and relatively lengthy incubation and fledging periods (see Breeding). These characteristics match a far less marked seasonality in Australian temperate systems, probably including less seasonal variation in invertebrate food resources. Pardalotes show these characteristics less pronouncedly than other Australian insectivorous birds. This may be because their hollow-nesting habit may allow larger brood sizes. Alternatively, their principal food resource, lerps, may undergo more substantial "boom-and-bust" cycles than is the case with most other foliage invertebrates, thus forcing pardalotes to be more nomadic and, hence, probably to suffer higher mortality rates than those experienced by sedentary insectivores.

Pardalotes are diurnal birds. They spend most of the daylight hours in foraging unobtrusively in foliage, often high in the canopy. It is usually only when they are breeding that they are amenable to close observation. Pardalotes are usually seen singly or in pairs during the breeding season. At other times, they frequently form parties, generally containing rather small numbers, although in the autumn-winter period the Spotted and Striated Pardalotes sometimes gather in flocks of up to several hundred individuals. Outside the breeding season, mixed flocks containing two or more pardalote species are by no means uncommon, and pardalote flocks are often accompanied also by *Acanthiza* thornbills.

During the breeding season, particularly, pardalotes perform a range of stereotyped simple displays (see Breeding). At other times, they tend not to be aggressive. In contrast to the marked intraspecific response to playback of calls (see Breeding),



pardalotes generally ignore playback of vocalizations of other pardalote species. On the other hand, there can be some substantial interactions between pardalote species in association with foraging, and chases involving two different members of the family are reasonably common. In south-eastern Tasmania, where three pardalote species co-exist, the Forty-spotted Pardalote is dominant over both the larger Striated Pardalote and the smaller Spotted Pardalote. All three pardalotes, however, are chased by larger aggressive honeyeaters. Some aggressive colonial honeyeaters can completely exclude pardalotes, as well as other small leaf-gleaning insectivorous birds. One observer reported a physical attack on a lone Striated Pardalote by Noisy Miners (*Manorina melanoccephala*). One of the miners caught the pardalote and held it by the wing, while another pecked it around the eyes and head; after 20 minutes of such attacks by up to five miners, the assailants dropped the pardalote to the ground, where it was found to be dead.



Information on the roosting habits of pardalotes in the wild is lacking, and extremely little has been documented with regard to the maintenance behaviour of this family. In the north Flinders Ranges, in South Australia, a pair of Red-browed Pardalotes was observed to take turns to bathe in a stream. Each individual splashed about actively for a few seconds, and then flew to a rock at the water's edge; here, it shook itself to remove water droplets from the plumage and preened vigorously, before flying into the top of some river red gums (*Eucalyptus camaldulensis*) bordering the stream. The only other relevant observation in the wild concerns a Striated Pardalote, which was seen to preen its left wing after displaying.

In captivity, two Forty-spotted Pardalotes, caught in the wild, roosted side by side on a low branch, usually selecting the same spot each night. It was noted that these captives appeared to indulge in preening more in the morning than they did at other times of the day, but the difference was not very marked. In addition, they bathed regularly in a dish which was half-filled with mud, over which lay a shallow depth of water covered with litter. The pardalotes splashed about in this until their plumage was thoroughly saturated and they were unable to fly; they then moved on to a low branch, where they spent many minutes as they dried out and preened. Incidentally, one captive Forty-spotted Pardalote was thought possibly to have drowned during bathing; it was found dead in a water dish.

Voice

Most pardalotes are loud-voiced for their size, having a simple song, typically of 3–5 syllables, that is frequently repeated. The song of the Spotted Pardalote is highly diagnostic, notwithstanding regional variations from the basic theme, and the presence of this small arboreal species may often be determined first by means of its voice, especially in tall forest. In addition to being extremely loud, it has been described as being brilliant, evocative, staccato and ringing: the song is a short set of 3–4 notes, typically, if quaintly, transcribed as “sa-weet ba-by” or “s-leep ba-by”, with the first note weak and the last two notes higher, the entire series lasting for just 1–2 seconds. This vocalization may be given frequently, and appears to be uttered only by males. Tasmanian

Pardalotes are usually monogamous. During the breeding season pairs often perform simple displays. These usually involve stereotyped forms of behaviour that show off the plumage to best advantage. For example, the **Red-browed Pardalote** raises the crown feathers while turning the head or body from side to side. This tends to accentuate the yellow chest and the white dotting of the crown.

[*Pardalotus rubricatus rubricatus*, Bowra Station, Cunnamulla, Queensland, Australia. Photo: Chris Sanderson]

All pardalotes are cavity nesters, capable of excavating tunnels in the ground. For some species tunnel excavation is rare, while for others it is the norm. The **Striated Pardalote**, for example, often digs tunnels into sloping ground or earth banks, either amongst vegetation or out in the open. Its tunnels are more or less horizontal, and are generally excavated by both pair members. During the initial phase they typically dig with the bill, later employing the feet to flick out excess soil in characteristic fashion. The entire process can take anything from two to 20 days.

[*Pardalotus striatus uropygialis*, Manning Gorge, Mt Barnett, Kimberley, Western Australia, Australia. Photo: Don Hadden]

populations of the species give a simpler version of this song. During the breeding season, males may respond in animated fashion to other singing males. They also respond vigorously to playback, with reported instances of their making physical attacks on speakers broadcasting taped calls. In addition, Spotted Pardalotes have a small range of quieter, simple calls, typically related to breeding or used for contact among flock-members, although the repertoire is limited and the use of these calls is infrequent.

Striated Pardalotes likewise have a simple loud distinctive song, typically rendered as "wit-e-chu", consisting of 2–7 notes. In the breeding season, especially, this song may be given repetitively, almost continuously. This species also has a range of other vocalizations that are given far less frequently: these include a trilling call, as well as a brief contact call in flocks. The song and calls of this species vary in nuanced but complex ways across its geographical range, and may be subtly but distinctively different among the various subspecies.

The song of the Red-browed Pardalote is similarly loud, simple and stereotyped. Typically, it consists of a single note repeated 3–6 times over an interval of 1–2 seconds, but often with the first note lower and longer, hence "do doo-doo-doo-doo". The notes have a pleasing, "liquid" quality, and this species is sometimes referred to colloquially as the "bellbird".

In contrast to the conspicuously loud but simple vocalizations of the other pardalotes, those of the Forty-spotted Pardalote are subdued and more complex. This species' repertoire includes a repeated loud "k-choo" as a song, a more frequently given low-pitched contact call, "where-where where-where", a short soft trill of 5–6 notes, and a churring call given in agonistic encounters.

Food and Feeding

Pardalotes are mostly insectivorous, but they do also consume some plant exudates (see below) and occasionally seeds. In addition, there is one record of a Striated Pardalote capturing and consuming a small scincid lizard.

While the diet of pardalotes includes a broad range of invertebrates, there is a particular specialization on members of the family Psyllidae. These are small hemipteran insects that, in the nymphal stages, attach themselves to leaves, especially those of

eucalypts, and suck juices from the phloem. The psyllid utilizes extra carbohydrates obtained to form a protective shell covering, known as a "lerp". Although there is considerable interspecific variation in size and chemical composition of the lerp, they can offer particularly rich food resources for birds, and also for other consumers, including ants (Formicidae) and indigenous humans. Given the immobility of psyllids with their lerp coverings, they are also relatively easy food items to exploit. Pardalotes are the most specialized lerp-feeders among Australian birds, and their short but strong bill appears to be particularly well suited for prising lerp from the leaves to which they are attached. There may, however, be strong interspecific competition among lerp-feeding birds, and this can result in substantial harassment and, in some cases, exclusion for pardalotes. This is especially so where aggressive colonial honeyeaters, notably the *Manorina* miners, are involved. In one study, it was found that pardalotes spent about 5% of their daylight time being chased by honeyeaters, which accounted for 9% of their expended energy.

Psyllids are attracted to foliage, particularly where a tree is stressed. Such trees may host extraordinary numbers of psyllids, with tens of psyllids on every leaf, and at these high densities the insects can themselves contribute to further stressing of the tree. Areas with psyllid outbreaks may be sought out by dispersing pardalotes, resulting in unusually high densities of the birds. The pardalotes may contribute to reducing the numbers of psyllids in outbreak areas, and thus play an important role in maintaining the health of the ecosystem. Where pardalotes, and other small insectivorous birds, are excluded by aggressive colonial honeyeaters, tree decline is more likely.

Each psyllid species builds a lerp of characteristic shape and chemical composition. An experimental study showed that pardalotes are more likely to consume lerp having a higher biomass and greater concentration of soluble sugars, such as those made by psyllids in the genus *Glycaspis*. This resource is a package, comprising both the sugary exudate covering, which is the lerp itself, and the sheltering psyllid nymph, which is higher in protein content.

Lerp is not the only sugary exudate to be found on eucalypt foliage. Some eucalypt species, especially the manna gum, may produce a sugar-rich exudate from the foliage, particularly where leaves have been damaged, as, for instance, by herbivorous in-



Not all **Striated Pardalote** nests are in excavated tunnels, as many pairs nest in natural tree holes, typically with an opening of 4–10 cm. Whether nests are placed in trees or in excavated tunnels, they tend to be a loose globular structure built from a variety of plant fibres, including grass stems, strips of eucalypt bark, and conifer needles. A lining of soft material, such as fur or feathers, is usually added. The clutch consists of 3–5 unmarked eggs, which are incubated by both sexes for a period of 15–23 days. There is much geographical variation in plumage characters in this species. The individual pictured here belongs to the race *ornatus*, with the strongly streaked ear-coverts and hindcrown of the nominate race, but with bright red rather than yellow tips to the primary coverts.

[*Pardalotus striatus ornatus*,
Flinders Chase NP,
Kangaroo I, South Australia.
Photo: Marie Read]



When it nests in earth banks, the **Striated Pardalote** excavates tunnels up to 1 m deep with a terminal chamber into which the nest structure is built. Unlike most members of the family, which are distinctly territorial with well-dispersed nests, this species is known to nest colonially on occasion, with up to 50 active cavities recorded in 30 m along one bank. Aggregations of this kind probably result from a limited supply of suitable nest-sites rather than colonial behaviour. The individual pictured here belongs to the race *melanocephalus*, which lacks striations on the ear-coverts and crown.

[*Pardalotus striatus melanocephalus*, Ipswich, Queensland, Australia.
Photo: Raoul Slater]

sects. This solidified exudate, known as “manna”, can be common, at least in some trees and in some seasons. The highly restricted Forty-spotted Pardalote is closely associated with forests of manna gum, and manna comprises a large proportion of its diet. This food resource, however, may be readily dissolved or washed off leaves during rainfall, and its importance in the diet of this pardalote species is probably, as a result, seasonally variable.

The abundance and distribution of lerps, and of manna, vary with some seasonal regularity, but also with a more complex pattern of outbreaks. Pardalotes respond to this variable availability of key food resources by undertaking a range of dispersal movements. These may not always be successful searches: substantial episodes of mortality have been reported occasionally, probably because of food shortages.

Very detailed studies have been made of the foraging behaviour of Striated, Spotted and Forty-spotted Pardalotes, along with comparative studies of other, co-existing small insectivorous birds. The foraging of pardalotes is different from that of these other foliage-gleaning insectivores, which comprise members of the acanthizid genera *Acanthiza*, *Smicronis* and *Gerygone*. Pardalotes utilize eucalypts far more than do most other leaf-gleaning birds, and they are more sedate and stereotyped in their foraging activity, gleaning their prey from leaves, rather than flying after more mobile insects. In addition, their foraging is carried out almost entirely among leaves, rather than on other substrates, and they forage at higher levels, or in taller trees, than do most other species. The key food resources for pardalotes are found in eucalypt foliage. It is not surprising, therefore, that almost all foraging by pardalotes takes place in tree foliage, particularly in eucalypts. Some eucalypt species are preferentially selected, typically those holding a relatively high abundance of psyllids. Hence, eucalypts of the subgenus *Symphymyrtus* are selected preferentially for foraging by pardalotes, whereas those of the subgenus *Monocalyptus* are proportionately under-represented. Occasionally, lerps and, to a lesser extent, manna are dislodged from leaves by, for example, heavy rain, and may then accumulate on the ground beneath trees. In such cases, pardalotes will forage also on the ground.

While the pardalote species are generally very similar in foraging behaviour, there are nuanced differences among them. Spot-

ted Pardalotes typically forage lower in trees than Striated Pardalotes, and the smaller size of the former makes them slightly more agile and aerial in their foraging behaviour. Forty-spotted Pardalotes are generally very similar to Spotted Pardalotes in their foraging habits, but they are more selective, exhibiting a distinct preference for seeking food in manna gums. More so than other pardalotes, paired individuals of the Forty-spotted Pardalote typically forage close together in the same canopy, and they can be strikingly regular in their choice of locations, often restricting their foraging to just one or two particular trees.

Comparatively little is known about the behaviour of the Red-browed Pardalote. This species appears to forage mostly in foliage, typically that of eucalypts, but also among the leaves of other trees and occasionally in low shrubs. It has been reported as spending more of its feeding time on or close to the ground than other pardalote species.

As mentioned earlier (see General Habits), pardalotes are generally observed singly or in pairs during the breeding season, but they also forage in flocks of varying size at other times of the year. During the period of post-breeding dispersal, Spotted and Striated Pardalotes can gather in single-species or, frequently, mixed flocks of several hundred individuals.

A characteristic feature of pardalotes when foraging is the quiet clicking noise made by the birds. This sound is produced by the snapping of the mandibles as the birds dislodge lerps from their leaf attachments.

Breeding

In temperate Australia, the nesting season reaches its peak in the spring, from September to November. Nevertheless, for Striated and Spotted Pardalotes, at least, nesting has been reported in most months. It is common for two or more broods to be reared in a single season, with reported intervals between the successful fledging of one brood and the laying of a second clutch sometimes as short as 2–8 days.

Pardalotes are typically monogamous, and nest as simple pairs. The co-operative breeding characteristic of many other Austral-

ian passerines is not a feature of this family, although there are some reported instances, particularly for Striated Pardalotes, of three individual birds apparently using the same nesting tunnel at the same time. Both sexes are involved in nest construction, incubation of the eggs and feeding of the young. Partners may remain together for successive seasons, and they may reuse a nest-site in the same year or in successive years, but there are, unfortunately, too few data available to enable the frequency of this pattern of persistence to be determined with any degree of reliability.

Unlike most other Australian foliage-gleaning insectivorous birds, pardalotes generally nest either in tree hollows or in tunnels constructed in the ground. There are noteworthy differences among the four species in the relative use that they make of these two options, and also in the characteristics of their respective nest-sites.

Spotted Pardalotes nest almost exclusively in tunnels in the ground. These tunnels, typically horizontal, are usually constructed in sloping ground, often where there is some vegetation. Both sexes are involved in the task of excavation, some reports suggesting that the female does the majority of the work. The pardalote may initially use the bill to make indentations in the soil, but then subsequently digs with the feet, characteristically flicking out unwanted soil from the burrow entrance. The tunnel is almost circular in cross-section, with a diameter of about 4–5 cm, and it extends for about 25 cm or, sometimes, up to 1 m, ending in a larger nesting chamber of 5–10 cm in diameter. The work of digging the tunnel can take between 2 days and 20 days. Within the nest-chamber, the birds then construct a loose domed nest, mostly from the fibrous bark of eucalypts and from grass stems. Spotted Pardalotes occasionally nest in tree hollows, but such instances are comparatively few.

In contrast, Striated Pardalotes frequently nest in tree hollows, typically those with an opening diameter of 4–10 cm, but they also commonly nest in ground tunnels. The latter are typically in steeper banks and harder, more exposed soils than those used by Spotted Pardalotes. Otherwise, the two species are similar in terms of the shape and dimensions of the tunnel and nest. Striated Pardalotes will also exploit a wide variety of artificial situations, including exposed piping, cavities under house roofs and nestboxes.

Forty-spotted Pardalotes usually nest in tree hollows and in hollow logs or stumps, especially where these are in dead wood. Less commonly, they may nest in tunnels constructed in the

ground. Conversely, Red-browed Pardalotes typically nest in ground tunnels, characteristically in the eroded banks of water-courses, although they do sometimes nest in tree hollows.

The breeding dispersion of pardalotes exhibits some marked contrasts. Nesting aggregations may be formed by both Striated and Red-browed Pardalotes. One such example involved 50 pairs of Striated Pardalotes nesting in an earthen bank about 30 m long and 6 m high. This tendency for nests to be rather close together may be due more to spatial limitations on suitable nest-sites than to any inherent predisposition towards coloniality; indeed, where nest-sites are more common or widely spaced, nesting pairs of these species are more dispersed. In contrast, both Spotted Pardalotes and Forty-spotted Pardalotes show marked breeding territoriality. Both members of a breeding pair of Spotted Pardalotes will vigorously defend an exclusive territory of about 1–3 ha during the breeding season, while Forty-spotted Pardalotes similarly defend an exclusive breeding territory of 0.3–2 ha.

As is typical of cavity-nesting birds, pardalotes lay white eggs, in marked contrast to the splotched and speckled eggs typical of other small foliage-gleaning Australian birds, which for the most part use cup-nests placed in foliage. The clutches of pardalotes consist of 3–5 eggs, which are incubated for 16–24 days, and the fledging period of the chicks is 18–25 days. These details are notably different from those applicable to other Australian foliage-gleaning birds, which typically have smaller clutches and shorter development periods.

Particularly during the breeding season, pardalotes perform a range of stereotyped simple displays. Striated Pardalotes, for example, display most commonly with the tail held fanned and with the wings outstretched like an open fan and held forwards. A displaying individual may hold this position, motionless, for more than 30 seconds, or it may either quiver the fanned wings or rapidly fan and close them. This display is often, but not always, accompanied by repeated “chip-chip” calls or by a less distinct trilling. Displays may be directed at another bird and/or at and around the entrance to a currently used or potential nest-tunnel. Striated Pardalotes have been reported as using this display on a speaker broadcasting their calls. Displays can be particularly frequent at sites where many nests are in close proximity, especially at the outset of the nesting season. At the nest-site, Striated Pardalotes may direct this display also towards potential predators and towards other bird species that may compete for nesting hollows. In the same situation they will some-

The Spotted Pardalote never forms breeding aggregations. Instead, both members of pairs vigorously defend breeding territories of 1–3 ha, regularly countersinging with neighbours and fighting over territory boundaries. In fact, they are so aggressive in defending their territories that one set of experiments with taxidermic mounts had to be abandoned because the specimens were repeatedly destroyed by territory owners. Both sexes share incubation duties and co-operate to provision their chicks with a range of insect prey, in this case a caterpillar.

[*Pardalotus punctatus punctatus*,
Kettering, SE Tasmania.
Photo: Dave Watts]



times utilize another display, one that involves the wings being folded and the body moved from side to side.

Male Spotted Pardalotes, too, have a small set of stereotyped displays. When singing, they stretch as upright as possible, with craned neck and with the bill tucked into the chin, and they may twist the body in order to project their call in different directions. When displaying to a potential mate, the male raises the crown feathers, turns his head from side to side, and arches his neck upwards and then down, with the bill tucked into the chest; this display accentuates the vivid yellow throat markings and the conspicuous spotting on the crown. Interactions between males can at times be violent. In a study in which a freeze-dried specimen and playback of the calls were used as props, male Spotted Pardalotes adopted a crouched near-horizontal posture, with the crown feathers raised, as they approached the model, which they then attacked, pecking particularly at its yellow throat. One of these trials had to be discontinued when the attacking male flew off with the freeze-dried specimen; and replacement specimens rapidly became too damaged by attacks to be used for ongoing trials. Other agonistic types of behaviour reported for rival males include a wing-flicking display and complicated and long-lasting fluttering aerial chases.

The Forty-spotted Pardalote exhibits a range of breeding and agonistic displays. Aggressive encounters, which are frequent during the breeding season, mostly involve a "churr" display call. If this is not followed by the retreat of one individual, the aggressive behaviour may escalate to become a prolonged physical confrontation, involving males and females, as female Forty-spotted Pardalotes appear to take a far more substantial role in territory defence than females of other pardalote species. Such duels, which can last for at least 5–10 minutes, may involve two individuals, with claws locked together, falling from the canopy to the ground. When playbacks of the "churr" call are broadcast, territorial birds

approach and exhibit a characteristic display of rapid wing-flicks, 1–2 per second, with the folded wings raised and lowered quickly over the back. This display is accompanied by a responding "churr" call or a more subdued "whoowhoo" call, or is performed in silence. The approach and response may be sustained. In one instance, two individuals caught in mist-nets set around a speaker were recaptured four times within 20 minutes, because, following release, they flew straight back to resume "confrontation" with the broadcast call.

There are a number of reports of nesting pardalotes displaying to and/or chasing off other hollow-nesting bird species when these approach the pardalotes' nest-site. Conversely, some reports exist of pardalote nest-sites being usurped by other birds, such as, for example, Budgerigars (*Melopsittacus undulatus*). One intriguing record involved a Forty-spotted Pardalote which was found to be sharing a small nest-hollow with roosting bats.

Little information is available on the breeding success of the members of this family. On the basis of samples of 30–40 nests, the nest failure rate has been reported to range between 13% and 32%, for the Striated Pardalote and the Spotted Pardalote, respectively. These figures are better generally than the equivalents for other Australian foliage-gleaning insectivorous birds. Failure is due mostly to predation, including by snakes, lizards and carnivorous marsupials, but some failures have been reported as having resulted from the collapse of nest-sites or from the latter becoming saturated with water. There have been no confirmed records of pardalote broods being parasitized by cuckoos (Cuculidae).

Movements

The dispersal patterns of pardalotes are complex and not fully understood. These patterns include some regular seasonal move-



The Spotted Pardalote rarely uses tree holes, almost always nesting in burrows dug into earth banks. It typically lays 3–5 white eggs which are incubated for 16–22 days, with the chicks fledging after a further 18–25 days. Both the size of the clutch and the duration of the fledgling period are unusually large for Australian passerines. After the breeding season this species disperses in flocks which may number hundreds of individuals, sometimes mixed with Striated Pardalotes (*Pardalotus striatus*). These gatherings may roam over considerable distances, searching suitable woodland areas for outbreaks of lerp-forming psyllid insects.

[*Pardalotus punctatus punctatus*, Moggill State Forest, Brisbane, Queensland, Australia.
Photo: Raoul Slater]

The rarest of this quartet of species is the **Forty-spotted Pardalote**.

It occupies a restricted range in the Tasmania Endemic Bird Area, where it has a tiny overall range and population, estimated at only 3000–4000 individuals. This population is concentrated in optimum habitat, particularly where native eucalypts are common. It is thought to have contracted in range and declined in numbers drastically over the past century as a result of habitat loss, and perhaps in response to the spread of an aggressive competitor, the Noisy Miner (*Manorina melanocephala*). In plumage pattern and colour, the Forty-spotted Pardalote is the most subdued member of the family.

[*Pardalotus quadragintus*, Hobart, Tasmania.
Photo: Peter Fuller]

ments, directed away from colder areas in winter. Thus, most Striated Pardalotes migrate from Tasmania northwards across the 200-km stretch of Bass Strait to overwinter on the Australian mainland. Furthermore, both Spotted and Striated Pardalotes, during the winter months, become less abundant in the higher-altitude forests of south-eastern Australia and more numerous in lower-rainfall inland plains, a pattern consistent with the seasonal variation in the abundance of foliage invertebrates. Dispersal by these two species may involve large flocks, containing hundreds to thousands of individuals.

In addition to such regular trends of movement, the Spotted and Striated Pardalotes may make more convoluted or irregular movements, probably to seek somewhat spatially unpredictable outbreaks of psyllid infestations (see Food and Feeding). In other areas, populations of these pardalote species may be largely sedentary.

There have been few recoveries of individually ringed pardalotes away from the site of the initial capture. This is a common phenomenon in Australian ornithology, and is due largely to the fact that the human population density is very low. The sparsity of such records is further compounded for this family by the small size of the birds and their habit of foraging high in trees. Nonetheless, two long-distance movements by ringed Spotted Pardalotes have been recorded, one of 201 km and the other of 590 km.

Movement patterns of Forty-spotted Pardalotes are far more restricted, being confined entirely to eastern Tasmania and its adjacent islands. Although few data are available, populations of this species are probably mostly sedentary, or include some components that undertake relatively local seasonal dispersal. The movements, if any, of Red-browed Pardalotes are unknown.

Relationship with Man

Generally, the members of this family, being small, obscure and arboreal species, have a low profile and little interaction with humans. Nevertheless, there are some relationships with people, of varying intricacy.

When breeding, pardalotes can be extremely confiding and allow very close approach. Spotted and Striated Pardalotes will use a variety of artificial sites, such as roof eaves and nestboxes, or disturbed soil, as on road embankments or temporary soil heaps in gardens, for the siting of their nests, and at such times they may attract considerable interest and appreciation from humans. This may be particularly so in the case of the jewel-like Spotted Pardalote.

The Forty-spotted Pardalote, geographically highly restricted, acts as a magnet in drawing birdwatchers to its limited stronghold, particularly Bruny Island. Here, it is the focus of a range of ecotourism initiatives, including accommodation and other ventures.

Pardalotes may be highly beneficial in helping to maintain the health of forest and woodland trees. This is perhaps particularly the case where they can control or prevent outbreaks of psyllids, bugs which otherwise are likely to contribute to extensive tree decay or even to the death of trees.

Status and Conservation

Three members of this family, the Striated, Spotted and Red-browed Pardalotes, are widespread and common. The remaining species, the Forty-spotted Pardalote, is however, highly restricted, with an area of occupancy of less than 500 km² and a fragmented distribution within this. It has a small total population, estimated at 3000–4000 individuals, and has declined substantially over the last 200 years. As a consequence, the Forty-spotted Pardalote is recognized as Endangered by the IUCN and under Australian legislation. Even before European settlement of Australia this specialist species was apparently restricted in its distribution. Its decline since then has been due mainly to clearance of a high proportion of its preferred habitat, forests dominated by the manna gum, and to the partly consequential increase in aggressive colo-



nial honeyeaters, particularly the Noisy Miner, which harass and exclude pardalotes and other small foliage-gleaning insectivorous birds.

Research and management activities over the last three decades have delineated important populations of Forty-spotted Pardalotes; have identified major threats to the species; and have enhanced habitat suitability and levels of protection at key sites. Much of the remaining range of the Forty-spotted Pardalote is now included within national parks and other reserves, or lies on private lands managed with conservation agreements. The species' population is now probably stable.

While the Striated and Spotted Pardalotes are still widespread and abundant, their populations have probably decreased over the last two centuries as a result of extensive clearing of their habitat, particularly in eastern, south-eastern and south-western Australia. These two species are presumably disadvantaged also by commercial forestry in native eucalypt forests. This is because young regrowth eucalypts are less suitable as foraging habitat. Also, in the case of Striated Pardalotes, timber-harvesting reduces the abundance of tree hollows suitable for use as nesting cavities.

Pardalotes are dependent upon native forest and woodland habitats, and are disadvantaged wherever these are cleared or substantially modified. The clearing of eucalypt forests and woodlands may have not only direct site impacts but also consequential impacts, because loss of forest linkages will often disrupt essential dispersal patterns connecting pardalote populations over broader, regional scales.

General Bibliography

Barrett *et al.* (2003), Basden (1965), Bell (1959), Bock (1994), Bryant (1991), Christidis & Boles (1994), Christidis & Schodde (1991), Dickinson (2003), Frauca (1980), Garnett & Crowley (2000), Green (1971), Higgins & Peter (2002), Hindwood & Mayr (1946), Keast (1961), Lane (1967, 1974), Mollison (1960), Rogers *et al.* (1986), Rounsevell & Woinarski (1983), Salomonsen (1961b, 1961c, 1967a, 1985), Schodde & Mason (1999), Short *et al.* (1983), Sibley (1996), Sibley & Ahlquist (1980, 1985b, 1990), Sibley & Monroe (1990, 1993), Smythies (1984), Woinarski (1974, 1984a, 1984b, 1984c, 1985a, 1985b, 1988, 1989a), Woinarski & Bulman (1985), Woinarski & Cullen (1984), Woinarski & McEvey (1983), Woinarski & Rounsevell (1983), Woinarski, Cullen *et al.* (1989), Woinarski, Dorward & Cullen (1983), Woinarski, Recher & Majer (1997).



PLATE 30

Family PARDALOTIDAE (PARDALOTES) SPECIES ACCOUNTS

Genus *PARDALOTUS* Vieillot, 1816

1. Spotted Pardalote

Pardalotus punctatus

French: Pardalote pointillé **German:** Fleckenpanthervogel **Spanish:** Pardalote Moteado
Other common names: Diamond-bird; Yellow-rumped Pardalote (*xanthopyge*)

Taxonomy. *Pipra punctata* Shaw, 1792, "New Holland" = Port Jackson region, New South Wales, Australia.

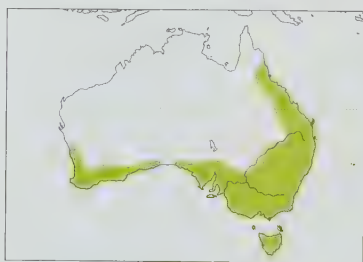
Most closely related to *P. quadragintus*. Race *xanthopyge* sometimes treated as a separate species, but intergrades with nominate in South Australia (Mt Lofty Ranges); *militaris* less clearly distinct. Three subspecies recognized.

Subspecies and Distribution.

P. p. militaris Mathews, 1912 – NE Australia (coastal and subcoastal NE Queensland).

P. p. punctatus (Shaw, 1792) – coastal and subcoastal SW, S, E & SE Australia (in E, as far N as Clarke Range), including Bass Strait islands (King I, Flinders I) and Tasmania.

P. p. xanthopyge McCoy, 1866 – semi-arid inland SW & SE Australia.



Descriptive notes. 8.5–10.5 cm; 7–12 g. Tiny passerine with exquisite coloration and pattern of spots, short square-cut tail and short deep bill. Male nominate race has black crown with bright white spots, white supercilium, bright yellow throat and breast; face and side of neck to breast side vermiculated blue-grey; upperparts with coarse yellowish-buff spots and black scalloping, rump chestnut, uppertail-coverts red; upperwing black, remiges and wing-coverts tipped white; uppertail black, feathers with small white subterminal spots; underparts below breast mostly pale buff, darker or browner on lower breast and flanks, brighter yellow undertail-coverts; iris brown to blackish or dark greenish; bill black, paler base of lower mandible; legs brown to pinkish-grey. Female is similar to male but duller, with creamy spots on greyer crown, duller and less contrasting supercilium, and yellow of throat less intense and not extending to breast. Juvenile is even duller, with less distinct spotting on crown. Race *militaris* resembles nominate, but spots on upperparts paler; *xanthopyge* has rump and most of uppertail-coverts yellow or orange-yellow, underparts paler than nominate. **Voice.** Surprisingly loud and rich song of 3–4 syllables, "s-leep ba-by", first note weak, last two at higher pitch; Tasmanian populations give simpler, shorter version, usually of 2 notes; race *xanthopyge* song "wit wee-eee". Calls include small range of simple, quiet notes, used as contact and also during breeding.

Habitat. Wide range of eucalypt (*Eucalyptus*) formations, varying from tall open forests with canopy above 30 m to sparse low woodland (canopy below 2 m); accidental or rare in vegetation formations lacking eucalypts. From coastal and semi-arid inland areas up to alpine areas above 2000 m.

Food and Feeding. Diet invertebrates and plant exudates; main items are lerps (the carbohydrate-rich cover of some psyllid insects) and manna (sugary exudate produced by some eucalypts). Arboreal; forages almost exclusively in foliage of eucalypts. Usually singly or in pairs when breeding; at other seasons often in flocks of 10–20 individuals, occasionally several hundreds together; in autumn–winter often joins mixed flocks with congeners, especially *P. striatus*, and thornbills (*Acanthiza*).

Breeding. Season recorded as Jun–Mar, principally Aug–Dec; two broods per season perhaps normal, but proportion of pairs rearing further broods unknown. Monogamous. Nest built by both sexes, a loose dome of bark and grass stems located at end of nearly horizontal shaft dug into sloping ground. Clutch 3–5 eggs, white; incubation by both sexes, period 16–22 days; chicks fed by both sexes, fledging period 18–25 days; young probably independent within 8 days of leaving nest.

Movements. General tendency for post-breeding dispersal to drier inland lowlands and/or more N parts of range, and away from higher altitudes and more S regions (e.g. Tasmania); dispersal pattern, however, possibly complex and irregular, and some individuals or populations may be resident. Dispersal in flocks, at times large (hundreds of individuals), sometimes mixed with *P. striatus*.

Status and Conservation. Not globally threatened. Generally common throughout an extensive range; somewhat elusive, often detected more readily by call. Reported densities 0.1–1.7 birds/10 ha across a set of 16 widely spaced sites in Victoria. Present in many protected areas.

Bibliography. Barrett *et al.* (2003), Christidis & Boles (1994), Cowles (1974), Higgins & Peter (2002), Johnstone & Storr (2004), Keast (1961), Lane (1967, 1974), McCarthy (2006), Mollison (1960), Richards (1972), Rogers *et al.* (1986), Salomonsen (1961b), Schodde & Mason (1999), Short *et al.* (1983), Sonter (1986), Woinarski (1974, 1984a, 1984b, 1984c, 1985a, 1985b, 1988, 1989a), Woinarski & Bulman (1985), Woinarski & McEvey (1983), Woinarski & Rounsevell (1983), Woinarski, Cullen *et al.* (1989), Woinarski, Recher & Majer (1997).

2. Forty-spotted Pardalote

Pardalotus quadragintus

French: Pardalote de Tasmanie **German:** Tasmanpanthervogel **Spanish:** Pardalote Tasmano
Other common names: Forty-spotted Diamond-bird, Many-spotted/Tasmanian Pardalote/Diamond-bird

Taxonomy. *Pardalotus quadragintus* Gould, 1838, "Van Diemen's Land" = Tasmania.

Most closely related to *P. punctatus*. Single specimen from King I (W Bass Strait) named as a geographical race *rex*, but indistinguishable from birds elsewhere in range. Monotypic.

Distribution. E Bass Strait (Flinders I) and SE Tasmania, including some offshore islands (Schouten, Maria, Bruny).

Descriptive notes. 8.5–11 cm; 9–13 g. Tiny passerine with short square tail and short deep bill; lacks pronounced vivid coloration of congeners. Has forehead, crown and most of upperparts subdued olive-green, subtle colour variation on feathers resulting in scaling pattern, generally inconspicuous (other than on close inspection) but most evident on crown; contrasting black upperwing with two regular lines of small but distinct white spots (tips of wing-coverts), tertials with distinct white spots at tips, primaries tipped white; uppertail dark grey, grading to black distally, feathers thinly tipped white;



lores, face, side of neck and undertail-coverts yellowish, rest of underparts paler, grey-white; iris brown; bill blackish; legs pinkish-brown. Sexes similar. Juvenile is duller than adult, with less scalloping on greyer crown, has thin black stripe behind eye, overall body colour more brownish than green-yellow. Voice. Far less conspicuous voice than those of congeners, but larger repertoire. Moderately loud and possibly ventriloquial "k-choo", repeated as song by male. Calls include quieter and more frequently uttered "where-where" as contact, churring call that accompanies agonistic encounters, also a short soft trill of 5–6 notes.

Habitat. Restricted to coastal and subcoastal eucalypt (*Eucalyptus*) forests and woodlands, especially those dominated by manna gum (*Eucalyptus viminalis*).

Food and Feeding. Insectivorous, but diet comprises principally lerps (the carbohydrate-rich cover of some psyllid insects) and manna (sugary exudate produced by some eucalypts); manna appears to be a more important food resource for this species than for its congeners. Arboreal; feeds almost exclusively in foliage of eucalypts. Forages usually in twos or in small flocks, occasionally singly; sometimes associates with *P. punctatus* and *P. striatus* and with Black-headed Honeyeater (*Melithreptus affinis*).

Breeding. Sept–Jan; two broods per season probably common. Monogamous. Nest built by both sexes, a compact dome or cup constructed mainly from fibrous bark of some eucalypt species and grass stems, often with lining of wool, fur and/or feathers; located usually in tree hollow, hollow log or stump (typically in dead wood), rarely in tunnel dug in ground. Clutch 3–5 eggs, white; incubation by both sexes, period 18–23 days; chicks fed by both parents, fledging period 23–25 days.

Movements. Limited data; probably sedentary, but some localized post-breeding dispersal possible. Periods of wet weather, with local food shortages, perhaps force short-distance wanderings.

Status and Conservation. ENDANGERED. Restricted-range species: present in Tasmania EBA. Has tiny global range and small total population, estimated at 3000–4000 individuals. Distribution is closely associated with that of the eucalypt species known to provide greatest abundance of manna. Where present, may occur at reasonably high densities, e.g. 86 breeding adults in 55-ha site. Range formerly more extensive, covering much of E & C Tasmania; substantial decline over last 100 years, probably associated with forest clearance and with spread of Noisy Miner (*Manorina melanocephala*), and aggressive colonial honeyeater. Old record from King I, in 1887. Occurs in several protected areas.

Bibliography. Anon. (2006a, 2007c), Barrett *et al.* (2003), Brown (1989), Brown & Rounsevell (1986), Bryant (1991, 1998a, 1998b), Bulman (1981), Bulman *et al.* (1986), Butchart & Stattersfield (2004), Christidis & Boles (1994), Cochran (1995), Garnett & Crowley (2000), Higgins & Peter (2002), Keast (1961), Rounsevell & Woinarski (1983), Salomonsen (1961b), Schodde & Mason (1999), Stattersfield & Capper (2000), Wall (1982), Woinarski (1984b, 1984c, 1985a), Woinarski & Bulman (1985), Woinarski & Rounsevell (1983), Woinarski *et al.* (1997).

3. Red-browed Pardalote

Pardalotus rubricatus

French: Pardalote à sourcils rouges **German:** Rotbrauen-Panthervogel **Spanish:** Pardalote Cejirrojo

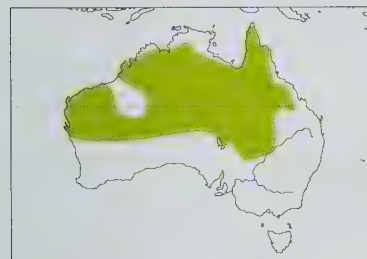
Other common names: Pallid/Red-lore Pardalote, Fawn-eyed/Red-browed Diamond-bird; Cape Red-browed Pardalote (*yorki*); Pale Red-browed Pardalote (*rubricatus*)

Taxonomy. *Pardalotus rubricatus* Gould, 1838, "Australia" = New South Wales. Races intergrade in NW Queensland. Other proposed races are *parryi* (N Western Australia), which is merged with nominate, and *carpentariae* (subhumid zone of NW Queensland), merged with *yorki*. Two subspecies currently recognized.

Subspecies and Distribution.

P. r. rubricatus Gould, 1838 – inland N & C Australia S to SC Western Australia, NE South Australia (L Eyre region) and SW New South Wales.

P. r. yorki Mathews, 1913 – N Queensland (Cape York Peninsula).



Descriptive notes. 9–11.5 cm; 9–14 g. Tiny, attractively patterned passerine with short square-cut tail and short deep bill. Male nominate race has black cap with distinct white spots, pale buff forehead leading on to creamy supercilial stripe with red spot near bill, rather indistinct thin dark eyestripe; neck side and upperparts fawn-brown with thin dark shaft streaks, rump unstreaked yellow-brown, lower rump and uppertail-coverts yellowish with dark shaft streaks; underparts blackish, feathers broadly edged yellow (forming broad yellow panel), edges of remiges and tertials white distally; uppertail black, narrowly tipped white;

throat and underparts creamy, yellow patch on breast; iris straw-coloured to brownish-yellow; bill dark grey, contrasting whitish cutting edges and lower mandible; legs grey to blue-grey or brown. Sexes similar. Juvenile is duller than adult, has dull yellow-brown crown with darker scalloping, less pronounced supercilium, yellow wash over entire underside. Races differ mainly in plumage tones: *yorki* has darker and more heavily patterned back and more pronounced yellow rump than nominate, also deeper yellow in wing. Voice. Loud simple song of 2–6 syllables, "do doo-doo-doo-doo", lasting 1–2 seconds, quite melodious, often with first note lower and longer than others.

Habitat. Wide range of woodlands and open forests, especially riparian woodland dominated by eucalypts (*Eucalyptus*). More likely than congeners to use woodlands dominated by non-eucalypts, especially acacia (*Acacia*) low woodland.

Food and Feeding. Diet poorly known; consists mainly of invertebrates. Arboreal; forages mostly in foliage, typically of eucalypts, but also including other plants. Sometimes feeds on the ground. Usually singly, in pairs, or in small groups of up to five or six individuals; often forages with *P. striatus*.

Breeding. Recorded in all months, mostly Aug–Oct. Nest built by both sexes, cup-shaped and substantial, mostly of bark, lining of grass stems and other finer material, placed in chamber at end of narrow tunnel excavated in ground, typically in eroded bank of creek, tunnel length 45–120 cm, chamber c. 10 cm × 10 cm; occasionally in tree hollow. Clutch usually 3–4 eggs, white; incubation and brood-feeding by both sexes; no information on duration of incubation and fledging periods.

Movements. Little known; resident in much of range.

Status and Conservation. Not globally threatened. Generally common throughout its extensive range. Can be elusive; often detected more readily by means of its voice than by direct observation.

Present in many protected areas.

Bibliography. Barrett *et al.* (2003), Christidis & Boles (1994), Cowles (1974), Ford & Sedgwick (1967), Higgins & Peter (2002), Hornsby (1996), Johnstone & Storr (2004), Lavery (1986), Salomonsen (1961b), Schodde & Mason (1999), Senter (1978).

4. Striated Pardalote

Pardalotus striatus

French: Pardalote à point jaune **German:** Streifenpanthervogel **Spanish:** Pardalote Estriado **Other common names:** (Striated) Diamond-bird; Black-headed Pardalote (N races); Northern Pardalote (*uropygialis*); Eastern (Striated) Pardalote, Red-tipped/Orange-tipped Pardalote (*ornatus*); Yellow-tipped Pardalote (*striatus*)

Taxonomy. *Pipra striata* J. F. Gmelin, 1789, "in America australi"; error = Adventure Bay, Tasmania. Geographical variation in plumage patterning complex, and has led to various taxonomic treatments. At times, nominate race, *substriatus* and *ornatus* treated as three separate species, with N races *uropygialis*, *melvillensis* and *melanocephalus* combined as a fourth species; further, race *uropygialis* has sometimes been proposed as an additional species. Treatment of all races as representatives of a single variable species now considered more appropriate, as substantial evidence exists of interbreeding and intermediates where races come into contact. Other proposed races include: *bowensis* (CE Queensland) and *barroni* (Cairns, N Queensland), synonymized with *melanocephalus*; and *restrictus* (Jardine R, N Queensland), synonymized with *uropygialis*. Six subspecies currently recognized.

Subspecies and Distribution.

P. s. uropygialis Gould, 1840 – N Western Australia E to N Queensland (Cape York Peninsula).

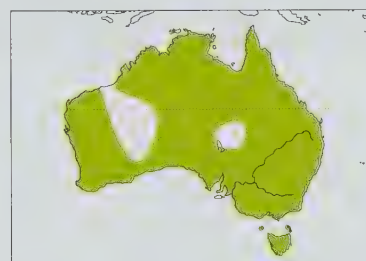
P. s. melvillensis Mathews, 1912 – Tiwi Is (off Northern Territory), in N Australia.

P. s. melanocephalus Gould, 1838 – NE Australia from NC Queensland (foot of Cape York Peninsula) S to NE New South Wales.

P. s. substriatus Mathews, 1912 – much of W & C Australia (except N parts, deserts and Nullarbor Plain).

P. s. ornatus Temminck, 1826 – SE Australia.

P. s. striatus (J. F. Gmelin, 1789) – breeds Bass Strait islands and Tasmania; non-breeding E & SE Australia.



Descriptive notes. 9–12 cm; 9–15 g. Tiny, attractively patterned passerine with short square-cut tail and short deep bill. Nominative race has cap, nape, loreal stripe and ear-coverts black with distinct white streaks, broad supercilial stripe bright yellow near bill and white posteriorly; upperparts fawn-brown, rump pale brown; underparts black, primaries narrowly edged white (forming very narrow white stripe on wing), tertials edged more prominently white, outer tertial partly edged rufous-brown, small yellow tips of primary coverts; uppertail black, feathers narrowly tipped white; bright yellow chin and throat, yellowish breast,

creamy belly to vent, yellowish-olive band on flanks; iris dark brown to blackish; bill black, sometimes pale base of lower or both mandibles; legs dark slate to brown or pinky brown. Sexes similar. Juvenile is duller than adult, with less marked head pattern, less distinct yellow on throat. Races differ mainly in plumage pattern, especially of head and wing, and in colour tones: *ornatus* is very like nominate, but tips of primary coverts red (not yellow), crown streaking extending somewhat less on to forehead; *substriatus* closely resembles previous, but has much more white in wing (forming broad white panel on primaries); *melanocephalus* is distinctive, has cap, eyestripe and ear-coverts solid black (lacking white streaks), anterior supercilium deeper yellow to orange, rump and uppertail-coverts richer buff, wing as previous (broad white wingpanel, red tips of primary coverts); edge of outermost tertial less extensively rufous-toned or, instead, pale yellow; *uropygialis* is very like previous, but rump and most of uppertail-coverts yellow to orange-yellow or yellow-buff, red on primary coverts darker, outer tertial usually all white-edged, black eyestripe narrower, anterior supercilium usually deeper orange; *melvillensis* is very like last, but rump and uppertail-coverts deeper orange-yellow. Voice. Loud song of 2–7 notes, most typically "wit-e-chu" or "wit-wit", with some regional variation; uttered frequently, especially in breeding season. Various other vocalizations, given far less frequently, include trilling call, and brief contact call when in flocks.

Habitat. Wide range of eucalypt (*Eucalyptus*) formations, varying from tall open forests with canopy higher than 30 m to sparse low woodlands with canopy below 2 m; accidental or rare in vegetation formations without eucalypts. From coastal and semi-arid inland areas to alpine areas above 2000 m.

Food and Feeding. Food predominantly invertebrates, especially lerps (the carbohydrate-rich cover of some psyllid insects); in some areas, also takes the plant exudate manna. One record of an individual capturing and consuming a skink (Scincidae). Arboreal; feeds almost exclusively in foliage of eucalypts. Usually singly or in pairs in breeding season; in autumn and winter often forms flocks, sometimes of hundreds of individuals, and often joins mixed flocks.

Breeding. Recorded in all months, typically Aug–Dec in temperate S Australia; two broods per season possibly normal, but proportion of pairs rearing multiple broods unknown. Monogamous. Nest built by both sexes, a loose dome or cup-shaped structure made from bark, grass stems and/or "needle" foliage from pines and similar species, sometimes with some fur or feathers in lining, located in tree hollow or in tunnel constructed in ground, in latter case generally in eroded creek bank, cliff or similar nearly vertical surface; tunnel generally horizontal, variably 15–100 cm in length, with opening 4–6 cm wide, and with larger nest-chamber at distal end. Clutch 3–5 eggs, white; incubation by both sexes, period 15–23 days; chicks fed by both parents, fledging period 21–25 days.

Movements. Movement patterns not well known, and probably vary across range. Tasmanian population (nominate race) makes post-breeding migration to Australian mainland, extending N at least to SE Queensland, and populations breeding in mountain areas in SE Australia move to coastal or inland lowland areas for winter; movements by other populations may be less regular; some individuals or populations probably resident. Post-breeding dispersal often in large flocks (hundreds of individuals), sometimes mixed with *P. punctatus*; such flocks may search for outbreaks of psyllids.

Status and Conservation. Not globally threatened. Generally common throughout range; can be hard to locate, and often detected more readily from call than by direct observation. Reported densities of 0–1–16 birds/10 ha across 16 widely spaced sites in Victoria. Present in many protected areas.

Bibliography. Barrett *et al.* (2003), Bell (1959), Christidis & Boles (1994), Cooper (1961), Cowles (1974), Dell (1984), Ford (1986), Girvan (1994), Green (1971), Higgins & Peter (2002), Hindwood & Mayr (1946), Hyett (1963), Johnstone & Storr (2004), Keast (1961), Lane (1974), Macdonald (1969), Mayr (1961), McCarthy (2006), Mees (1965b), Reid & Cox (1981), Rogers *et al.* (1986), Salomonsen (1961c), Schodde & Mason (1999), Woinarski (1974, 1984b, 1984c, 1985a, 1985b, 1988, 1989a), Woinarski & Bulman (1985), Woinarski & McEvey (1983), Woinarski & Rounsevell (1983), Woinarski, Cullen *et al.* (1989), Woinarski, Dorward & Cullen (1983), Woinarski, Recher & Majer (1997).

Class AVES
Order PASSERIFORMES
Suborder OSCINES
Family ZOSTEROPIDAE (WHITE-EYES)



- Small, warbler-like passerines with brush-tipped tongue, all except one species having vestigial outermost primary; often with olive-green upperparts and yellow throat, and yellow or white belly, many with conspicuous white eyering.
- 9.5–16 cm.



- Old World.
- Forest, open woodland and gardens to offshore islets and alpine shrubland.
- 14 genera, 98 species, 250 taxa.
- 20 species threatened; two species and two subspecies extinct since 1600.

Systematics

The first white-eyes ever scientifically described, all in 1760, were the Mascarene White-eye (*Zosterops borbonicus*) and Malagasy White-eye (*Zosterops maderaspatanus*), believed by the author, M. J. Brisson, to be *Ficedula* flycatchers, and the Reunion Olive White-eye (*Zosterops olivaceus*), thought at the time to be a *Certhia* treecreeper. Before receiving the present generic name, white-eyes were successively included in the wagtail genus *Motacilla*, the Old World warbler genus *Sylvia*, and the flowerpecker genus *Dicaeum*. In 1827, the name *Zosterops* was introduced by N. A. Vigors and T. Horsfield, and this word was finally decreed to be of masculine gender, although there is still disagreement about the respective genders of the composite words *zoster*, meaning a belt or girdle, and *ops*, eye. This remarkably homogeneous genus now includes a large number of similar-looking birds, encompassing 210 different forms belonging to 74 species. Other, closely related genera, believed to be derivatives of *Zosterops*, have been described alongside.

Most classifications have regarded the white-eyes as representing a distinct family. The brush-tipped tongue has been the basis for placing them next to the nectarivorous groups of sunbirds (Nectariniidae) and honeyeaters (Meliphagidae), and they have sometimes been treated as a subfamily of the sugarbirds (Promeropidae). More recently, DNA data have indicated that they are part of a sylvioid lineage that diverged about 40–42 million years ago, in the Oligocene, and they have therefore been included within the superfamily Sylvioidea, between the Old World warblers (Sylviidae) and the largely African cisticolas and allies (Cisticolidae). This suggests that the white-eyes may be only distantly related to the Meliphagidae, which are put in the “parvorder Corvida”, whereas the white-eyes are accommodated in the “parvorder Passerida”, together with the Nectariniidae. The latest molecular studies indicate a relationship with the babblers (Timaliidae), and place the white-eyes in a clade with *Yuhina* and *Stachyris* babblers. Ironically, the Sumatran race *frigida* of the Golden Babbler (*Stachyridopsis chrysaea*) was described by G. Hartlaub, in 1865, under the generic name of *Heleia*, a white-eye genus, before being included in the babblers, and it was not until a long time thereafter, in the 1990s, that the true position of the Golden White-eye (*Cleptornis marchei*) was realized, this monotypic genus having previously been considered to belong in Meliphagidae, the species then being known as the “Golden Honeyeater”.

The abundance of morphologically very similar forms may appear to present a promising opportunity for the study of speciation and evolution. Morphology and distribution have guided most museum workers in their attempts towards a synthesis, apparently supported by facts known about general behaviour, nesting, vocalizations and other aspects. Nevertheless, it is still practically impossible to postulate relationships among the species of the Zosteropidae, despite numerous serious attempts by such authorities as R. E. Moreau, for the western taxa, and E. Mayr and G. F. Mees, for the eastern taxa. In particular, the complex colour variations within and between populations, the result of differences in the amount and distribution of melanins and yellow carotenoids, as well as the dispersal of polymorphic populations, have led to confusion with regard to the taxonomic affinities within the family.

Ecology is not a very reliable guide to relationships among species. The Oriental White-eye (*Zosterops palpebrosus*), for example, includes a subspecies restricted to hills above 400 m,



Subdivision of the
Zosteropidae

[Figure: Douglas Pratt]

The family *Zosteropidae* comprises nearly 100 species, shared among 14 genera. The most speciose genus, *Zosterops*, contains roughly three-quarters of the species. Typical white-eye features include olive-green upperparts, a yellow throat and a prominent white eyering. This last gives the family its morphologically inexact vernacular name, for only a few white-eyes have the irides themselves white. Several species show patches of distinctive coloration, as is the case of the **Chestnut-flanked White-eye**. The flank patch may be less intensely coloured in the female, which can also have grey lores as opposed to the male's black.

[*Zosterops erythropleurus*,
Happy Island,
Hebei, China.
Photo: Johannes Ferdinand]



as well as others on coral islands. An extreme case is found with the subspecies *maxi* of the Lemon-bellied White-eye (*Zosterops chloris*), which has populations on small coral islands in the western part of its range, but occurs throughout the mainland of large islands in the east.

Similarly, the possession of a brush-tipped tongue has proved to be of minor taxonomic significance, as demonstrated by the modern rearrangement of the former "trinity" of the sunbirds, the white-eyes and the honeyeaters into the superfamilies of, respectively, Passeroidea, Sylvioidea and Meliphagoidea. Likewise, belly colour has minor importance as a specific character, as is suggested by apparently unhindered interbreeding of "different-bellied" races of the Cape White-eye (*Zosterops pallidus*) in South Africa, and by the equivalent behaviour by Oriental White-eyes in Java. The dismissing of belly-colour differences as representing no more than colour "phases" or morphs, as has sometimes been done, is not really an acceptable option, as white-eyes generally do not have morphs. The difference between yellow and grey is determined by multiple genetic factors, as indicated in western Java, where the grey subspecies *buxtoni* and the yellow race *melanurus* of the Oriental White-eye overlap. The gradual transition in Oriental Mountain White-eyes (*Zosterops montanus*) from a yellow median streak to an entirely yellow belly is also indicative of such a multiple factor. Whereas in South-east Asia the belly seems to change from grey to yellow, as is the case with the Oriental Mountain White-eye, in Africa it changes from yellow to grey. Throughout the global range of the family there are species that are in the process of losing the yellow pigment, and the Micronesian Grey-brown White-eye (*Zosterops cinereus*) has even lost its yellow pigment entirely, as well as its white eyering.

Vocalizations are of variable use in determining relationships. Calls appear to have little or no taxonomic value. Call notes resembling those of a sparrow (*Passer*) are shared by distantly related species such as the Bridled White-eye (*Zosterops conspicillatus*), the Lemon-bellied White-eye, the Sri Lanka White-eye (*Zosterops ceylonensis*) and the Solomon White-eye (*Zosterops kulambangrae*), whereas both of the closely related species from the Kai Islands, the Golden-bellied (*Zosterops uropygialis*) and Pearl-bellied White-eyes (*Zosterops grayi*), have very different calls. Song may be a more trustworthy criterion for judging relationships, and some African white-eyes have been split on the basis of song differences. It has been suggested that, among some Micronesian forms, the lack of a complex song, as illustrated by the Citrine White-eye (*Zosterops semperi*), indi-

cates a Melanesian ancestor, whereas a relatively complex song, as sung by the Bridled and Plain White-eyes (*Zosterops hypolais*), is indicative of derivation from continental forms to the north, which also have complex songs. A closer and more general study of calls, song and behaviour may lead to a better understanding of relationships.

Morphology does not always correspond with variation in mitochondrial DNA (mtDNA), and this is demonstrated by Silvereyes (*Zosterops lateralis*), the present subspecies boundaries of which are not entirely congruent with the distribution of mtDNA haplotypes. This may reflect local processes, rather than evolutionary ones. The same is true for the poor correspondence of boundaries between the Australian Yellow White-eye (*Zosterops luteus*) and the Silvereye and the distribution of mtDNA haplotypes, in which eastern samples of the former appear more closely related to eastern Silvereyes than they do to western samples of the Australian Yellow White-eye. This is probably due to historical hybridization.

It is postulated that dispersal of the white-eye family took place from Africa and Asia into the Central Pacific. In the Indian and Pacific regions in particular, white-eyes are widespread and are represented by many species; they have been able to colonize the most remote archipelagos, with high rates of endemism in both regions. Unlike trends found in other bird groups, with white-eyes there is a greater incidence of congeneric sympatry on small islands than on continental mainlands. Their social behaviour, preferences for marginal habitats, and good flying abilities make white-eyes good colonizers of small islands. When these "marginal" species colonize islands, they move into the native forest, in which their competitors in forest on the mainland are absent. Increased specialization by the species arriving first facilitates a second successful invasion. When new colonists arrive, the first-comers are replaced in the lowlands, resulting in rarity, extinctions, restriction to interior mountain areas, relict distributions and, ultimately, sustained co-existence of two species.

There are a number of cases of apparent sympatry of *Zosterops* species, although only a minority of these are genuine, because, in most cases, altitudinal, geographical or major ecological separations are involved. The largest assemblages are on the large island of New Guinea, where the Black-crowned (*Zosterops atrifrons*), Capped (*Zosterops fuscicapilla*) and New Guinea White-eyes (*Zosterops novaeguineae*) can be found at one locality, as well as on the tiny island of Norfolk, where the closely related Slender-billed (*Zosterops tenuirostris*) and White-chested White-eyes (*Zosterops albobularis*) and the Silvereye co-occur.



The broad white eyering of many members of Zosteropidae is formed by scale-like feathers around the eye. In some species, these feathers are grey or black rather than white. In others, such as the **Black-ringed White-eye**, the white feathers are present but reduced in number, their place being taken by a continuation of the black loreal line that loops around the eye. In common with other zosteropids, the Black-ringed White-eye has slender but strong legs that are an adaptation to the family's arboreal life.

[*Zosterops anomalus*, Karaenta Forest, near Makassar, Sulawesi. Photo: Pete Morris]

Two types of colonists of small and remote islands can be distinguished. The first is endemic species, usually confined to a single geologically fairly old island, with at most some adjacent islands; examples are the Christmas White-eye (*Zosterops natalis*) and the Enggano White-eye (*Zosterops salvadorii*). The second type consists of widely ranging taxa usually inhabiting coral islets of recent origin; examples include the subspecies *maxi* and *chloris* of the Lemon-bellied White-eye, the race *albiventris* of the Ashy-bellied White-eye (*Zosterops citrinella*) and the race *eichhorni* of the Louisiade White-eye (*Zosterops griseotinctus*). The seasonality of food resources of small coral islands, and their poor flora and fauna, coupled with a size hardly large enough to support a viable population for any length of time, do not permit their inhabitants to be sedentary, as sedentary birds could easily become extinct. When remote islands or groups of islands are colonized, however, selection pressure may strongly favour the development of sedentariness.

Difference in the speed of the speciation process among white-eyes is nicely demonstrated by four forms in the Australasian region. These are the extinct Robust White-eye (*Zosterops strenuus*), which formerly occurred on the offshore island of Lord Howe, the White-chested and Slender-billed White-eyes on Norfolk Island, and the nominate race of the Silvereye of Flinders Island, Tasmania and New Zealand. The first three island forms developed from the last, as indicated by plumage characters such as a pale throat and deep brown flanks; the "islet" species must, therefore, have developed into species after the nominate race of the Silvereye had become racially differentiated from neighbouring populations in south-east Australia, but it is apparent that the three did so in a much shorter time. Another example of rapid speciation is that of the Silvereye, following its arrival in 1904 on Norfolk Island, where the two endemic species, the White-chested and Slender-billed White-eyes, both originating from Silvereyes, already existed. Measurements in 1926 indicated narrower bills than in 1912–1913, a possible selective adaptation, not produced by hybridization among local species, which had been reversed by 1968–1969. A relatively old Silvereye race, *tephropleurus* of Lord Howe Island, often regarded as a full species, has an estimated age of hundreds of thousands of years; less distinct races, such as *chlorocephalus* of the Bunker and Capricorn Groups, in the Great Barrier Reef, are reckoned to be some 3000–4000 years old. In contrast, an old species, the Slender-billed White-eye, which is confined to Norfolk Island, is millions of years old.

In north-east Australia, DNA "fingerprinting" revealed an absence of significant gene flow between isolated populations of Silvereyes in the Capricorn Islands, in the Great Barrier Reef,

and in mainland Queensland. The mtDNA haplotypes of the distinct Capricorn subspecies *chlorocephalus* and the adjacent mainland race are identical, but frequencies of their variants differ. This suggests that *chlorocephalus* may be a recent derivative from the mainland, but one that has become effectively isolated. Indeed, mainland Silvereyes do winter on the islands, but they never stay on to breed. Populations inhabiting the mainland are thousands of years old, while that on Heron Island is some 3000–4000 years old, and that on Lady Elliott Island is just two decades old; the degree of genetic variability reflects both their size and the time elapsed since colonization. Other molecular research showed that founder effects in populations of the Silvereye in Tasmania, on both of the main islands of New Zealand and in the Chatham Islands, to the south-east of Australia, are weak, and it is assumed therefore that the new populations, with large effective founder numbers of 150–200 individuals, were not founded by small flocks of fewer than 100 individuals, but by a large flock or several average-sized flocks, as genetically diverse as the source



The largely olive-green plumage of white-eyes appears to be an adaptation to their habitat, providing camouflage amidst arboreal foliage. In species such as the **Golden-green White-eye**, bright colours are almost entirely forsaken in favour of tones that promote concealment. Apart from a bright yellow area around the forehead and lores, the plumage of this white-eye is yellow-olive. Intriguingly, some individuals lack the short black loreal line found in almost all Zosterops. The presence of this line may be related to the foraging behaviour of open-bill probing known as "Zirkeln".

[*Zosterops nigrorum innominatus*, Mount Makiling National Park, Luzon, Philippines. Photo: Doug Wechsler/VIREO]



Many white-eyes have several subspecies, and these commonly vary in plumage. The **Abyssinian White-eye** is a case in point, with six subspecies spread over an area extending from the Middle East south to Tanzania. These taxa vary principally in the tone of the upperparts and underparts, and the presence or absence of a discrete throat patch. The race *jubaensis* occurs in south Ethiopia, north Kenya and south Somalia; it differs from most other races in its more yellow-green upperparts and uniform warm yellow underparts. The race *arabs* of Saudi Arabia, Yemen and Oman is similar to nominate *abyssinicus* of north-east Sudan, Eritrea and north and central Ethiopia; both have greyish-green upperparts, a pale yellow chin and throat, and greyish underparts. Race *socotranus* of north Somalia and Socotra is similar, differing mainly in its brighter yellow throat and blackish bill. Some authors consider that the four subspecies mentioned constitute one species, with the two other races accepted herein forming a distinct species.

[Top: *Zosterops abyssinicus jubaensis*, Negele, Ethiopia.
Photo: Ketil Knudsen.

Middle: *Zosterops abyssinicus arabs*, Kawkaban, Yemen.
Photo: Hanne & Jens Eriksen.

Bottom: *Zosterops abyssinicus socotranus*, Socotra Island, Yemen.
Photo: Jon Hornbuckle]



population. An island such as Norfolk Island, with an effective number of founders of 20, was probably colonized by a single flock of moderate size.

Typical features of the white-eye family include the occurrence of montane and lowland species on the same island. Although rarely more than two species are sympatric, many islands have had double invasions of white-eyes, and Norfolk Island has been invaded three times. Further characteristics of the Zosteropidae are the alternation of yellow and grey in the abdomen colour among representatives of the same species, and a great similarity between taxa which must, in fact, be distinct species. Examples of virtually indistinguishable but distantly related taxa are the south Indian subspecies *nilgiriensis* of the Oriental White-eye and the nominate, Lesser Sunda race of the Ashy-bellied White-eye. A similar pair is the Annobon White-eye (*Zosterops griseovirescens*) and the Christmas White-eye. This insular plasticity in closely related *Zosterops* species is illustrated by the Golden-bellied White-eye and the Pearl-bellied White-eye, two species living on two separate but near-contiguous islands. These two species of the Kai Islands show how a narrow stretch of water, the two main islands of the group being separated by only about 7 km of sea, can perfectly isolate two different populations which could subsequently differentiate into very distinct forms. A similar situation is found with the Louisiade White-eye group in the Solomon Islands.

The genus *Zosterops* seems to be the most "primitive", with species closest to the ancestral forms of the family. All other genera have a limited number of species, with often very restricted geographical ranges, and are merely modified offshoots from a stock of *Zosterops*-like ancestors. The Asian-Pacific branch of the genus *Zosterops* comprises eight superspecies, involving a combined total of some 31 species; in addition, there are 29 independent species.

The Oriental White-eye forms a superspecies with the Japanese (*Zosterops japonicus*) and Lowland White-eyes (*Zosterops meyeri*). The Oriental White-eye is a widespread species, represented in eleven subspecies distributed from Oman, in south Arabia, eastwards to Flores, in the Lesser Sunda; these include a number of races on offshore islands, such as the race *nicobaricus*, which must have colonized the Andamans and Nicobars from the continent, rather than from the closer Sumatra. An offshoot of much older date is the Sri Lanka White-eye. Other species possibly closely related to this superspecies are the Chestnut-

flanked White-eye (*Zosterops erythropleurus*) and the Enggano White-eye.

In Micronesia, the Bridled, Rota (*Zosterops rotensis*), Citrine and Plain White-eyes form a superspecies occurring in the Northern Mariana, Palau and Caroline Islands. This group exhibits some affinity to species to the west and south-east of Micronesia, rather than to the north and north-west, and it may therefore have colonized Micronesia from the Philippines or the Moluccas, rather than directly from Melanesia; the Citrine White-eye, which bears a resemblance to the Golden-green White-eye (*Zosterops nigrorum*) of the Philippines, appears to be a possible connecting link. Mitochondrial-sequence data indicate that the Yap Olive White-eye (*Zosterops oleagineus*), previously placed in the genus *Rukia*, is better accommodated under *Zosterops*, and it may be most closely related to the Citrine White-eye, both occurring allopatrically in the Caroline Islands. It is distinguished from this and other *Zosterops* species by its large size and its melanistic plumage, possibly reflecting rapid differentiation in an island population.

Within *Zosterops*, the Yellow-spectacled White-eye (*Zosterops wallacei*) is unique in having an orange forehead, a colour found in few other members of the genus, and a yellow, not white, eyering, but above all in having speckled instead of uniformly white or bluish eggs, an aberrant wing formula and a trace of a superciliary stripe. It is possibly an intermediate form between the genera *Lophozosterops* and *Zosterops*, and may be better placed before or after the Grey-brown White-eye. The Javan White-eye (*Zosterops flavus*) seems to be an old inhabitant of the south-eastern border of the Pleistocene Sunda shelf; its once contiguous range was apparently split up into Java, Madura and southern Borneo by the rising of the Java Sea.

The Lemon-bellied and Ashy-bellied White-eyes form a superspecies, and the Golden-bellied and Pearl-bellied White-eyes constitute another. The last two are found on the periphery of the Kai Islands, which were recolonized by the Lemon-bellied White-eye in postglacial times, and they are therefore sometimes included in the same superspecies as the latter. It is possible that the Pale-bellied White-eye (*Zosterops consobrinorum*) of Sulawesi also belongs to this group. The superficially very similar Oriental, Oriental Mountain, Lemon-bellied and Ashy-bellied White-eyes include yellow-bellied and grey-bellied forms, and they apparently have a common history associated with successive invasions or reinvasions.



In recent times, several white-eyes new to science have been discovered. The predilection of the family for small islands has produced a number of restricted-range endemics, for example in the islands around Sulawesi. Another example comes from the island of Vanikoro in the Solomon Islands. In 1994, the hitherto unknown white-eye seen here was discovered, and found to be not uncommon. The taxon differs from the Santa Cruz White-eye (*Zosterops sanctaecrucis*) of the nearby island of Santa Cruz by dint of its more slender bill and yellow-orange (rather than blue-grey) legs. The scientific description of this taxon is shortly to be published.

[*Zosterops* sp.,
Vanikoro, Solomon Islands.
Photo: Guy Dutson]

The genus *Lophozosterops* contains six largely montane species from Indonesia and the Philippines. Three of these species, including the **Javan Grey-throated White-eye**, form a superspecies. They are similar in ecology and morphology, all, for example, lacking a white eyering. As a genus, *Lophozosterops* is morphologically distinct from other Zosteropidae in two characteristics: the bill has a gently curved culmen; and the wings are long and pointed, in contrast to the short, rounded wings of most family members.

[*Lophozosterops javanicus frontalis*,
Gede-Pangrango National
Park, Java.
Photo: Ketil Knudsen]

The genus *Heleia* contains two monotypic species that are restricted to the Lesser Sundas. The **Thick-billed White-eye** occurs in forests up to 2000 m on the islands of Flores and Sumbawa, whereas the **Spot-breasted White-eye** (*Heleia muelleri*) occurs in lowland and mid-altitude forest on Timor. Morphologically, this stocky genus is characterized by a strong bill, a long tail and a very short second primary. In contrast to the predominantly yellow and olive plumage of its congener, the **Thick-billed White-eye** is drab olive-brown above and whitish below. It does, however, have a striking head pattern.

[*Heleia crassirostris*, Flores, Lesser Sundas. Photo: Morten Strange]

The genus *Chlorocharis* contains a single species, endemic to moss forests and stunted growth in montane Borneo. The affinities of the **Mountain Black-eye** with other white-eyes are unclear. It is relatively long-tailed and has a long, slender, decurved bill with an orange-yellow lower mandible. Its most striking plumage feature is a small black eye mask with a broad yellow border. There are four subspecies, which vary clinally, with larger, longer-tailed, darker birds in north Borneo gradually giving way to smaller, short-tailed, paler birds in the south.

[*Chlorocharis emiliae*, Kinabalu Park, Sabah, Borneo. Photo: Doug Wechsler/VIREO]

Another superspecies in this region consists of eight species, each a geographical representative on islands or island groups around New Guinea. They appear quite different from one another, with the belly yellow or white, the forehead black or olive, the eyering broad or lacking altogether, and the throat orange, yellow or whitish. These eight are the Creamy-throated White-eye (*Zosterops atriceps*) from Halmahera, the Black-crowned White-eye from north Sulawesi and the Sula Archipelago, the Togian White-eye (*Zosterops somadikartai*), the Sangihe White-eye (*Zosterops nehrkorni*) and the Seram White-eye (*Zosterops stalker*) from their respective islands, the Black-fronted White-eye (*Zosterops minor*) from mainland New Guinea, the White-throated White-eye (*Zosterops meeki*) from Tagula, in the Louisiades, and the Black-headed White-eye (*Zosterops hypoxanthus*) from the Bismarck Archipelago. The Capped White-eye may be an old offshoot of this "species group", as is suggested by the striking similarity of its nominate subspecies to the Black-headed White-eye. Likewise, the Buru Yellow White-eye (*Zosterops buruensis*) may be a geographical representative of the group. The Christmas White-eye is likely to be a derivative of the Lemon-bellied White-eye, but it has a relatively longer tail than almost any of the other Indo-Australian white-eyes; interestingly, African white-eyes seem generally longer-tailed than the Asian species.

The next superspecies consists of six species native to the Louisiades and the Solomon Islands, where they replace each other geographically. They differ from one another in colour, rather than in morphology or size; thus, they vary in having no black to much black on the forehead, no green to much green on the breast, a white belly or a yellow one, a yellow or black bill, and a large eyering to no eyering at all. Four of the species occur in the New Georgia Group, each living within 8–14 km of an island holding another member of the superspecies. One of these, the Solomon White-eye, is further subdivided into three very distinct subspecies, these differing distinctly in, for instance, song pattern in places where they are separated by only 3.4 km of water. The Louisiade White-eye may have evolved after the last glacial period from the island of Misima, known also as St Aignan Island, which was cut into smaller islands by rising sea-levels. The subspecies which then evolved could have colonized the other islands. In particular, the race *eichhorni* is an inhabitant of small coral islands, having a good facility for colonization and expansion; this form is therefore found over a fairly large range, within



which it shows no geographical variation. The Splendid White-eye (*Zosterops luteirostris*) has weak but distinct bristles on the gape, something which is not of general occurrence in *Zosterops*, but the phylogenetic significance of which is unclear. The Rennell White-eye (*Zosterops rennellianus*) differs in bill shape, in lacking an eyering and in having yellow feet, and its plumage is intermediate between the soft plumage of the nominate race and subspecies *pallidipes* of the Louisiade White-eye and the stronger, almost shiny plumage of the Solomon and Admiralty Islands subspecies *eichhorni* of the latter species. The Kolombangara Mountain White-eye (*Zosterops murphyi*) is morphologically extremely similar to, and apparently very closely related to, the Louisiade





Four islands in Micronesia each have their own large, distinctive species of white-eye. On Palau is the **Giant White-eye**, the sole member of its genus. Morphologically and vocally it is so different from other white-eyes that observers seeing it for the first time might not initially realize what group it belongs to. The Giant White-eye has a large, deep bill, a fairly short tail, broad flight-feathers, including a short second primary, and surprisingly stout legs for an arboreal bird.

[*Megazosterops palauensis*, Ngeremdiu beach, Ngeruktabel Island, Palau. Photo: Mandy Etpison]

White-eye and should perhaps be included in this group. It inhabits the mountain area of Kolombangara Island, where the lowlands are inhabited by the Solomon White-eye, which is of later arrival at the island but evidently derived from the same ancestral species within northern Melanesia.

Although the taxonomic affinities of the Yellow-throated (*Zosterops metcalfei*) and Grey-throated White-eyes (*Zosterops rendovae*) are unclear, it has been speculated that both may be related to the "*Z. atrifrons* group". The two species, however, co-occur on Bougainville, and they are therefore probably old endemics of the Solomon Islands. A rather speculative proposal is that the Fiji (*Zosterops explorer*), Yellow-fronted (*Zosterops flavifrons*), Small Lifou (*Zosterops minutus*) and Green-backed White-eyes (*Zosterops xanthochroa*) form a superspecies, on the basis of their sharing of yellow underparts and living in the same general region.

The taxa within the "*Z. lateralis* group" are characterized by their grey back, and their origin is therefore more easy to trace back than is that of most other members within the family. The most likely hypothesis is that the group evolved from an ancestral Silvereye on the Australian mainland, from where successful colonizations of islands in the south-west Pacific followed. Their specific status is elucidated by their co-existence with second and sometimes even third invaders derived from the mainland stock. Vanuatu, New Caledonia, the Fiji Islands and New Zealand are now inhabited by Silvereyes; Lord Howe Island is home to two forms, the Silvereye subspecies *tephropleurus*, also known as the "Lord Howe Island White-eye", and the now extinct Robust White-eye; Norfolk Island is inhabited by the Slender-billed and White-chested White-eyes and the nominate race of the Silvereye; and Lifou, in the Loyalty Islands, has been colonized by two forms, the Large Lifou White-eye (*Zosterops inornatus*) and the Silvereye race *melanops*. DNA research shows that all continental Silvereye forms intergrade through broad zones, and that neighbouring subspecies are each other's closest relatives; this suggests that the group should not be split into separate species.

The Grey-brown White-eye and the Dusky White-eye (*Zosterops finschii*) share a total lack of yellow, a nearly total absence of green in the plumage, and the absence of a white eyering. Their relationship to other species is unclear. It has been suggested that they are derived from the Creamy-throated White-eye of the northern Moluccas, but this is unconvincing.

The African and Oriental forms of *Zosterops* must have been isolated from each other a long time ago. Although the Sri Lanka White-eye is most likely a derivative from the Oriental White-eye on the Indian mainland, its affinities may be found just as well in the west, considering its morphological resemblance to the Malagasy White-eye. It is very likely also that the Abyssinian White-eye (*Zosterops abyssinicus*), with a population in Yemen, extended much farther east during the Neolithic humid episode in these latitudes, about 6000 years ago. The Oriental White-eyes recently found in Oman are the closest oriental forms, but these do not represent a relict population but, rather, recent colonists, as indicated by the analysis of their DNA and tape recordings.

In the African representatives of *Zosterops*, a complex situation is presented by the five or more mainland species, with 33 distinct subspecies. In past decades various forms have been switched across species and species complexes, and a definitive arrangement appears still to be elusive. One superspecies can be distinguished, that formed by the African Yellow White-eye (*Zosterops senegalensis*), a mainland species, and the Pemba White-eye (*Zosterops vaughani*), a small-island endemic. Sometimes, the Abyssinian, African Montane (*Zosterops poliogastrus*), African Yellow and Cape White-eyes are put in one superspecies, but the relationships among these are unclear. Speciation in the 19,400-km² mountain area of Kilimanjaro east to Taita and the Usambara Mountains, on the Kenya-Tanzania border, has been extreme, and five species or subspecies of montane *Zosterops* have developed on mountains separated by extremely narrow gaps. One of these is the African Montane White-eye, which some authors split into six full species on the grounds mainly of vocal differences.

On the tiny islands in the Gulf of Guinea, off West Africa, two endemic species occur. These are the Principe White-eye (*Zosterops ficedulinus*) and the Annobon White-eye. The Malagasy region has seven *Zosterops* species. Of these, two species of the Mascarene Islands, the Reunion Olive White-eye and the Mauritius Olive White-eye (*Zosterops chloronothos*), form a superspecies, and are adapted to nectarivory to a greater extent than are the other white-eyes; their long, fine, curved bill and strong legs very much resemble those of members of the family Nectariniidae. Their wing-flicking action and "chipping" calls may suggest a relationship to the similar Seychelles Grey White-eye (*Zosterops modestus*), although DNA results do not support

this. The other Mascarene endemic, the Mascarene White-eye, is apparently of more recent origin, within the last 1.2 million years, although not particularly close to others in the genus; vocally, it seems closer to mainland African species and the Seychelles species than it does to the two olive white-eyes. It is interesting that the first white-eyes to colonize the Mascarene Islands became more specialized flower-feeders, rather than more generalized in the absence of competitors, which is counter to the expectation that a reduced competitive environment would allow niche expansion. The co-existence with a generalized second successful colonizer was therefore facilitated. Socially, the species differ noticeably, the Reunion Olive and Mauritius Olive White-eyes being territorial throughout the year, whereas social feeding is common for the Mascarene White-eye. The Chestnut-sided White-eye (*Zosterops mayottensis*) and the extinct Seychelles Yellow White-eye (*Zosterops semiflavus*), of Mayotte and the Seychelles, respectively, are probably related to the mainland African Yellow White-eye, and thus of more recent arrival than the Seychelles Grey White-eye.

In the Comoro Islands, the Mount Karthala White-eye (*Zosterops mouroiensis*) inhabits the main island, and has a larger size and more melanin in the plumage, as is typical of montane *Zosterops* throughout Africa. The other islands are inhabited by the Malagasy White-eye, a species of much wider distribution; on Grand Comoro (Njazidja) it is segregated by altitude from the Mount Karthala White-eye.

Turning now to the other genera in the family, the genus *Woodfordia* consists of two species of very large size. Indeed, Sanford's White-eye (*Woodfordia lacertosa*) is the second largest member of the white-eye family. Both are relatively short-tailed, sturdy birds with a long, pale bill and rounded wings, and both are atypically coloured, with the plumage mainly brown and citrine. The two species are found in the Solomon Islands, the Bare-eyed White-eye (*Woodfordia superciliosa*) on Rennell and Sanford's White-eye in the Santa Cruz Group, their ranges being separated by 750 km of open sea. Considering the fact that white-eyes have crossed much larger stretches of sea elsewhere, colonization of one island from the other appears very possible.

The Micronesian islands of Palau, Yap, Chuuk and Pohnpei each have their own endemic species of large white-eye. These are the Giant White-eye (*Megazosterops palauensis*) of Palau, the Yap Olive White-eye, the Faichuk White-eye (*Rukia ruki*) of Chuuk, and finally, on Pohnpei, the Long-billed White-eye (*Rukia longirostra*). These are so distinctive that at one time each one was placed in its own monotypic genus, the Yap Olive White-eye then being put in *Kubaryum* and the Long-billed White-eye in *Rhamphozosterops*, with the Faichuk White-eye the sole member of *Rukia* and the Giant White-eye, as today, the only *Megazosterops* species. All were then united in a single genus, *Rukia*, after which the Palau species was returned to its monotypic genus and the Yap species placed in *Zosterops*, whereas the other two remained in the new genus *Rukia*. The present genus *Rukia* therefore consists of two large, slender-billed species with brownish plumage and unusually coloured feet, and with an incomplete eyering or none at all, a fairly short tail, and the second primary as long as the seventh or eighth. The two are confined to the Caroline Islands, the Faichuk White-eye in the tiny Faichuk Group within the Chuuk Islands, and the Long-billed White-eye on Pohnpei, some 600 km to the east.

North of the Carolines, the genus *Cleptornis* is restricted to the Northern Mariana Islands. Its single species, the Golden White-eye, is morphologically different from the other white-eyes in having large eyes and a first (outermost) primary, the latter being reduced or absent in most other members of the family. It was formerly treated within the Meliphagidae, but on the basis of DNA studies it is now included in the Zosteropidae, being perhaps a basal member of the family and appearing to be most closely related to *Rukia*.

Until recently, *Apalopteron*, now known as the Bonin White-eye (*Apalopteron familiare*), was likewise assigned to the honeyeaters in the family Meliphagidae, a treatment based primarily on its quadrid and fringed tongue, but also on its nest structure and "nares perviae" (open nostrils). The species had previously been associated with the bulbuls (Pycnonotidae), the

babblers, the Old World warblers and the white-eyes. Molecular research has indicated that its relationship is with the white-eyes, in particular *Cleptornis*.

The monotypic genus *Tephrozosterops*, with the Bicoloured White-eye (*Tephrozosterops stalkerii*), was formerly united with *Lophozosterops* because of an alleged structural resemblance, but it differs greatly in plumage colouring owing to an absence of lipochromes. The validity of the genus, however, is subject to debate, and it resembles *Lophozosterops* no more than it does *Zosterops*; in fact, there exists a great resemblance between the Bicoloured White-eye and the Mascarene White-eye, the Seychelles Grey White-eye and, in particular, the Grey-brown White-eye.

Madanga is another single-species genus, this one containing the Rufous-throated White-eye (*Madanga ruficollis*). This species is confined to the island of Buru, thus occupying a blank spot in the range of the genus *Lophozosterops*, of which it is most likely a derivative. It differs from this and other genera in plumage colour, and the second primary is longer than in any *Lophozosterops* species. Other peculiarities are the pointed, rather than square-ended, rectrices, and the rather long and strong toes, which may be adaptations to its bark-foraging habits (see Food and Feeding).

Lophozosterops consists of six species of large white-eye. These are distributed over the mountains of Java, Bali, Sumbawa and Flores, Sulawesi, Seram and, in the south Philippines, Mindanao. Three species, the Javan Grey-throated White-eye (*Lophozosterops javanicus*), found in Java and Bali, the Scaly-headed White-eye (*Lophozosterops squameiceps*), on Sulawesi, and the Black-masked White-eye (*Lophozosterops goodfellowi*), inhabiting Mindanao, are very similar morphologically and ecologically, but to unite them in one species would be to obscure the existence of the three to six subspecies in which each species is divided. The Yellow-browed White-eye (*Lophozosterops supercilialis*), confined to the mountains of Sumbawa and Flores, is also very close, but the other two, the Grey-hooded White-eye (*Lophozosterops pinaiae*) of Seram and the Crested White-eye (*Lophozosterops dohertyi*) in the hills of Sumbawa and Flores, are more distinct in appearance and behaviour from the others. The blackish lores shared by the Scaly-headed, Black-masked and Javan Grey-throated White-eyes have become white in the central, nominate race of the last-mentioned; the juvenile males of this race have greyish lores. It may possibly be better to split the heterogeneous genus *Lophozosterops* into several different genera, or, conversely, to unite it with *Zosterops*.

The single species in the genus *Oculocincta*, the Pygmy White-eye (*Oculocincta squamifrons*), is small in size, smaller

The genus *Speirops* contains four monotypic West African species, three of which inhabit islands and the other a single, island-like mountain. The genus is thought to have originated on São Tomé, home to the **Black-capped Speirops**, and to have speciated following colonization of the other three areas. They are quite large for white-eyes, and show a dark crown and reduced white eyering; all lack yellow or green tones in the plumage.

[*Speirops lugubris*, São Tomé, Gulf of Guinea. Photo: Walter Mankel]





than any other member of the family, but with a normal rounded wing and a relatively short tail. It is differentiated from *Zosterops* mainly by the scaly appearance of the frontal feathers and the pale greyish-yellow throat, combined with a more clear yellow breast and belly. From *Lophozosterops*, to which it seems most closely related, it differs in its small size, short tail and whitish iris. It is restricted to Borneo.

Heleia is a well-marked genus with a relatively long tail, a remarkably short second primary, and a comparatively heavy bill. Its two members are mainly lowland species, the Spot-breasted White-eye (*Heleia muelleri*) found on Timor and the Thick-billed White-eye (*Heleia crassirostris*) on Sumbawa and Flores.

The monotypic genus *Chlorocharis* harbours the Mountain Black-eye (*Chlorocharis emiliae*), a fairly large dark species distinguished by its black lores and circumorbital region, its long, very slender, partly orange-yellow bill and its relatively long tail. It has no clear affinities within the family. The genus is endemic to the mountains of Borneo.

As both its generic and its English names suggest, the single species of *Megazosterops*, the Giant White-eye, is very large, and at first sight does not look like a white-eye at all. It is atypically coloured, and has a yellowish eyering, soft plumage, broad primaries and secondaries, a relatively short tail, a short second primary, a rather heavy horn-coloured bill and strong legs. In addition, its vocalizations are unlike those of other white-eyes. As mentioned a few paragraphs above, it has sometimes been placed with the other large species in *Rukia*, but it is clearly differentiated by the aforementioned characters, and it may be no more closely related to this than it is to the other white-eye genera.

The genus *Speirops* is characterized by the large size, stout bill, complete lack of yellow or green in the plumage, and the possession of a darkish cap and reduced white eyering. The four species are mainly montane and occur in disjunct areas of Africa. They are morphologically well characterized and differ in the morphometric proportions of wing, tail and tarsus lengths. All four form a monophyletic group and are sometimes regarded as members of one superspecies. The Black-capped Speirops (*Speirops lugubris*) and the Mount Cameroon Speirops (*Speirops melanocephalus*) are the two most closely related to each other, however, and it is probably better to treat these two alone as forming a superspecies. The genus is hypothesized to have originated

on the island of São Tomé, from where it would have colonized the other three areas.

The placement in Zosteropidae of the genus *Hypocryptadius*, with its single species, the Cinnamon Ibon (*Hypocryptadius cinnamomeus*), has been queried by several researchers, who have pointed out that the tongue is only slightly divided at the tip, with a short fringe laterally, whereas all other members of this rather uniform family have a deeply bifid tongue, ending in filaments. Other characters that would justify its placement in another family, or perhaps even in a family of its own, are the rounded nostril openings entirely closed posteriorly by an operculum, whereas the nasal opening of virtually all other white-eyes is a slit covered by an operculum, with the lower border entirely free; the short tarsus, which is shorter than that of any other white-eye; the deep cinnamon colour of the plumage; the complete absence of an eyering; and the larger size, the wing length of *Hypocryptadius* being 10 mm longer than that of the second largest white-eye. Furthermore, the relatively short bill is much wider and deeper than that of any other member of the family. The only feature which the Cinnamon Ibon shares with the other white-eyes, and with various other passerines, too, is the reduced outermost primary. With the possible exception of the diverse babbler family Timaliidae, no family other than the Zosteropidae is usually suggested by taxonomists to accommodate the genus *Hypocryptadius*. Little or nothing is known about its vocalizations and nidification which could provide some clues to its relationships. In the meantime, it is probably best to place it in an old subfamily Hypocryptadiinae, of which it is the sole member, although it may merit placement in a separate family altogether.

Finally, there are a number of more or less recently discovered white-eyes awaiting formal description. In particular, the island of Sulawesi and its satellites, already known to be home to 15 taxa of largely endemic white-eyes, have proven to be very productive during surveys since the 1970s. The Togian White-eye, for instance, was described as recently as 2008, although its distinctiveness had been noted a few years earlier. In northern Sulawesi, Lemon-bellied White-eyes on Dodepo Island, in Tomini Bay, were found to be paler, and with less well-defined loreal streaks and a larger bill, than mainland individuals of this species. A Black-crowned White-eye found in 1979 near Soroako, in south-central Sulawesi, had measurements differing from those of known subspecies of this species. The islands of south-eastern Sulawesi may harbour a number of undescribed taxa. For example, during surveys in 1995 on Butung, the local Pale-bellied White-eye was found to differ morphologically and vocally from the mainland individuals of the species, and on Wangiwangi, in the Tukangbesi Archipelago, a large, pale-bellied, orange-billed white-eye found in 1999 showed no clear affinities with known species, and co-occurred there with the much smaller local race *flavissimus* of the Lemon-bellied White-eye. On Kabaena Island, both the Lemon-bellied and the Pale-bellied White-eyes are significantly larger than their conspecifics on nearby Butung, and may therefore be undescribed races. Far to the west of Sulawesi, in the Andamans, the Oriental White-eye population may represent an undescribed subspecies, and on Panay, in the Philippines, an undescribed race of the Oriental Mountain White-eye was found in 1987. On the island of Vanikoro, in the Solomon Islands, what is probably a not uncommon white-eye, similar to the Santa Cruz White-eye (*Zosterops sanctaecrucis*) but differing mainly in its yellowish-orange legs, was found in 1994.

Morphological Aspects

The majority of the white-eyes are small, 10–12 cm long, with average weights of about 11 g. A total of 1500 individuals of the Cape White-eye had weights ranging from 8 g to 20 g. The family giants are the Cinnamon Ibon, with a wing measurement of 92 mm and weighing up to 30.1 g, Sanford's White-eye, with a wing of 83 mm, and the Giant White-eye, with a wing of 82 mm and weighing up to 30.5 g. The largest members of the genus *Zosterops* are the White-chested White-eye, the wing of which measures 77 mm, and the Malaita White-eye (*Zosterops stresemanni*), which has a wing length of 68 mm and weighs up to 23 g.

The Cinnamon Ibon is a taxonomic oddity whose placement in the Zosteropidae is often questioned, but without convincing alternatives being offered. A monotypic species in a monotypic genus, Hypocryptadius is morphologically distinct from the rest of Zosteropidae, being the only white-eye to lack a deeply bifurcate tongue and the only one to have deep cinnamon plumage. Whereas it is considerably larger than even the second largest white-eye, it has, in contrast, the shortest tarsus. In addition, compared to other zosteropids, its nostril structure is different; it has a far wider and deeper bill; and it lacks an eyering.

[*Hypocryptadius cinnamomeus*, Baracatan, Davao, Mindanao, Philippines. Photo: Doug Wechsler/VIREO]

White-eyes are highly sociable birds. In many species, individuals regularly congregate in small foraging flocks that call constantly as they move through their environment. When reaching a natural break in their foraging route, such as an open area, white-eyes often become nervous. They may ascend a bare tree, which serves as a look-out post from which they can survey the terrain for potential predators and determine the safest route to their next destination. Outside the breeding season, flocks can be very large, those of the **Oriental White-eye** sometimes numbering over 100 individuals. Flock size seems to depend, in part, on food availability. In times or areas of plenty, flocks can be larger than in impoverished, arid habitats or dry seasons, where groups typically comprise just a handful of individuals, perhaps family units. Evidence from some white-eyes suggests that long-term bonds form between group members, and flocks can remain much the same for several years. In addition to such single-species groups, white-eyes are frequently core members, and even leaders, of mixed-species foraging flocks. For example, in Sumatra, Oriental White-eyes have been seen flocking with nuthatches (*Sitta*), tits (*Paridae*), Old World flycatchers (*Muscicapidae*) and minivets (*Pericrocotus*).

[*Zosterops palpebrosus*
egregius,
Panna National Park,
India.

Photo: Joanna Van
Gruisen/Ardea]





Bergmann's Rule, that warm-blooded animals increase in size with cooler climatic temperature, and thus also with increasing altitude, is confirmed for the New Guinea White-eye, all montane races in which are larger than the lowland races. Similarly, within the same race of the African Yellow White-eye, the montane populations are slightly larger in wing length than those in the lowlands, and this may be to compensate for lower air pressure. These examples are, however, counterbalanced by the Black-crowned White-eye superspecies (see Systematics), in which the lowland race *dehaani* of the Creamy-throated White-eye is the largest of all. The tendency of small bird species to be larger in size in insular populations, a phenomenon known as the "small-island effect", is found in a number of the Zosteropidae, and is most clearly illustrated by Silvereyes, with various populations of large races and derivative species on offshore islands. Other examples are found on Annobon, in the Gulf of Guinea, Christmas Island, in the Indian Ocean, Great and Little Kai, in the Banda Sea, and on several other islands. There are a few exceptions, such as the subspecies *maxi* of the Lemon-bellied White-eye; the western populations of this race that occur on tiny islands are, on average, smaller than the eastern population occurring on the larger island of Lombok.

It has been postulated that very small, and remote, islands have a limited number of resources, and that the act of becoming larger enables *Zosterops* to take a wider range of foods, thus expanding its niche. A later-colonizing, normal-sized *Zosterops* will be sufficiently different to be able to co-exist with the species already present, and both will diverge further, not only in size, but also in wing and bill shape, plumage structure and colour. Studies of the Silvereye showed that island populations do, indeed, have a wider feeding niche than those of comparable mainland populations. The island-dwelling individuals, however, are in fact more specialized than would be expected by chance. Moreover, neither large body size nor large bill size is associated with generalist foraging behaviour in itself. These studies suggest that generalist foraging and niche expansion cannot fully explain morphological shifts in island-dwelling white-eyes; alternatively, these can be explained by environmental effects, reduced predation, physiological changes, limited dispersal and intraspecific dominance. Where two species of *Zosterops* co-occur, the larger is always more different from the ancestral *Zosterops* and is presumably the first of the two to have arrived. A striking reversal of size has been found for Lemon-bellied and

Pale-bellied White-eyes that occur sympatrically on the islands of Butung and Wangiwangi, off south-east Sulawesi: the first species is the larger one of the two on the first island, but the smaller one on the second. Proportionate differences in wing and bill lengths, an indication of ecological separation within co-existing white-eye species pairs, can vary: for wing length, the figure ranges from 5%, as on Réunion, to 45%, as on Chuuk; for bill length it is from 15% to 30% on most islands, with extremes of 75% for the white-eyes on Pohnpei but less than 5% for a number of other species pairs.

The weight of adult Mascarene White-eyes usually increases during the breeding season, but in the case of the Reunion and Mauritius Olive White-eyes, which inhabit the higher parts of the Mascarene Islands, very cold winter nights demand that the birds have some body fat, resulting in higher weights during that season. Higher weights can be attained also when females are gravid: a female Mauritius Olive White-eye reportedly increased from 7.5 g to 9.6 g within a period of two weeks. Weights fluctuate in a seasonal pattern, as well as a daily pattern, as has been shown in South Africa for Cape White-eyes in Western Cape Province. Here, the lowest average weights were found in the peak breeding months of September–October, when the figure was 11.1 g, whereas an increase in weight was noted in the austral winter months of May–August, when the average was 12.4 g. Further, weight increases at food trees can be considerable; a preliminary study showed increases of about 6% of body weight during a single visit, this countered during the night, when weight losses of 12% were recorded. In New Zealand, diurnal fluctuations of 7% were found in the mean weight of Silvereyes, which were lightest at 09:00 and 10:00 hours, gradually increasing until 17:00 hours; maximum mean weights, of 14.55 g, were recorded in June, in the southern winter. Lastly, weights appear to be inversely correlated with the mean daily air temperature.

Bills of the Zosteropidae are quite uniform, generally short to medium-long, slender, pointed, and slightly arched on the culmen. In the genus *Zosterops*, the operculate nostrils are exposed, and no rictal bristles are present. There is a correlation between larger bills and small islands in the Louisiade White-eye. The bills of the Mauritius Olive White-eye and the Reunion Olive White-eye are the longest in the white-eye family, as also are the tongues; the bills, long, fine and curved, are almost identical to those of the specialized honey-eating sunbirds in the family Nectariniidae, in addition to which the thick legs appear to be

Feathers provide birds with their means of movement, their insulation, and much of their colour. Feather care is thus an essential daily activity for all birds. This **African Montane White-eye** is using its bill to preen its underwing-coverts. It nibbles individual feathers, delicately mandibulating each part of the feather in order to restore feather structure and remove dirt and other unwanted extras. The **African Montane White-eye** inhabits a variety of wooded habitats, particularly highland forest above 1500 m, from Eritrea south to Tanzania.

[*Zosterops polioastrus kikuyuensis*, Mount Kenya National Park, Kenya. Photo: Greg & Yvonne Dean/World Wildlife Images]



Close physical contact is an integral part of white-eye sociability. *Zosteropids* regularly huddle together, and in some species they roost communally.

Allopreening and heteropreening are also important forms of social behaviour. The **Japanese White-eye** being preened sits in a hunched position, with feathers fluffed out and head tilted back.

This posture facilitates the preener's access to the areas that a bird cannot reach itself, particularly the throat, eyes, ears and neck. The direct benefits of such heteropreening include tactile stimulation and the removal of ectoparasites, but its main function is probably to strengthen social bonds.

[*Zosterops japonicus japonicus*, Tobishima, Yamagata-ken, Japan. Photo: Hirozo Maki]

adapted for the various awkward positions adopted in order to reach flowers. In the genus *Lophozosterops*, the bill is small and slender, the culmen slightly curved, and the nostrils are covered with a membrane.

The typical long, slender, tubular, slightly curved tongue of the white-eyes is double-cleft, with each of the four ends fimbriated at the tip. This is apparently an adaptation for feeding on nectar and pollen. A brush-tipped tongue is found without any known exception in all Zosteropidae, even in the aberrant genera *Woodfordia* and *Rukia*, and nectar-feeding must therefore be a quite old habit of the family. The lacinate tongue of the Reunion Olive White-eye is the most deeply cleft of that of any member of the family. The tongue of *Apalopteron*, which was formerly assigned to the Meliphagidae, is quadrifid only at the distal end. Finally, the Cinnamon Ibon's only slightly bifid tongue, with just a short fringe laterally, is one among several reasons to assign this species to a family of its own (see Systematics).

In *Zosterops*, the wings are in general short and rounded, with the third to fifth primaries, P3–P5, the longest and of about equal length, while the first, outermost, primary (P1) is vestigial. In some species, the wing length increases by 0.7 mm with every 300 m of increasing altitude. Migratory populations of birds tend to have pointed wings, expressed in the possession of a relatively long second primary, whereas sedentary ones have more blunt wings, with a relatively short P2. In the strongly migratory Chestnut-flanked White-eye and the nominate race of the Silvereye the wings are, indeed, pointed, with a long second primary, this being intermediate in length in the wandering race *chloronotus* of the Silvereye and short in the sedentary *griseonota*. Further, Silvereyes of the Lord Howe Island subspecies *tephropleurus* and the Loyalty Islands race *nigrescens*, two small-island endemics, have blunt wings. Blunt wings are also an adaptation to forest life, and pointed wings to a life in open country. This would explain the relatively pointed wings of the two Afrotropical species the Cape White-eye and the African Yellow White-eye, which range extensively in comparatively open country.

White-eyes generally have medium-small, slender but strong legs with medium-sized toes. They are thus adapted to an arboreal life, and suited to hanging upside-down from twigs, hopping from one branch to another, and similar actions and movements. Adaptation to a terrestrial life by the Bonin White-eye is expressed in its long tarsi. Relatively long toes are a feature of the Rufous-throated White-eye, confined to the Moluccan island of Buru, where they are apparently an adaptation to bark-gleaning.

The plumage of white-eyes seems primarily an adaptation to their favourite environment of green foliage. For instance, the yellow of the Javan White-eye or the Australian Yellow White-eye blends perfectly with the yellowish-green colour of mangrove leaves, and many more such examples can be found. The dry lowland races of the African Yellow White-eye are paler in colour than the humid montane races. In contrast, the nominate race of the Malagasy White-eye of the Glorios Islands and the drier parts of Madagascar is the most yellow of all; a reduction of melanin has been linked to drier climates, in accordance with Gloger's Rule that pigment increases with humidity. The fading of black to brown is known to occur in the genera *Zosterops* and *Chlorocharis*, and the loss of the yellow pigment in specimens kept in spirit, as well as live birds kept in captivity, is well known. Xanthochroism, referred to also as flavism, a condition in which all pigments but yellow are lost, has been reported for the Cape White-eye, as also has the opposite, an almost complete loss of yellow or green. Lutino individuals of the Christmas White-eye, with the green colours replaced by yellow, have been recorded, and albinos of the Slender-billed White-eye and, in contrast, an almost completely melanistic individual of the Silvereye have been documented. Differences in the structure of the plumage exist between subspecies of the Louisiade White-eye, *eichhorni* having harder and stronger feathers than the nominate race; interestingly, the latter is a better colonizer of small islands, and a smoother plumage may be a prerequisite for better flying.

A striking feature of the small-island forms of white-eyes is the tendency to lose the yellow colour and the white eyering, and to increase in size. In the Capricorn race *chlorocephalus* of the Silvereye, under field conditions significant selection was de-

tected in three cohorts of nestlings for wing and tail lengths and culmen depth.

Polymorphism has been described for the Mascarene White-eye on Réunion, but the large-scale modification of the natural vegetation here has undoubtedly changed its balance by altering the parameters of optimal adaptation. The white rump patch of this species is unusual among white-eyes and it seems to play a part in the "follow-my-leader" behaviour of its flocks, in which the patch is conspicuously displayed in flight.

The average number of feathers, filoplumes excluded, of an adult white-eye totals approximately 3300, which is comparatively many for a passerine. Moulting is therefore a subject of interest. The eastern populations of the Cape White-eye start to moult about one month after the western ones, this correlating well with early breeding of the latter; the duration of primary moult does not differ among the populations and is possibly a species-specific trait. The main moult takes place in a period of one to three months after the breeding season, but some species, such as the Bridled White-eye in the North Marianas, moult and breed throughout the year. Migratory subspecies of the Silvereye, such as the nominate race, begin their moult, and complete it, earlier in the year than members of the non-migratory subspecies, such as *cornwalli* and *westernensis*, and they also exhibit a general uniformity among individuals in timing and duration, whereas the two more sedentary races show a greater degree of variability among individuals. Moulting is of the normal passerine type, in which the primaries are normally shed and replaced from the tenth outwards to the second. In captivity, the moult of juvenile Oriental White-eyes into adult plumage begins at an age of 20–23 days. Full moult of the juveniles takes place in August, when the wing and tail feathers also are replaced; in the same period the adults undergo their summer moult, whereas juveniles of a third brood start to moult in mid-September. In India, the Oriental White-eye's moult is completed in 8–9 weeks; the secondary moult was noticed after primary moult had a score of 15 (BTO scoring system); the number of primaries in growth at any one time varies from one to three, but the majority of individuals examined had only two feathers in growth simultaneously. The tail-feather moult sometimes commences before primary moult has started. Interestingly, in Cape White-eyes, feathers soiled with nectar were shed outside the moult periods, and this could be a general feature of short-billed nectarivores.

The eyering of white-eyes, which is such a prominent character of the family, ranges from being broad to being narrow, and

White-eyes bathe freely and regularly in various water bodies. This Australian Yellow White-eye is bathing in shallow water amidst mangroves, its principal habitat. White-eyes bathe by crouching in the water and flicking the wings to shower water droplets over the upperparts. The extent to which the bird gets wet depends on the occasion. Cleaning the feathers and underlying skin requires a thorough soaking. Making them more pliable to facilitate preening, on the other hand, merely needs them moistened.

[*Zosterops luteus balstoni*, Crab Creek, near Broome, Western Australia, Australia. Photo: Don Hadden]



in several cases is rudimentary. The ring consists of scale-like feathers, which are white on most species, but can also be dark grey, as on the Santa Cruz White-eye, or black, as on the Mountain Black-eye, or yellow, as on the Yellow-spectacled White-eye, and it may have recognition value. A few *Zosterops* species, the Dusky White-eye being an example, lack a contrasting eyering altogether. In the case especially of the African Montane White-eye, the eyering is very well developed. The eyerings of some sympatric and extremely similar-looking species, such as the Oriental and Japanese White-eyes, are much the same in appearance, and the function of this feature may therefore be of intraspecific importance. Some observers have hypothesized that the delay in the development of the eyering until the precise age at which the chick is fully capable of flight, 23 days in the case of the Japanese White-eye, is a mechanism to protect the vulnerable young from aggression by adults other than the parents. This assumes, of course, that the white eyering is a device that provokes aggression.

One of the very few species of white-eye that really does have white irides is the Plain White-eye, most other members of the family having eyes ranging in colour from greyish-white to reddish and to dark brown. The eye colour of the juvenile is usually somewhat duller than that of the adult. The large eyes of the Golden White-eye are said to be an adaptation for life in the shade of its understorey habitat.

With very few exceptions, one such being the subspecies *meyleri* of the Golden-green White-eye, the members of the Zosteropidae have a dull black, short-feathered loreal line, which interrupts the white ring anteriorly. The function of this dark line is uncertain, but it has been associated with the food-searching behaviour of open-bill probing, known as "Zirkeln", in which a bird pushes its bill into a small hole or crevice, opens it with some force, and looks down its bill in order to inspect the hole for something edible. The black line guides the bird and prevents reflections that could otherwise hinder its view, important only if the eyes can be focused to a distance of only a few centimetres. A groove, imbedded in the skull between the eye and the bill, improves vision; although the eyes are not in one line with this groove, which would be ineffective on account of the slight curvature of the bill, they are so with the anterior part of the bill, the part which is active in the *Zirkeln* movement. This groove, inci-

dentally, is found in the skulls also of starlings (Sturnidae) and New World blackbirds (Icteridae), and it is interesting that these avian groups, too, practise *Zirkeln*.

Only a few cases of sexual dimorphism have been reported for white-eyes, and even these indicate very slight differences between the sexes. In Chestnut-flanked White-eyes, the males have black lores, whereas those of the females are grey. In the so-called "Kulal White-eye" the subspecies *kulalensis* of the African Montane White-eye, the females are reported as only faintly yellowish-white on the belly, and have paler grey sides and flanks than those of males. Male Silvereyes reportedly have darker or more reddish flanks than females, although this may be the case only during the breeding season. In most white-eye populations, including the genera other than *Zosterops*, the males are on average 1–2% larger than the females, as expressed by wing length, but in the case of the Golden White-eye the males are up to almost 10% larger than the females in wing length. Females and males of the Japanese White-eye on Hawaii, however, do not differ in weight, the average for 568 individuals being 11.12 g. Female Oriental White-eyes may have slightly longer wings than those of the males, but the tail is shorter, and they weigh only slightly more. Similarly, the males of the Seychelles Grey White-eye are sometimes slightly smaller than the females. In Sri Lanka White-eyes, females as a rule have a greener-tinged yellow throat than that of males, and at times they have the eyes reddish rather than light brown. Apart from slight differences in size and, seasonally or not, in colour, the sexes of Silvereyes, and undoubtedly those of more species, differ in some call notes (see Voice).

Juveniles of the Zosteropidae are generally very similar to or identical to the adults, although those of a few species may be identifiable to age. For example, juvenile Oriental White-eyes have a duller yellow coloration and a narrower eyering, with a dark grey loreal stripe that later becomes black. Juveniles of the nominate race of the Grey-brown White-eye are darker in plumage than the adults, and have a conspicuously yellow bill with a dark tip. In most cases, the eyering starts to appear at around 17 days, first below the eye and then above it, and is fully developed in about five weeks, as illustrated by, for instance, the young Cape White-eye. Young Reunion Olive White-eyes gain the eyering very rapidly, whereas it takes a much longer period to



In arid areas or during the dry season, water is often a precious commodity and water bodies of sufficient size for bathing are frequently in short supply. Little wonder then that such gregarious birds as white-eyes regularly bathe together. This flock of **Silvereyes** is taking advantage of the opportunity offered by a tiny but nevertheless eminently suitable rock pool. Some species of white-eye are known to bathe in dew, wet foliage and rain, and this is probably true of most family members.

[*Zosterops lateralis*, Jervis Bay, New South Wales, Australia.
Photo: Graeme Chapman]

As is typical of sociable birds, white-eyes are very vocal. The family as a whole, and the genus *Zosterops* in particular, are fairly homogeneous in terms of vocalizations. Members of a foraging flock maintain contact through calls that recall those of newly hatched domestic chickens. Alarm calls are sharper and have an instantaneous effect on flock members, prompting them to flee. Most *Zosterops* sing primarily at dawn, and their song is described as resembling morse code. That of the **Oriental White-eye** is a short feeble jingle, and is given only during the breeding season.

[*Zosterops palpebrosus egregius*,
Kodaikanal,
Tamil Nadu, India.
Photo: Hanne & Jens
Eriksen]



acquire the blackish face of the adults. By the age of 30 days the juveniles are indistinguishable from the adults.

Habitat

White-eyes are found in a large variety of habitats and climates and at a wide range of altitudes. From extreme low elevations, such as offshore islets and mangroves, to the highest mountain tops, they are often one of the most abundant birds. On certain small islands they can even comprise 30% of the passerine avifauna, as on Norfolk Island, where three out of ten of the native passerines are white-eyes.

The habitat tolerance of mainland white-eyes and the amazing capacity of some species, notably the Silvereye, for crossing hostile habitats have been important factors in speciation processes, as these characters have made white-eyes excellent colonizers of remote islands. Disturbed habitats, such as open woodland, urban parks and the like, are often colonized from natural habitats with similarly simple vegetation structures, in particular mangroves. One of the possible reasons why the Silvereye and its relatives are able to exploit such a wide variety of environmental conditions lies in its ability to reduce its daily energy expenditure by employing nocturnal hypothermia, in which the body temperature fluctuates from day to night by as much as 5.5°C, and the resting metabolic rate and conductance are reduced by up to 50%. Daily fluctuations in, especially, metabolic rate are more pronounced in winter than in summer; this should maximize energy use and increase the probability of survival of this typical island-colonizer. White-eyes living naturally at higher latitudes, typified by the Japanese and Chestnut-flanked White-eyes, may experience extremely low ambient temperatures, but temperatures of minus 5° C have reportedly been endured by Oriental White-eyes of tropical origin kept in captivity in the UK. The race *egregius* of the Oriental White-eye in India also seems rather hardy, and a party of eight or nine reportedly remained high up in the mountains during the winter of 1906–1907. Owing to their lack of specialization in the driest areas, and even at the end of the worst droughts in southern Africa, white-eyes are able to find food in the form of various berries, such as those of *Rhus* and *Lycium*, and nectar.

Mutual exclusion has resulted in a checkerboard pattern in the distribution of the twelve *Zosterops* species occurring in the Moluccas and the New Guinea region, including the Bismarcks.

A situation of “first come, first served”, or slight competitive advantages related to small ecological differences among the islands, determined which were the locally successful species. Very small islands appear to be not large enough for the co-existence of both white-eyes and honeyeaters. On the atoll of Sapwuahfik, known also as Ngatik, near Pohnpei, in the Carolines, no white-eyes occur, but the Micronesian Honeyeater (*Myzomela rubrata*) is very common there. In the Solomons, the islands of Mono, Murray, Russell, Ramos, Savo, Gower, Santa Ana and Ongtong Jawa have no white-eyes, and in the West Papuan Islands, off north-west New Guinea, the same is true of the islands of Waigeo, Salawati, Batanta and Misool. The *Zosterops* species on Sulawesi more or less replace each other geographically, as illustrated by the distribution of the Lemon-bellied White-eye compared with that of the Black-ringed White-eye (*Zosterops anomalus*), and by the comparative distributions of the Black-crowned and Pale-bellied White-eyes. In north Sulawesi, the Black-crowned White-eye is found on Mount Emoung, whereas, on the nearby, slightly higher Mount Lokon, it is the Oriental Mountain White-eye that is present. In the north Sumatran mountains, the Black-capped White-eye (*Zosterops atricapilla*) is abundant in the absence of the Oriental Mountain White-eye, which occurs elsewhere in the highlands of that island.

The greatest number of white-eyes is found in the Solomon Islands. Eleven species occur here, but most replace each other geographically, and no more than two species co-exist on any one island. Some of the species are separated by narrow sea gaps, in extreme cases of only 1.7–2 km. In general, forest-dwelling white-eyes are highly sedentary and have restricted ranges, whereas the successful colonizers of distant islands are typical of low coral islands, as illustrated by the Lemon-bellied White-eye, and open woodland, as in the case of the Silvereye.

Other than by altitude, for which numerous cases are known, habitat segregation among species is found in several places in southern Africa, such as north Namibia and east Botswana, where the Cape White-eye occurs in open woodland and the African Yellow White-eye occupies evergreen forest and coastal bush. Habitat preferences can vary within one and the same species, as with the Oriental White-eye, both montane and lowland races of which are found adjacent to each other in, for example, Sumatra. In the case of the Lemon-bellied White-eye, the subspecies in the far east and that in the far west are restricted to small islets, although sometimes with seasonal movements to adjacent mainland areas; in the central part of its range the species is widely



White-eyes such as the **Sri Lanka White-eye** have a varied diet. Insects appear to provide the bulk of the nutrition for the vast majority of species, but fruits, berries and nectar are also consumed to a notable extent. The combination of this dietary plasticity and the ecological adaptations of the Zosteropidae have caused the family as a whole to develop a wide variety of foraging techniques. When searching for arthropods, they may glean a prey item from a surface while perched or hovering, probe a crevice or other cavity, or sally to capture an insect in mid-air.

[*Zosterops ceylonensis*,
Hakgala Botanical Gardens,
Central Province,
Sri Lanka.
Photo: Andy & Gill Swash]

distributed on large islands such as Sulawesi, where it is found at elevations of up to 1800 m.

The two members of the family present on Saipan, in the Northern Mariana Islands, namely the Bridled White-eye and the Golden White-eye, can persist on this tropical island despite periodic typhoon damage and human-caused habitat change. This is believed to be due to their high flexibility in habitat choice and their ability to use a range of foraging methods. They are able to forage in various tree zones, to change to different foraging surfaces, and to feed both in herbaceous vegetation and on the ground. It was found that there was no difference between the two main habitat types, limestone forest and the far more simple-structured "tangantangan" thickets, with regard to the amount of time that the birds spent on four different foraging modes. For the Bridled White-eye, gleaning accounted for 92.1% of its foraging time, probing for 5.1%, hovering for 2.5% and sallying for 0.3%; the corresponding figures for the Golden White-eye were 75%, 23%, 2% and 0%. Although the two species differ in foraging ecology, they appear to compete for food resources.

Population sizes of Australian Silvereyes in vineyards are influenced by the local abundance in flowering of two species of eucalypt trees, the grey box (*Eucalyptus microcarpus*) and the marri (*Eucalyptus calophylla*), but also by the prevalence of downy mildew, which suppresses the quality of the grapes. In the south-east of the country, it has been shown that only juvenile Silvereyes move into vineyards near Sydney, while the adults stay on their breeding grounds. In the south-west, migratory Silvereyes move through the area north of Perth in June–July, when nectar production is high.

General Habits

Rather a lot is known of the natural history of white-eyes, but much of it is based on studies of only a few members of the family. The Silvereye, as it is readily trapped and ringed, has been the subject of a number of studies focused on social behaviour, migration and other aspects of wild-living individuals. The Oriental White-eye is often kept in captivity, and much information on this species' social behaviour and breeding biology has therefore been gathered. Of the African members of the family, the Cape White-eye especially is well studied under field conditions. The Bridled White-eye is an example of a well-studied small-island endemic. Altogether, it appears that white-eyes are similar in their life his-

stories, and what is observed for one of the better-studied species is generally applicable to many other zosteropid species.

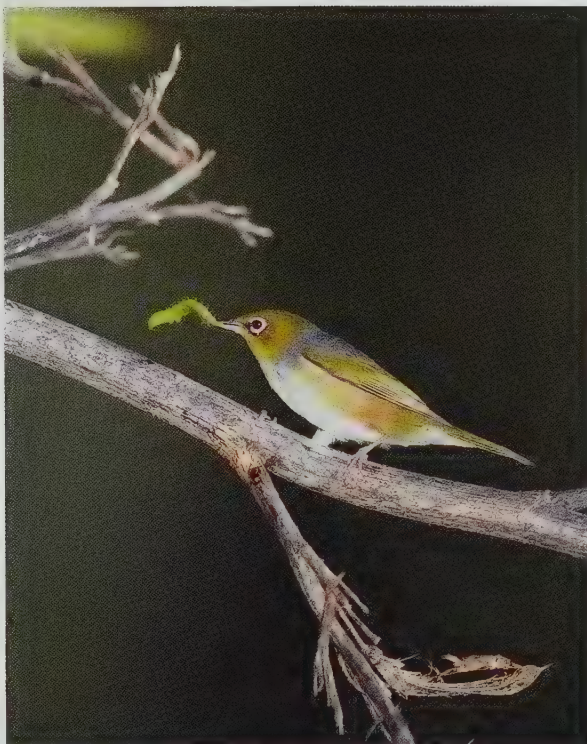
White-eyes are distinctly social. They congregate in small or, especially outside the breeding season, in large flocks, which move rapidly through bushland, orchards, gardens and other habitats, calling constantly as they move. The flocks of, for instance, Japanese White-eyes are formed by parent birds, which join together after breeding, and juveniles, which remain in flocks until the following breeding season, often near their natal territory. In the case of Silvereyes, the first, early immatures form the core of the post-breeding flocks, which in the course of the breeding season are joined by moulting adults that have completed their last broods. Unlike most white-eyes, the Mascarene White-eye associates in flocks throughout the year.

Flocks are very cohesive and ringed individuals in parties of Silvereyes have been retrapped together after intervals of several years. The members of Abyssinian White-eye flocks move between trees in ones and twos, creating pairs, which perch and forage closely together while travelling. The flight of Cape White-eyes between trees is generally rapid, straight and level, with bursts of flaps, but without undulating. Within flocks, African Yellow White-eyes generally keep in twos or threes, the former not always mated pairs. These "clumping alliances" fly and forage together, but their membership often changes. Many times during the day the members of such alliances stop foraging in order to preen one another, this behaviour being a form of sublimated aggression. There is constant quarrelling among flock-members, and a dominant individual will pursue another in short flights within trees, displacing it from several perches in succession. The supplanting by several dominant white-eyes is immediately followed by a higher intensity of foraging and by onward movement of the flock. Individual Bridled White-eyes can be attracted to playback of recordings of various flocking calls, and Silvereyes can recognize the calls of their mates in flocks.

Large flocks containing hundreds of individuals have been recorded for Sri Lanka White-eyes and Oriental White-eyes, and winter flocks of Silvereyes reportedly can comprise as many as 500 birds. In contrast, some large species, such as the White-chested White-eye, have lost the habit of being social and living in parties, but one of the other large zosteropids, the extinct Robust White-eye, is known to have lived in flocks. Smaller flocks are formed by the Golden White-eye, which typically occurs in family groups of three or four individuals. The genetic variation that has been assessed within and between flocks of Cape White-eyes at several

Many species of white-eye forage thoroughly and systematically, a process known as the "trap-line" method. A flock may take the same route around the territory at the same time each day, each individual carefully scouring vegetation for lurking arthropods or ripening fruits. The **Silvereye** feeds mainly by gleaning or probing. Its main animal prey comprises earthworms (*Oligochaeta*), spiders (*Araneae*) and insects like this caterpillar (*Lepidoptera*). Caterpillars may be prepared for consumption by being beaten against a branch and compressed by the bill.

[*Zosterops lateralis lateralis*,
Tiritiri Matangi Island
Open Sanctuary,
New Zealand.
Photo: Tui de Roy/
The Roving Tortoise]



localities showed that the flocks are cohesive units. Flocks of the Bridled White-eye on the small island of Saipan have characteristics intermediate between those indicative of permanent membership and those suggesting that the flocks are site-dependent.

In mixed-species foraging flocks white-eyes are often core species, determining the direction in which the flock moves. Various reasons have been given to explain the formation of mixed-species flocks, examples being the avoidance of predation, the flushing of insects, and the enhancing of foraging efficiency. On Mahé, flocks of Seychelles Grey White-eyes are frequently accompanied by Seychelles Sunbirds (*Cinnyris dussumieri*); the latter leave their haunts in temporarily insect-poor vegetation in order to join the white-eyes in tight flocks at insect-rich trees. An explanation for this behaviour is that the usually solitarily foraging and intraspecifically aggressive sunbirds benefit from the momentum of the white-eye flock, which reduces the duration of confrontations, and the sunbirds forage altogether more efficiently. Flocks with two species of white-eye are known to occur in several places, examples being parties containing New Guinea and Black-fronted White-eyes in eastern New Guinea, Yellow-throated and Grey-throated White-eyes on Bougainville Island, and Oriental and Oriental Mountain White-eyes in east Java, but different subspecies, too, may mix in areas where both overlap in range. In north-east South Africa, three taxa have been found in single flocks, the races *virens* and *atmorii* of the Cape White-eye mixing with African Yellow White-eyes. Although white-eyes associate with other species in bird parties and travel with them, the association often appears to be a loose one and the white-eyes are often seen to be detached from the rest.

Resting and sleeping postures adopted by white-eyes include one in which the head is partly or entirely hidden in the bend of the wing or in the back feathers, one with the bill resting on the breast, one in which the head is sunk between the shoulders in typical warbler fashion, and, finally, a posture in which the bill is pointed slightly upwards. A most peculiar way of sleeping, observed for captive Oriental and Japanese White-eyes, involves the bird hanging upside-down, the claws clinging tightly to the wire-netting roof of the aviary; this posture may be influenced by the birds' disturbed physiological condition, such that they look for the highest position in their cage. If possible, white-eyes will roost together with at least one partner. They move on to a roosting perch while uttering contact calls, and restlessly shuffling around; the feathers are somewhat fluffed, and some individuals briefly preen. At dusk the white-eyes are distributed in small

resting groups of three to five or more individuals, but with increasing darkness these groups merge into one row of tightly huddled birds, often covering each other with the wings and tail. The birds in one row do not necessarily face all in the same direction, and one individual can look as if it has two or more heads.

Ten to fifteen Japanese White-eyes were found to be coming to a communal roost every night, and Oriental White-eyes and other species are known to gather in large roosts. Indeed, the largest recorded roost for Oriental White-eyes, on an islet in Thailand, held as many as 750–1000 individuals. The urge for contact is so strong in white-eyes that even individuals of species belonging to other families are accepted as sleeping and preening partners; various estrildids and even quails (*Phasianidae*) have been reported as partners in captivity. Birds with similar plumage colours, olive above and yellow below, are, however, not tolerated. In a captive mixed flock of Silvereyes and Australian Yellow White-eyes, separation of the species occurred during roosting, and this coincided with a very subdued musical twittering suggestive of subsong; it is possible that this vocalization, in addition to the colour of the plumage, functioned in keeping the two species apart. Birds with more than normally fluffed feathers are especially attractive, almost irresistibly so, even in the presence of conspecifics. Abyssinian White-eyes roost in trees, two perching huddled close together; in the heat of midday, flocks sit in rows along sheltered twigs, dozing, loafing, warbling and preening. Bonin White-eyes always roost in pairs, with only a single pair in any one tree; only very seldom are two pairs found in the same tree, but they are then separated by a distance of two metres or so.

As with many other bird groups, fighting and threat displays are common among the comparatively aggressive white-eyes, which are well armed with their relatively long and sharp bill. Oriental White-eyes and Silvereyes have been described as using the half-open bill to peck the opponent, preferably in the nape and rump, and pulling at feathers, including those of the wing or tail, but never do the bills of the two rivals touch. When two antagonists fly upwards in aerial combat, the lower one will always beat a retreat. Various threat displays associated with aggressive behaviour have been noted for Silvereyes, including the commonly observed "wing-fluttering" and, in addition, the "head-up" posture, "beak-clattering" and pecking. Other elements of low-intensity threat behaviour include holding the bill open, pushing the body forward, and the challenge call. The flared eyerings and the yellow gape would seem to be two attributes for an in-

No information has been published on the diet of the **Creamy-throated White-eye**, which inhabits a few islands in northern Indonesia. Given the comparative dietary homogeneity of white-eyes, this species probably takes insects and other small arthropods. This individual has located a snail, which it may have located by open-bill probing into a crevice, a technique known as Zirkeln. The crevice may be in bark, twigs or even rolled-up leaves. The white-eye forces the edges apart with its bill so that it can investigate the contents.

[*Zosterops atriceps fuscifrons*,
Foli, Halmahera,
Moluccas.
Photo: Ong Kiem Sian]



timidating threat display. Threat display by Silvereyes is performed more often against higher-ranked opponents and unfamiliar opponents, and when prior food deprivation was of short duration; attack is used more often against lower-ranked and/or familiar opponents and after food deprivation of 90 minutes. Chasing occurs among breeding birds as a means of territory defence.

Occasionally, Bridled White-eyes can be seen to communicate with flock-members by tilting the head at a 45-degree angle, moving the head from side to side, and flicking the wings, while giving whining calls. The same calls are used during chases of a third individual by a pair, and during mobbing of presumed predators.

Within foraging flocks of African Yellow White-eyes there is a high level of aggression. A common posture employed to denote threat is that of crouching with the bill held wide open and the plumage sleeked. If unsure whether to pursue or to flee, a perched individual, with the body held stiffly and the bill pointing downwards at about 45 degrees, pivots slowly from side to side through 30 degrees or so without pausing at the turn, and without uttering a sound. Between spells of pivoting it calls loudly. Another, more common posture of the Oriental White-eye is "wing-dropping", in which the perched bird adopts a stiff-bodied posture, with the bill pointed down, the wings drooping loosely to leg level and quivering in short bursts, and the wrists held away from the body. During foraging, challenges are indicated by bill-snapping. Submission is shown by freezing while fluffing the crown feathers and sometimes opening the bill, or by fluffing up the crown and back feathers, or by fluffing the entire plumage and half-closing the eyes so that the white eyering becomes an oval shape. Aggression often sublimates into allopreening, of which appeasement and courtship are derived behaviour.

Among Bridled White-eyes, dominance relationships within flocks are suggested by the frequent chases and supplanting on perches. Fighting within wintering flocks of Silvereyes is believed to have the function of establishing and maintaining the social hierarchy and organizing the sharing of various objects among the individuals in a flock; this contrasts with the situation in summer, when breeding pairs have their individual territories and tend not to form flocks. About two-thirds of the winter fighting by Silvereyes takes place over food, in particular pieces of fig (*Ficus*) and insects longer than 8 mm, the frequency of fighting increasing with the item's energy contents, much in accordance

with cost-benefit theories. Fights over food also last longer than do other conflicts.

There is much variation in aggressiveness between the sexes, but in Silvereyes the male tends to be the dominant sex and may defend the territory more vigorously than the female does. At the nest and in its immediate vicinity, however, the female is dominant over the male. With this species, there is no correlation between lengths of wing, tail, tarsus and exposed culmen and the dominance class. Under crowded conditions, subordinate birds may be eliminated more quickly by increased aggression of dominant ones, and food shortage towards the end of the winter may have little effect on dominants. Such a case, though rather exceptional, was described for the Silvereyes of Heron Island, in the southern Great Barrier Reef, in 1968, where an influx of mainland birds of the subspecies *cornwalli* boosted the local population of the much larger *chlorocephalus*. Although some mainland individuals were aggressive, they had little access to patchily distributed stationary food items, such as figs, as these were successfully defended by dominant island residents. At feeding stations some mainland Silvereyes continued to attempt to feed, but they sustained severe head injuries from attacks by the larger subspecies. Many mainland individuals were found dead on the island.

Territoriality is not of the same intensity throughout the white-eye family. Generally speaking, white-eyes seem to defend the area within a short radius of the nest, but they are non-territorial outside this area and, obviously, when foraging in flocks. During the egg-laying and incubation stages, Oriental White-eyes defend the nest vigorously against any intruders, threaten them with bill-snapping, and chasing them far beyond the borders of the territory. The Cape White-eye, on the other hand, does not exhibit territoriality and does not occupy songposts. No evident territoriality is known to exist in the African Montane White-eye, either, and two nests of this species were once found together with three nests of Abyssinian White-eyes in a small bamboo clump. Reunion Olive White-eyes are not social, occurring in isolated pairs, and they are highly territorial throughout the year in relation to flowers; they spend much of the time in aggressive chasing and chattering. Similarly, the Golden White-eye is territorial, and defends its territory boundaries against other males; it also responds to playback of its recorded song. When one Giant White-eye male begins to sing, others in the vicinity do likewise and a chorus ensues; after a while they all suddenly stop and dash away into



The fact that insects provide the bulk of the diet of white-eyes should not conceal the important nutritional contribution of fruit. The **Black-capped White-eye** of the foothills and montane forests of Borneo and Sumatra feeds on a variety of small fruits, including those of wild raspberry (*Rubus*), mistletoes (*Loranthaceae*) and purple figs (*Ficus*) of just a few millimetres in length. During a drought, this white-eye was also recorded taking grass seeds. Small flocks of Black-capped White-eyes forage in fruiting trees in the lower and middle storeys of forest and in shrubby vegetation on the forest edge.

[*Zosterops atricapilla atricapilla*, Kinabalu Park, Sabah, Borneo. Photo: John & Jemi Holmes]

Research into the diet of the **Silvereye** has revealed that it consumes the fruits of a number of trees and shrubs. It prefers medium-sized fruit, over 4 mm long; larger fruit contains relatively more flesh and thus offers greater energetic reward. To minimize the energetic costs of feeding on larger fruits, the Silvereye often penetrates the skin of the fruit and extracts the pulp from around the seed, rather than consuming it whole. When fruit is scarce, Silvereye flocks often venture into orchards and vineyards to raid commercial harvests. In Australia, such behaviour has resulted in the Silvereye being called "Grape-eater", and being regarded as a pest by some farmers.

[*Zosterops lateralis lateralis*,
Golden Bay, South Island,
New Zealand.
Photo: Tui de Roy/
The Roving Tortoise]



the vine tangles, bursting into song again some 15–30 minutes later from a different group of trees.

The Bridled White-eye appears socially subordinate to the three other small forest passerines occurring within its range, these being a larger white-eye, a fantail (*Rhipidura*) and a honeyeater. It is always the object of chasing or supplanting on perches by these other species; indeed, a Bridled White-eye can be seen to wait for the larger and dominant Golden White-eye to finish feeding at a cluster of fruits before flying to the food source to investigate it for itself. In complete contrast is the behaviour of the extremely aggressive and inquisitive Mauritius Olive White-eye; this species chases bulbuls, Red Fodies (*Foudia madagascariensis*) and Mascarene White-eyes out of its territory, although it will tolerate fodies if both species are at the same feeding site. No interspecific aggression initiated by Bridled White-eyes has been recorded, other than the scolding of a Collared Kingfisher (*Todiramphus chloris*). Seychelles Grey White-eyes have been observed to exhibit interspecific aggression, towards fodies and Seychelles Black Bulbuls (*Hypsipetes crassirostris*), only near nests. In Hawaii, serious competition with the native honeycreepers (Drepanididae) has been cited as an important factor in the decline of the latter, but there is no conclusive evidence of competition for nesting sites or food, as little is known about behavioural interactions between native birds and the introduced white-eyes. Normally, Japanese White-eyes in Hawaii permit other bird species to nest and feed within their territory without aggression, and trees in heavy fruit or nectar are not defended. In fact, there are reported cases of Japanese White-eyes being kept away from nest trees or feeding territories by introduced Red-vented Bulbuls (*Pycnonotus cafer*) and native Elepaos (*Chasiempis sandwichensis*). On flowering trees, the Silvereye is aggressive only towards conspecifics, and is chased off by the larger honeyeaters, and even by the smaller Scarlet Myzomela (*Myzomela sanguinolenta*). Golden White-eyes chase other birds, such as Eurasian Tree Sparrows (*Passer montanus*), Bridled White-eyes and other Golden White-eyes, from its nest. A male Giant White-eye will chase starlings and kingfishers from the tree in which it happens to be singing.

In captivity, the feeding of young House Finches (*Carpodacus mexicanus*) by mature Japanese White-eyes in the same cage has been reported. The finches even approached the white-eyes to be fed, although there was an adult finch in the same cage. Later,

nestling House Sparrows (*Passer domesticus*) were fed by the same white-eyes. The Japanese White-eye has been seen to feed a wild nestling House Finch in Hawaii, and a pair of Oriental White-eyes was observed to visit, and possibly feed, the young of a pair of Asian Paradise-flycatchers (*Terpsiphone paradisi*) in a nest 2 m from the white-eyes' own nest on the same branch.

An interesting hypothesis involves the Tetepare race *tetiparius* of the Solomon White-eye. The white-eye's song is so similar to that of a distant Singing Parrot (*Geoffroyus heteroclitus*) that some authors have suggested that the latter's absence from the island is caused by the white-eye's "jamming" of the parrot's vocal communication system. This, however, seems unlikely, and it is perhaps equally possible that so large a parrot is unable to sustain itself with the limited food resources available on this small island.

Preening is carried out in the same way as it is by most other passerines. The white-eye preens the breast and belly areas, and the neck and back feathers, very intensively. The wing and tail feathers are drawn through the bill, the tail being fanned sideways and each feather pulled forwards; the upperwing-coverts are preened, with the wing slightly raised and held away from the body, the carpal joint is pecked and nibbled, and the underwing is treated from below while the wing is slightly spread. The white-eye scratches the head feathers with the middle claw of one of the feet, for this purpose employing the indirect method of head-scratching whereby the leg is raised over the slightly drooped wing. This scratching begins early in the individual's life, even before fledging. The preening movements are of variable duration, depending on need, and have no fixed sequence. The Japanese White-eye has been observed to perform open-bill probing in its own feathers.

Close huddling and allopreening are also practised. When allopreening, two individuals preen each other in those places which they cannot reach with their own bill, mainly the head, neck and throat, but also the contour feathers in general and even the tail. Sometimes they use open-bill preening, but this has been described for only a few species in the family. During allopreening, which probably serves to reinforce social relationships, the white-eyes are typically seen huddled together in head-to-tail positions, one pulling mainly the rump, belly and tail feathers of the other through its bill. It was once noted that the female preened the belly of the male, which was hanging

under the branch on which the female was perched; only when she got under the wings, or came too close to the cloaca, did the male become unquiet, peck at her and fly off. The contour feathers are treated with open-bill probing, known as *Zirkeln* (see Morphological Aspects), with the bill sunk deeply into the feathers; this has been reported especially for the Cape White-eye. Whether this is a specifically distinct method of allopreening, or is done simply for extrinsic reasons, such as searching for small particles under the feathers, is unclear. With African Yellow White-eyes, the preened individual sits with the legs bent, the body hunched and the plumage ruffled; the other bird nibbles around the eyes, ears, chin and neck, for which the recipient turns its head in order to facilitate the treatment. In the case of Cape White-eyes, the feathers of the throat, the side of the head, including the eyering, and the nape are treated, during which the preened individual points its bill upwards. Although allopreening is reported to be practised by all *Zosterops* species, and the above description of an allopreening session may be considered the standard procedure for white-eyes, it has so far been documented for only a few species.

Even their human attendants are accepted as preening partners by tame white-eyes, which will stretch the neck, fluff the feathers, and turn the head in various directions in order to be scratched. When white-eyes are housed with larger birds, such as mousebirds (Coliidae), these, too, are subjected to preening, and in captivity these other species have been observed while, willingly or unwillingly, they were having the belly preened by white-eyes hanging beneath the perch.

Unlike the situation with finches and weaverbirds (Ploceidae), the fluffed plumage of Oriental White-eyes and Silvereyes is not part of a posture expressing subservience, but always a sign of readiness for contact. During threat, aggression and fleeing gestures, the plumage is tightly sleeked. Eyering-pecking has been observed among Seychelles Grey White-eye during the incubation period, involving helpers at the nest, as well as breeders, and may have a general social function, rather than just courtship. It may also have a function in intraspecific aggression, and in this connection it could explain the delay in the development of the eyering of young white-eyes (see Morphological Aspects), al-

though there are arguments against this reasoning. Feather-plucking by captive white-eyes has been observed, this most likely being a result of boredom.

Bathing is carried out in the conventional way. The white-eye dips the bill into the water, throws the water sideways, crouches in the water, and uses rapid wing movements to bring water over the back, the downward-held tail and beyond. White-eyes are fond of bathing, for which various water sources serve. Oriental White-eyes often descend in the morning to bathe in the dew which carpets the grass, and they also use the wet topmost branches of small-leaved shrubs; this species is also fond of rain showers, even if quite heavy and persistent. Bathing is often done gregariously, and up to 35 Cape White-eyes may bathe together if waterside space permits. A flock first comes down to low bushes, after which a few individuals at a time fly to the water to drink and dive into the shallows, shaking the body and flapping the wings. The birds plunge into dew-laden vegetation and rain-soaked leaves, and they utilize water taps by hanging upside-down underneath them and pecking at drips. In the Comoro Islands, a party of Chestnut-sided White-eyes was seen to bathe in a small water-filled hollow about 7 m up in a forest tree. Tame, hand-raised white-eyes will bath in the dry or wet hand of a human attendant, making all the normal movements as if bathing in a water-filled dish.

White-eyes sometimes sit motionless for two minutes or so, with the wings spread over leaves by the perch, apparently sunning. During sun-bathing the head hangs deeply forwards, often to below the level of the perch, and the body feathers are strongly fluffed up, with the wings spread horizontally. There are no known observations of dust-bathing or sand-bathing by members of this family.

Anting has been reported for the Oriental and Cape White-eyes. After wet weather, the latter species seizes the stingless but venomous ants *Camponotus rufoglaucus* and, especially, *Anoplolepis custodiens* in its bill and rubs the insect along the underside of the flight-feathers, treating first one wing and then the other. Similar behaviour, but with mealworms *Tenebrio molitor* employed, has been seen to be carried out by juveniles in the first 3–5 weeks after fledging, but ants were used later; one individual



While white-eyes tend to favour fruits of small and medium size, they do not ignore considerably larger fruit if sufficiently ripe. Several *zosteropids*, including the **Green-backed White-eye** of New Caledonia, are known to feed on fruit as large as papaya (*Carica papaya*), a tree native to Latin America but now cultivated in many tropical countries. The Green-backed White-eye also consumes berries, including those of Lantana, another widely introduced plant that is taken by many species of white-eye. This species mainly inhabits primary forest, but flocks are attracted into less wooded areas in search of ripening fruits and berries.

[*Zosterops xanchochroa*,
Isle of Pines,
New Caledonia.
Photo: Don Hadden]

Being groove-shaped and brush-tipped, the tongue of white-eyes is well adapted to nectarivory.

These morphological characteristics enable the birds to suck up liquids, such as nectar, without needing to tilt back the head. In turn, this enables the white-eye to imbibe large volumes more quickly.

In spring, **Japanese White-eyes** commonly visit flowering trees such as Japanese apricot (*Prunus mume*), camellia (*Camelia japonica*) and broad-leafed mangrove (*Bruguiera gymnorhiza*).

The species is also renowned for robbing nectar from Hibiscus flowers by splitting the base of the corolla. The short bill of white-eyes means that they are frequent nectar thieves and, consequently, the family is not a particularly important pollinator.

[*Zosterops japonicus simplex*,

Zhangzhou Development Zone, Fujian, China.
Photo: Xue Juzheng]



reportedly used a small stink bug (Pentatomidae) for “anting”, before consuming it.

Known predators of the Oriental White-eye are the Black Drongo (*Dicrurus macrocerus*), and possibly the false vampire bats (*Megaderma*). The Sri Lanka White-eye is reported as prey of the Chestnut-backed Owlet (*Glaucidium castanonotum*), and is known to be impaled by the Brown Shrike (*Lanius cristatus*). Cape White-eyes are preyed on by shrikes, boubous (*Laniarius*) and snakes, and have also been found entangled in spider webs and impaled on cactus thorns. Christmas Hawk-owls (*Ninox natalis*) are known to prey on Christmas White-eyes, remains of which have been found in the owl’s pellets, and the remains of Silvereyes have been found in the regurgitated pellets of the New Zealand Morepork (*Ninox novaeseelandiae*). Despite its abundance in Hawaii, the Japanese White-eye has never been documented as falling prey to cats or mongooses (Herpestinae), but its nests and fledglings are preyed on by both of those mammals, as well as by the introduced arboreal lizard *Anolis carolinensis* and House Sparrows. Somewhat unexpected natural enemies have been recorded for the Silvereye in the shape of the Australasian Bittern (*Botaurus poeciloptilus*) and the Great White Egret (*Egretta alba*), the latter reportedly having developed a special technique for catching and swallowing white-eyes.

Anti-predator behaviour by white-eyes is recorded only sporadically. A Bridled White-eye has been seen to mob a Collared Kingfisher, a presumed regular predator, and in New Zealand the Sacred Kingfisher (*Todiramphus sanctus*) is mobbed by various other birds, among them Silvereyes, which are occasionally caught. The “confusion chorus” of Bridled White-eyes, invariably heard upon the dramatic arrival of a kingfisher, consists of ordinary call notes uttered at maximum intensity and frequency by all flock-members. It lasts for a minute or so, during which time the white-eyes remain stationary. They respond in this manner to the kingfisher only when it is in flight. After it has alighted, the chorus dies down and they resume foraging, only to be thrown again into consternation at the next attack by the kingfisher, which may have been sitting in the same tree with them all the time. The Mauritius Olive White-eye gives distraction displays, feigning injury, when it has young. The Lemon-bellied White-eye practises a similar “exhausted bird” technique to distract the human

observer at the nest, whereby it drops to the ground and fakes lameness; this species sometimes congregates in a large, very agitated chirping flock for seemingly trifling reasons, such as a cat walking on the ground or an arboreal lizard approaching a nest too closely. The discovery of a Sulawesi Owl (*Tyto rosenbergii*) or Grey-headed Goshawk (*Accipiter poliocephalus*) causes much excitement among the white-eyes, and birds of prey are scolded, as are bulbuls and sunbirds. In Hawaii, the Short-eared Owl (*Asio flammeus*) may be mobbed by mixed flocks of introduced Japanese White-eyes and native Oahu Alauahio (*Paroreomyza maculata*) and Iiwis (*Vestiaria coccinea*). Elsewhere, Oriental Mountain White-eyes react to human intruders by scolding and approaching them to a very close distance, and Giant White-eyes will gather around a human observer while creating a loud scolding commotion, with the bill held continuously open and showing the bright orange-yellow mouth-lining. Adult Japanese White-eyes have been seen to lead dogs away from fledglings by flying just ahead of the dog.

Parasites are often regarded as important for elucidating the relationships of their hosts, but insufficient is known of this subject with regard to the white-eyes. Nevertheless, a large number of species, mainly of Protozoa and Sarcophagales, have been found on and in white-eyes. Surprisingly, chewing lice (Mallophaga) are virtually absent among the parasites, although two genera were found on Bare-eyed White-eyes. *Haemaphysalis* blood parasites were found almost universally and Microfiliariae were present in about 15% of Bridled White-eyes on Saipan and Tinian, but neither parasite was found in the Guam race of the same species. On Mauritius, both the Mascarene White-eye and the Mauritius Olive White-eye are extremely sedentary, and this is expressed in the incidence of endoparasites: both species are heavily infested by the endemic *Leucocytozoon zosteropsis* in the undisturbed native forest, where the avian malaria *Plasmodium* does not occur at all. In disturbed upland native forest both parasites are found in the Mascarene White-eyes, and some individuals even carry both of them. In lowland exotic plantation no *Leucocytozoon* occurs, but about a third of the Mascarene White-eyes were infested with *Plasmodium*. Avian malaria may limit the distribution of these species outside the undisturbed forest. Avian poxes were found in 13.5% of the Silvereyes captured in



As is frequently the case with white-eye taxa that occur only on remote islands, little is known about the diet or foraging strategies of the **Chestnut-sided White-eye**. This species has been recorded feeding on vegetable matter, caterpillars (Lepidoptera), other insects, and spiders (Araneae), but probably also consumes nectar. It is the only member of the genus *Zosterops* within its restricted range on islands in the south-east of the Comoro archipelago. The species inhabits forest, open woodland and mangroves.

[*Zosterops mayottensis*, Mayotte, Comoro Islands. Photo: Roland Seitze]

1978 in Western Australia, when they were very numerous. The mildly pathogenic parasitic *Ataxoplasma paddae* has been found in, for example, the Rennell White-eye and the Bare-eyed White-eye, and it appears to occur in many species of the family Zosteropidae.

The daily activity pattern of white-eyes exhibits two peaks. The first is in the early hours of the morning, when the birds are busy with foraging, and the second, after a resting period around noon, is in the late afternoon, shortly before or after sunset, when they gather in loudly twittering groups for roosting. During the day the birds spend the time mainly in working through the vegetation, interspersed with resting periods of various lengths during which they huddle together, preen or take a nap. The following account of a typical winter day in a Cape White-eye's life may be regarded as representative of many other white-eye species. In the early morning, pairs, which have been roosting during the night, awake well before dawn, but remain huddled for 15 minutes or so. They then rouse themselves, stretch the wings and legs, and fly to a place up to 400 m away where pairs and single individuals assemble in a tall tree, such as a *Eucalyptus*, often the same tree being used for up to a week. Still well before dawn, the assembled flock then moves out and starts to forage in surrounding vegetation. As the day unfolds, the single large flock splits up into smaller groups, these foraging widely and independently of each other. Their composition changes constantly as pairs or individuals leave or join from other parties. Towards the end of the day, most small flocks have disintegrated into pairs. After a tree has been worked over by a flock, one white-eye flies to the next tree, soon followed by the remainder, flying over in pairs and singles. From time to time the birds settle to rest in a tree, to doze, or to preen themselves or, two huddled side by side, preen each other. Foraging is often alternated with brief spells of social excitement, including wing-flicking and tail-flicking, dashing flights between bushes, chases during which clicking noises are made with the bill or wings, and quarrelling, in which two individuals flutter together in mid-air and fall earthwards, soon separating. At sunset a large flock reassembles, and from this the pairs disperse to roosting sites. During the night, the white-eyes sleep on a small branch, in pairs, the partners close to each other and facing in the same direction, with the head tucked in the back feathers.

Voice

White-eyes are highly vocal, and their voices, although rather weak and simple, are quite far-carrying. When heard from a whole flock, the cumulative sound is a loud one. The contact calls are given at all times of the day, but especially in the early morning and late afternoon. When alone or in small flocks, however, white-eyes are usually silent. The primary song is delivered during 20–45 minutes around sunrise, sometimes starting 45 minutes before, and is given sporadically also throughout the day. Bonin White-eyes are occasionally observed to sally from perches and then perform song flights.

The members of this family present relatively little variation not only morphologically, but also acoustically, and this is true particularly of the genus *Zosterops*. Even distantly related forms, such as the African Cape White-eye and the Australian Silvereye, are very similar in their songs and call notes, differing only in minor details. On the other hand, some species have very simple songs or no song at all, as typified by the Christmas White-eye, or have very distinct songs. The most complex and bizarre song of the family is that of the Giant White-eye. A solo performance by this species is said to sound like a chorus; it has a mechanical quality, with abrupt starts and stops as if the bird is being turned on and off by a switch, and rhythmic rattling or clicking and simultaneous canary-like whistles, trills and slurs.

Where two related bird species overlap, their songs tend to differentiate (character displacement), whereas no selection for song differentiation takes place with remotely related species, resulting in very similar songs and calls. Very strong differentiation in songs and calls has certainly occurred with the closely related Pearl-bellied and Golden-bellied White-eyes of the Kai Islands; although these two do not overlap in range, they may have done so historically. In the case of the Mascarene White-eye, the call notes of the nominate race of Réunion resemble more those of the subspecies *virens* of the Cape White-eye and those of the Silvereye than they do those of the conspecific *mauritanus* of Mauritius; the latter has also lost its evening warble, the challenge song.

Singing in a dawn chorus can act as an indicator of male quality, because the amount of fat available in the morning to fuel singing depends on such factors as foraging success. Indeed,

When feeding on nectar, white-eyes typically cling either to the flower or the umbel itself or to an adjacent twig. With feet wide apart to assist balance, they lean forward and incline the head to facilitate access. The chosen method of nectar retrieval depends on the species of both white-eye and plant. In some instances, the bird inserts its head and bill into the flower. Depending on the respective lengths of the flower tube and bill, this method can result in the white-eye's forehead being dusted with pollen, which means that it may act as a pollinator. In other situations, white-eyes will pierce the base of the calyx or sides of the tubes and simply steal the nectar, with no corresponding benefit to the plant. A taste for nectar sometimes brings white-eyes into conflict with nectarivores, especially honeyeaters (Meliphagidae); in such case, the larger honeyeaters usually dominate. The **Silvereye** has learned to take advantage of alternative sources of sugar, and is a regular visitor to garden birdtables, where it seeks sugar-rich products such as honey, syrup and jam. It tends to forage in smaller flocks than many congeners, groups not normally numbering more than eight individuals.

[*Zosterops lateralis lateralis*,
Golden Bay, South Island,
New Zealand.
Photo: Tui de Roy/
The Roving Tortoise]





Some flowers are not designed for easy arboreal access. This is particularly true of plants pollinated by the aerial-feeding hummingbirds (Trochilidae), of the Americas. Some of these have been introduced elsewhere in the world. In order to gain access to the nectar of such plants, white-eyes need to hover alongside the flower and insert the bill into the tube. While hovering may not come as naturally to a white-eye as to a hummingbird, several species, including the **Cape White-eye**, are relatively well prepared, and habitually catch aerial insects in sallying flight.

[*Zosterops pallidus*.
Photo: Peter Steyn/
Photo Access]

experiments with Silvereyes showed that supplementary food increased both the quantity and the quality of the song. Experimental playback of the tape-recorded song of the Seychelles Grey White-eye elicited a response in song from only one individual, possibly a breeding male, out of a group of this species, although the other group-members were immediately alerted and approached the tape recorder. Silvereyes in the Capricorn Islands, in the Great Barrier Reef, almost always responded to playback of their songs with visual displays and calls, but rarely with song, suggesting a strong emphasis on mate attraction, rather than territorial defence, as a function of song. There is also no differential response to playback of the songs of neighbours or strangers, this being due to the continuous nature of individual variation in the species' songs.

Song mimicry is described for many species, including, among others, the Cape White-eye, the Black-capped Speirops, the Silvereye and the White-chested White-eye, and is often given in subsong. The last-mentioned species is found only on Norfolk Island, where it imitates perfectly the song of two introduced species of thrush (Turdidae). In the white-eyes of the Mascarene Islands, mimicry occurs during periods of singing at any time of the day during the breeding season; both Reunion Olive and Mauritius Olive White-eyes give long song sequences that sound exactly like those of the imitated species, but in addition they incorporate short phrases of mimicry in their own distinctive songs. The song of the Mascarene White-eye, as is the case with a number of other species in the family, appears to be derived from flocking and flight calls. A typical song session starts when, after an individual has landed on a vantage point, its continuous calling slows in tempo and then continues in a song, interspersed with soft and elaborate phrases, including mimicry. The most elaborate songs of the Mascarene White-eye are heard within the nesting area, and can in fact be used as a means of locating the nest.

The vocabularies of several species of white-eye are well described, and the following descriptions of vocalizations and their functions focus mainly on two species, the Silvereye and, at the other end of the global range of the family, the Cape White-eye. The repertoires of these two *Zosterops* species exhibit some striking resemblances to each other. Silvereye song is divided

into three different types, the warbling song, the challenge song and the whisper song. The first of these, given apparently during the earliest stages of territory establishment, is of low volume but varied, including trills, warbles and slurs. The second, the challenge song, normally begins after mating and before building, and is made up of a rapid succession of high-pitched call notes with very occasional trills interposed; compared with the warbling song, it has less range in tone and pitch but is louder. Finally, the whisper song, given by both sexes, consists of whispered trills punctuated by a normal call note and is inaudible at more than a few metres' distance. In addition, an autumn subsong is described which is very like the whisper song, but includes some mimicry. The whisper song is given also by the Japanese White-eye when resting during the afternoon.

In the course of the year, the song of the New Zealand Silvereye changes. The warbling gradually becomes longer in July and August, when a territory tree is being attended but no attempts at nest-building are made; during September the Silvereye spends much time in the tree, delivering the warbling song or performing courtship with the whisper song; in late September, when a particular branch or twig has been selected for regular visits, the male begins his challenge song from a vantage point nearby. During October the amount of challenge song decreases as the male participates in incubation of the eggs, and song stops entirely with hatching. After the young have become independent, at the end of November, there are short periods of warbling and challenge songs before the second clutch is started.

The song of the male Cape White-eye in the breeding season is of two types. The rambling daytime song, normally lasting for 7–40 seconds and occasionally more than five minutes, starts with a short phrase of subdued sibilant twittering, followed by a somewhat louder subsong of disjointed chips, chirps and whistles, including imitations of robins (Turdidae), bulbuls, canaries (*Serinus*), sunbirds and others, and finally breaks into a series of sweet, slightly burred warbles and whistles. The second type, the regular song, given alone, is short, one transcribed example lasting about six seconds, as “chup, chipway-cheeo, wur-lee, cheeu-chu, cheeu, chu-chayee-chuchoo-cheeo”. A shorter version of the daytime song, without the initial twittering, is about 6–10 seconds in duration and is delivered at dawn.

White-eyes foraging on flowers are primarily seeking food directly from the plant, in the form of sugar-rich nectar. But flowers also offer indirect food resources, as they attract arthropods that are potential prey. This **Silvereye** has reaped such a benefit, as its probing amidst the flower has located a grasshopper (Orthoptera). A large item such as this will need to be mandibulated and perhaps beaten against a branch prior to being swallowed. To discover lurking arthropods, white-eyes probe with vigour between salient parts of the plant.

[*Zosterops lateralis chloronotus*, Wanneroo, Western Australia, Australia. Photo: Bert & Babs Wells/Oxford Scientific Films]



The song of most *Zosterops* species has been likened to the sound of a telegraph message being transmitted by Morse code: more or less a series of notes closely similar in pitch, but differing in quality and in form, being single notes, upslurs or downslurs. Although seemingly a haphazard sequence of trills, warbles and slurs, in song bouts with an average of 16 syllables, and lasting about five seconds in total, the song of Capricorn Silvereyes has a well-organized hierarchy. An average repertoire contains 53 syllable types, organized into 30 different sequences each of five or more syllables, and repeated several times, but interspersed with “filler” syllables. During one morning chorus, half of the number of sequences is given. In a study on Heron Island, males of the same age cohort were found to share more syllables than other males, and it appears that the complex song repertoire of the Silvereyes is established by the first breeding season, after the birds have ranged widely throughout the island and learned a wide range of syllable types in largely the same acoustic environment. The complexity of a song may be influenced by low visibility of the species, sexual indistinguishability, intensity of competition, and low complexity of the community, but the song is subject also to temporal variation caused by change in song motivation, the time of the day and the stage of the dawn chorus. None of these explains the complexity very satisfactorily, but more research on the combined effect of these factors and possibly others throughout this speciose family may provide a useful indicator of a species’ overall ecology.

Flocking calls of Silvereyes in flight sound like “cli-cli-cli...”, and commonly a rather plaintive “cree” or thin peevish “psee” is heard. Equivalent calls of Cape White-eyes are a short “pee”, a longer, downslurred “pee-u”, a double “pee-u-pew”, an upslurred “tu-tsee” and a harsh “pik” or “tip”; excitement calls of individuals flying in follow-my-leader fashion from bush to bush are “krrreee”. The contact calls of Silvereyes differ according to sex. In field studies and studies of captive, as well as studies of individuals being released, the so-called “Variable call”, one of the species’ three types of contact call, was given by males only. Moreover, recognition of mates by voice has been demonstrated, this being the first evidence of vocal mate recognition by a species that maintains pair-bonds in mobile foraging flocks. At least three calls are used for mate recognition: male-specific linear

and variable calls, carrying over long distances, and a soft contact call, which is the main vocalization in close contact and easily pinpointed.

Among *Zosterops* species, flocking calls typically sound very like the calls of newly hatched domesticated chickens, “chew”, “chee” or the like, but Lemon-bellied, Sri Lanka and Solomon White-eyes are known also to utter a “shilp” like that of a House Sparrow. The Mauritius Olive and Reunion Olive White-eyes have a metallic and clipped “plik plik” or “chip chip” contact call which they share with the Seychelles Grey White-eye. In contrast, the Bridled White-eye commonly gives a whining call when in flocks, the same whining call being used also in agonistic interactions, such as intraspecific chases or the mobbing of a presumed predator. During incubation, the change-over calls of the Seychelles Grey White-eye, given when one partner leaves or arrives at the nest, are series of three or four notes, or occasionally warbling notes, the volume of which depends on the identity of the individual. In excitement the Cape White-eye emits a “krrreee” call, and two individuals in excitable mood may utter a tripping stutter, “k,r,r,r,eee”; this species’ alarm call is a harder and louder version of the “krrreee”. Among other vocalizations of this family are the searching call of a solitary bird that has lost sight of its companions, that of the Slender-billed White-eye having been described as a very loud “kyeeéé...kyeeéé...”, similar to the corresponding call of the Oriental White-eye and some other zosteropids; when Oriental White-eyes have found each other again, they utter an excited double “kia-kie” or “tia-tüih”. Special Silvereye calls, modifications of the “cree” call, are given during incubating, brood-feeding and feeding of fledglings, and as a threat call. The characteristic begging call of the juvenile Silvereye after leaving the nest is “ee-chéeta”, while a begging call of young Lemon-bellied White-eyes sounds like “chee-chee-chee-chee”.

White-eye alarm calls seem to be universal within the family, and similar calls are described for various species. The Oriental White-eye utters, with hardly opened bill, a “trrr-rt” or “deerrreet”, causing panic and fleeing reactions among conspecifics, whereas fledglings crouch and freeze upon hearing this call, their own alarm sounding like “scheep”. Christmas White-eyes emit a “tsirr...tsirr...” as an alarm and agitation call, and a high “cheeuw...cheeuw...cheeuw...” when scolding an



Australasian Goshawk (*Accipiter fasciatus*). The Seychelles Grey White-eye gives specific alarm calls on sighting a low-flying *Pteropus* fruit bat, a loud single “chewick” causing the group to scatter; human observers elicit thin “whee” calls. The nest-alarm call of the Silvereye is a grating or nasal “swang”, rarely heard except in the breeding season, but liable to be used if a kingfisher, owl or cat is nearby. When a Silvereye is actually flushed from the nest, this call is modified to “swang di-di-di-di”. Another alarm is described as “wee-ee-ee-ee-ee”, and a whinnying call of alarm and agitation sounds like “ti.hi.hi.hi.hi”.

Finally, Cape White-eyes have been reported as making clicking, possibly non-vocal, sounds when momentarily hovering in search of food items trapped in spider webs, for instance. The African Yellow White-eye, too, makes clicking noises, perhaps with the wings, during mutual chases. The wings of the Mountain Black-eye produce a thrumming “brtp brtp” noise in flight. Bill-clicking is a feature of aggressive encounters by Silvereyes, which produce this sound from an age of 25 days and older.

Food and Feeding

The diet of white-eyes seems to consist mainly of insects, but fruits, berries and nectar constitute a large proportion. Buds and seeds are taken sporadically, and capillary suckers of sugary plants and insect secretions are sometimes consumed. The morphology of the intestine and gizzard of the Silvereye, for example, is typical of that of facultative frugivores, being intermediate between the internal morphology of insectivores, in which the dimensions are similar, and that of specialist frugivores, which have a substantially larger gizzard. This plasticity in diet and the ecological adaptations of the Zosteropidae have resulted in a diversity of foraging behaviour. The generalist nature of these birds made them successful colonizers of oceanic islands. In Hawaii, the introduced Japanese White-eyes were found to spend 9% of their foraging time on fruits, 26% in feeding on flowers, 38% in foliage-gleaning, 16% in foliage-probing, 4% in bark-gleaning and 4% in bark-pecking.

The main feeding strategy, as described for the Abyssinian White-eye, is what is known as the “trap-line” method. The birds

systematically investigates the vegetation, taking the same route daily around the home range; they then appear at a given tree at the same time on successive days. On Palau, such a fixed foraging circuit of Citrine White-eyes included the edge of a woodland, bushes in gardens and taller trees in an adjacent mangrove swamp; the flock made the rounds here about once every hour, but at one time the birds interrupted their foraging in order to rest silently for half an hour in a large tree in a swamp. A neighbouring flock of Grey-brown White-eyes had about the same circuit, but the two species remained independent, their paths crossing occasionally as if by accident, at which time they would forage in the same tree. In the case of Mauritius Olive White-eyes, the home ranges appeared to be extremely variable, and, depending on food availability, ranged from 2 ha in areas rich in flowering plant species to 20–30 ha in others, where the birds could be seen to make long flights of up to 500 m to reach nectar sources.

In the search for arthropod prey, white-eyes employ four major foraging actions. These are that of gleaning, whereby prey is removed from a surface while the bird is perched; probing, in which the bill is thrust into a crevice, fruit or flower; hovering while removing an item from a surface; and sallying, in which the white-eye captures aerial prey on the wing in flycatcher-like fashion by darting from a perch. The foraging behaviour of *Zirkeln*, or open-bill probing (see Morphological Aspects), well described for the Common Starling (*Sturnus vulgaris*), is often practised by white-eyes, too. Crevices and holes are inspected in this way, and attention is paid especially to places where leaves are affixed to the stem, where tiny insects hide, and to cracks in palm stems, which are favourite places for scale insects (Coccoidea), including mealy bugs (Pseudococcidae). The African Yellow White-eye inserts its bill into crevices in bark and twigs, rolled-up leaves and flowers, and then, by opening the mandibles, prises apart the edges of the crevice or vegetation and peers inside. White-eyes also probe with considerable force into relatively firm plant and food parts without existing holes, such as grapes, nearly spikeless cactuses and the like, and then open them by opening the bill in order to gain access to the juicy parts.

Some species, such as the Cape White-eye, take flying insects in short, purposeful hawking flights reminiscent of those made by other sallying songbirds; upon discovery of a prey item, the bird stiffens and makes twitching movements, before striking, the prey then being killed and swallowed, after which the bird usually shakes its feathers. Not all insects are taken immediately; when insects are flying at a distance, the birds fix on the prey, following it with their eyes, while staying put. Insects flying within a short distance, however, are seized immediately. Flies (Diptera) and moths and butterflies (Lepidoptera) are skilfully caught in this way.

Inspecting of other birds' nests in the search for insects has been observed. This can lead to excessive behaviour, such as the feeding of the nestlings of the other species, and on Lord Howe Island the extinct Robust White-eye was even reported as “sucking” the eggs of other birds.

Although zosteropids are regarded as purely arboreal birds, there are observations of Oriental White-eyes occasionally flying down to the ground, even to a gravel path in a garden. Some members of the family can regularly be seen to potter about on the ground, working among dead leaves, a common habit of, for example, the Slender-billed and Christmas White-eyes. The African Yellow White-eye can progress for a metre or two by hopping, but these birds are able to walk, too. Although a very skilful climber, the Bonin White-eye, with its long tarsi and strong toes and claws, is well adapted to foraging on the ground, where it uses a thrush-like hopping mode, without walking or scratching and gleaning food with the bill. The Lemon-bellied White-eye is sometimes seen perched on the bark of a tree, with the tail held against the bark in woodpecker (Picidae) fashion, and with the head tending backwards, apparently to get a better view; it moves upwards in small leaps, everywhere searching for insects with great precision. This species often hangs upside-down in the manner of a nuthatch (Sittidae), sometimes from one foot only, but it never moves downwards head first. On Buru, the Rufous-throated White-eye is even further specialized in bark-feeding (see Systematics). White-eyes are able to jump from one branch

White-eyes need to take in water as well as food. A groove-shaped tongue assists them with drinking, as it means that they can suck up water without needing to tip the head back. The African Yellow White-eye flicks out its tongue a millimetre or two to draw water into its mouth. This white-eye also readily drinks from puddles and uses its tongue to lap up water from the surface of leaves. Populations of certain species living in seasonally arid regions exploit alternative water sources. In Western Australia, for example, the Silvereye (*Zosterops lateralis*) extracts water from the nectar of marri (*Eucalyptus calophylla*) or from grapes.

[*Zosterops senegalensis anderssoni*, Stone Hills Game Sanctuary, Zimbabwe. Photo: J. R. Peek]



White-eyes are monogamous and solitary breeders, and some species, such as the **Oriental White-eye**, have pair-bonds lasting several years. Breeding responsibilities are shared, with both sexes building the nest, incubating, brooding and feeding the offspring. The nest is typically suspended between twigs or forked branches in a shrub or bush. The height of the nest above ground varies among species and among individual pairs; Oriental White-eyes tend to nest in the first few metres above ground, but occasionally breed as high as 18 m up. The nest itself varies little across the family and is part of the justification for including monotypic genera such as *Chlorocharis* with *Zosterops*. The typical white-eye nest is a small, open, fairly deep cup. That of the Oriental White-eye is rather delicate and thin-walled, measuring just 6–7 cm in diameter and 3 cm in internal depth. Plant fibres, tendrils and grass constitute the basic building materials, and these are woven together and strengthened with spider web, moss and animal hair. Construction usually takes the Oriental White-eye pair 4–6 days, which is rather shorter than other congeners for which data are available. New nests are built for each brood.

[*Zosterops palpebrosus auriventer*, Singapore.

Photos,

Above: Jimmy Chew.
Below: Morten Strange]





or twig to another without using the wings, bridging distances of up to 50 cm.

A favourite food for most, if not all, white-eyes is aphids (Aphidoidea), which are gleaned from stems. Caterpillars, taken from leaves, are also frequent items in the diet. Invertebrates found in the stomachs of, for instance, African Yellow White-eyes included spiders, both homopteran and heteropteran bugs, lacewings (Neuroptera), beetles (Coleoptera), ants (Formicidae) and caterpillars. When dealing with larger prey, the bird removes the wings by taking the item in its bill and rubbing it against a branch. Young white-eyes very soon display their inborn insect-catching skills. Grubs, caterpillars and similar items are taken by the head and beaten against a branch, and then squeezed through the bill several times, before being swallowed. Cape White-eyes soften some insects by nibbling on them before ingestion. Several white-eyes have been observed to make use of their feet to hold food or nesting material.

Fruits form an important part of the diet of this family. Nestlings of at least some species are at a certain stage even fed exclusively with fruits (see Breeding). In experiments with captives and observations on wild Silvereyes, this species showed a preference for fruit that is accessible, and the birds avoided "hanging" in order to obtain fruit, but they did not exhibit any preference for "picking" over "reaching up". The foraging methods are, however, likely to vary according to the species of fruiting plant and its morphology, including the branching pattern, the perch stability and the position of the fruit. In other experiments, captive Silvereyes showed a strong preference for red fruits, both artificial and natural ones, regardless of the spatial format of presentation, but the preference was based on selection of hue, rather than brightness, although some individuals selected for particular brightness levels within the same hue. This would be consistent with the hypothesis that fruit colour is related to avian frugivory, and would suggest that birds can act as strong selectivity agents with regard to fruit colour. It has also been demonstrated experimentally that green fruits are preferred if their sugar concentrations are twice those of red or white fruits; it appears that the birds are able rapidly to judge the fruit's nutritional quality, and thus its maturity, by taste. Further, in the same study, large fruits, those more than 4 mm in size, were preferred over

small fruits of 2 mm; large fruits contain more pulp, and the white-eyes, by consuming them, will maximize energy intake, provided that the fruits are not so large that they incur high handling costs.

When fruits are too big, the white-eye, using the bill, pierces them and pecks away the flesh from around the seed. This is how the Silvereyes, for instance, dealt with 6-mm olives (*Olea*), but the same olives were swallowed without difficulty by the much larger White-chested White-eye. Cape White-eyes swallow fruits whole, but they peck holes in olives, and they feed on oranges through natural cracks or splits or when these fruits have fallen to the ground and become rotten; large oranges hollowed out by other birds were entered by the white-eyes. One of the ways in which the Black-fronted White-eye breaks down fruits is by holding the fruit in the bill and beating it against the perch, a treatment sometimes referred to as "thrashing".

Fruits of the native rubiaceaceous shrub *Coprosma quadrifolia* are frequently eaten by Silvereyes, and experiments on the passage time of this fruit through the gut showed rates of six to 28 minutes, fastest when fed to birds with empty guts, and significantly slower when food had already been consumed. No difference whatsoever in seed viability was found between the two treatments, although the viability of seeds that had passed through Silvereye guts was significantly lower than that of fresh seeds. Disadvantages to seed viability may thus be countered by advantages in longer dispersal distances. During a study of a temperate Australian woodland, it was established that Silvereyes were the dominant frugivores, and 90% of their faecal material contained the seeds of fruiting plants. They were able to consume up to 40 fruits per visit, each of which lasted for only about a minute, after which they would fly towards canopy trees. With a gut passage rate of about 30 minutes, the seeds would be dropped away from the parent plants; despite the high viability of seeds recovered from the droppings, 94.4% for *Rhagodia* and 100% for *Hymenanchera*, the density-dependent seed mortality is nevertheless also high because of the large number of seeds per dropping. Experiments with captive Silvereyes revealed that the time taken by fruit with one large seed to pass through the gut, 22 minutes, is significantly shorter than that for fruits with three small seeds having the same total volume, which is 28 minutes, and that the birds consume significantly more large-seeded fruits than small-seeded ones. Apparently, the birds compensate for the costs of seed ingestion, increased ballast load, by a rapid passage rate through the gut and hence an increased rate of fruit consumption. Observations on wild Silvereyes feeding on fragrant saltbush (*Rhagodia parabolica*) showed that the birds prefer fruits with small seeds, as opposed to those with large seeds; in experiments with captives in which artificial fruits with many seeds were used, the ingestion of seeds was avoided, suggesting that Silvereyes are inefficient dispersers for plant species with large fruits containing many small seeds. Secondary metabolites in ripe fruit, such as tannins, alkaloids and saponins, serve to deter consumers that do not disperse viable seeds, and it has been suggested that they promote the movement of frugivores from the parent plant after consuming only a few fruits, and shorten the time of retention of the seed in the gut. It has been shown that Silvereyes consume tannin-rich artificial fruit if they can swallow it whole, but avoid a tannin-rich aqueous cereal diet. Rather than depending on a morphological adaptation, although the species' relatively large liver (5.48% of the body mass) may suggest otherwise, the consumption of secondary metabolite-rich fruit by wild Silvereyes is more likely to depend on food availability, nutrient content of the fruit, and the degree of dietary mixing.

White-eyes play their part in plant pollination. More than once in the past, specimens of the Cape White-eye the yellowish-green throat of which had become bright orange through aloe (*Aloe*) pollen have made their observers believe that they had discovered a new species of white-eye. Typical differences between American flowers, those visited by hummingbirds (Trochilidae), and Asiatic bird-flowers, typically visited by sunbirds and white-eyes, is that the former are situated such that they can be reached by hovering hummingbirds from the air, whereas the latter are in such positions that they are within reach of birds sitting in the foliage. White-eyes cling to the flowers, with the feet held wide apart, in a horizontal to perpendicular

The breeding season of the Cape White-eye varies geographically. In the south-west of its range, in southern Africa, it nests between August and April, whereas in the north-east it starts and ends two months earlier. During the laying period, white-eyes appear to lay one egg per day, around sunrise. Incubation often starts once three eggs have been laid. The incubating individual keeps as much of its body as possible within the nest cup, often with just the head and tail protruding above the rim. Cape White-eyes incubate for 10–12 days; judging from the limited data available, this period appears to be at the lower end of the white-eye range.

[*Zosterops pallidus virens*, Eshowe, KwaZulu-Natal, South Africa.

Photo: Guy Upfold]

stance and with the neck stretched forward and bent a little to the side; they work each flower only briefly. During visits by African Yellow and African Montane White-eyes to flowering silky-oaks (*Grevillea robusta*), only ten flowers per raceme are worked, while the birds usually remain in the same position and probe within a relatively small area of open flowers, staying for an average of only 20 seconds. Although the tongue of these species is adapted to nectar-feeding, the short bill makes them flower-robbers and thus not important pollinators, and not an example of close co-evolution. A study of pollination of *Grevillea* flowers in Kenya, however, showed that both of these *Zosterops* species brushed the bill and head against the flowers' stigmas, so that pollen removal and deposition on stigmas seemed highly probable. Their effectiveness as pollinators was supported by the absence of fruit-set in flowers that had been bagged to exclude visiting sunbirds and white-eyes. Frequency of visits to *Grevillea* flowers in Kenya corresponds with the times when the measured nectar concentration and volume are high, between 08:00 and 10:00 hours. In addition, low flower density greatly influences the visitation rate, and this may be affected by the availability of other food sources. Flower-visiting seems to follow the same pattern of sustained exploration of the environment as that used in inspection of branches, twigs and foliage. Tiny, inconspicuous flowers, as well as striking ones, are visited by Cape White-eyes, which suggests that these birds, unlike hummingbirds and sugarbirds, are not guided by colours. In the Mascarene Archipelago, it has been found that *Angraecum striatum*, which belongs to a subtribe of orchids specialized mainly for moth pollination but which differs from others in the group in being unscented and in having short-spurred flowers, is pollinated only by the endemic Mascarene White-eye.

Oriental White-eyes take the nectar of *Hibiscus* flowers by piercing the base of the calyx. Similarly, the corollas of *Watsonia* and *Tecomaria* are damaged by Cape White-eyes in their attempts to reach nectar, and the flowers of mistletoe (*Loranthaceae*) are exploited in the same "illegitimate" way. The petals of, for example, *Feijoa* flowers are torn up and the pieces swallowed. Abyssinian White-eyes, after having fed at flowers, often have a distinct dusting of yellow or cinnamon pollen on the

forehead. Oriental White-eyes of the Sumatra highland subspecies *buxtoni* feed in flocks at *Erythrina subumbrans* flowers, into which they insert the head and neck, and are therefore one of this plant's most important pollinators. However, this *Zosterops* takes nectar from the sides of *Erythrina orientalis* flowers, and cannot therefore be reckoned among its pollinators. Mountain Black-eyes push the head deep into the pink to deep red and purple corollas of rhododendron (*Rhododendron*) flowers with tube lengths of 15–20 mm, about the same as the bill length of this species; some birds show a yellow-stained forehead afterwards. They may also pierce the sides of the tubes in order to obtain the nectar. The robust flowers are placed in umbels at the ends of small branches, with up to ten flowers together, and with convenient leaf and flower stalks on which the black-eyes can perch.

The groove-shaped brush-tipped tongue of white-eyes enables them to suck up fluids, and saves them the effort of drinking in small amounts and having to raise the head each time. The tactile tongue of the African Yellow White-eye can be flicked out to a distance of 1–2 mm to draw water, exudates and liquid nutrient into the mouth by capillary attraction; this species also drinks water from puddles, and sucks with the tongue while foraging in damp forest. During drinking, the tongue in the half-open bill moves rapidly with long up-and-down strokes, very much like the action of the honeyeaters. When water is less available, and slightly saline, Silvereyes in Western Australia are dependent on the nectar of marri (*Eucalyptus calophylla*) as a source of water and carbohydrates. Only when marri nectar, too, is in short supply do the Silvereyes turn to the less favoured substitute of ripe grapes in vineyards, then becoming pests. The grapes alone are not, however, sufficient to meet the Silvereyes' needs for water, as vineyard birds appear to be dehydrated, having a total body-water content measured at 69.4%, as opposed to a "normal" value of 78.3 %.

Feeding trials with captive Cape White-eyes indicated a high sucrose activity, as absorption efficiencies of the three nectar sugars sucrose, glucose and fructose were close to 100%. A fourth nectar sugar, the pentose sugar xylose, a major constituent of the nectar of *Faurea* flowers, which are known to be visited by Cape

There is no published information on the breeding biology of the **Yap Olive White-eye**, which is endemic to the small island of Yap in the Caroline Islands. Judging from this photograph, however, it would seem likely that both sexes participate in the breeding responsibilities, in common with other family members. The nest of the Yap Olive White-eye appears to be a deeper and larger cup than in many *Zosterops* species, which is perhaps not entirely unexpected for a relatively large white-eye.

[*Zosterops oleagineus*,
Colonia, Yap,
Caroline Islands.
Photo: Mandy Etpison]



White-eyes in South Africa, had an absorption efficiency of 61%, and was rejected in the trials; it is not clear whether the sugar is utilized. Of the three other sugars, sucrose was preferred over the hexoses glucose and fructose, even though most fruits are hexose-dominant. Cape White-eyes resemble the specialized southern African nectarivores in their responses to nectar sugars.

Generalists' diets of fruit, nectar and insects vary considerably in nutrient content, and therefore require different digestive processing. Feeding trials in which transit times and assimilation efficiency of captive Cape White-eyes were measured indicated that body mass was lost when fruit was fed, but was maintained when nectar was fed, and mass was gained with mealworm diets. Assimilation efficiency was highest for nectar and lowest for mealworms. It was further shown that the white-eyes selected the most efficiently digested and energy-rewarding diet. Moreover, they regulated their daily energy intake by adjusting the transit time, rather than by maximizing assimilation efficiency; by maximizing the rate of energy gain per gram of food, they were able to maintain the energy balance.

Artificial food is occasionally eaten by the Zosteropidae. Cape White-eyes take jam and sugar from garden tables, and the Silvereye is commonly fed with fat, fruit, sugar, honey, syrup, jam and bread. In captivity, white-eyes thrive on a mixture of minced hard-boiled eggs or grated cheese, grated carrot or chopped chickweed, sweet biscuits, seaweed tablets, alfalfa tablets and soya meal, made crumbly and moist with honey and marmite, porridge, tomatoes, peaches and peanut butter; fruits taken include, among others, banana, apple, grapes, orange, tinned peaches and, especially, pear. Mealworms and spiders appear to be preferred above all other foods offered.

Gastroliths are small pebbles or similar items which an animal, and especially a bird, intentionally ingests, as an aid in the process of digestion. Sand has been reported as a gastrolith for Cape White-eyes, and grass seeds were found in the stomachs of Black-capped White-eyes during an *El Niño* drought.

Nestlings of the African Montane White-eye are fed with small spiders and numerous tiny caterpillars; tiny nymphs of long-horned grasshoppers (Orthoptera), however, were rejected by Abyssinian White-eyes as they were too large. Cape White-eyes feed their young with insects, small fruits and pieces taken from

larger fruits. Oriental White-eyes have been seen feeding their fledglings with the orange, fleshy arils of earleaf acacia (*Acacia auriculiformis*). Parents have also been observed to feed their nestlings with liquid; whether this was nectar, or water to facilitate the swallowing of large insects, was unclear.

Although the diets of the Zosteropidae show much similarity, there are some specialists. The Javan Grey-throated White-eye and perhaps other mountain-dwelling species appear to be more vegetarian than other members of the family. The two olive white-eyes on Mauritius and Réunion are, to a greater degree than other white-eyes, nectar specialists. Nectar-feeding by these species takes place from a perch, on which remarkable gymnastics are performed in order to reach the nectar sources in awkwardly positioned flowers; one individual of a pair pierced the corolla of *Trochetia* flowers up to half-way, a process sometimes known as "cheating", while its partner always used the direct method, suggesting specialization.

The acquisition of foraging skills by Silvereyes has been investigated by comparing foraging efficiency, measured in terms of captures per unit time and captures per unit energy, in three age groups. First-year and second-year individuals are less efficient foragers than are older birds. Breeding, however, is not delayed until adult levels of foraging efficiency have been attained, as some second-year Silvereyes attempt to breed. Both learning and selection effects, such as food shortages in winter, may have been involved in causing the age-related differences.

Breeding

In New Britain, Black-headed White-eyes breed in the early wet season and again in the latter part of the wet season. This is in contrast to some other parts of the tropics, for instance Java, where Oriental White-eyes breed mainly in May–June, the beginning of the dry season. The same pattern is found for Flores, in the Lesser Sundas. Within its tropical range the Australian Yellow White-eye breeds throughout the year, with a possible peak in September–October, the late dry season.

The breeding cycle of the Silvereye in New Zealand has been summarized as follows. In July, when the pairs still wander as members of foraging flocks, the male starts to make dawn visits to one particular tree, which could be his nesting tree of the previous season, and here he warbles briefly before joining the flocks later in the morning. His visits become gradually longer, and only females that enter his territory are tolerated, as they incite him to sexual displays and whisper songs (see Voice). Soon, the male follows and accompanies one particular female, and spends long periods in sitting next to her, allopreening and attacking any newcomers. In September the pair-bond is definitive, and the pair-members feed together, and spend much time in the territory tree, busily engaged in courtship activities such as mutual preening, whisper song, and posturing. In late September, one branch or twig in the territory tree has become the favoured site, and the male starts to sing his challenge song at a vantage point nearby. In early October, the female begins the task of nest-building, rarely accompanied by the male, but greeted with intense sexual displays on returning to the site with material. The eggs are laid daily, and the partners now forage singly, taking turns to incubate the eggs and to feed and brood the young; soon, however, they feed together as before. After fledging, the adults and young spend less than a day in the territory tree before the family wanders widely through the territories of aggressive neighbouring white-eyes. At the end of November the pair returns to its territory to start a second nest, and a third brood may be completed in March.

With the African Yellow White-eye, courtship is commenced by the male, which stands high on his legs, with the crown feathers or, when more intense, more feathers fluffed, and the half-open wings held horizontally, with wingtips quivering; rarely, the wings are fully opened. The female can react by flying away, or by pecking towards the male's neck and body in a half-hearted and hurried manner. If the male accepts the female's advance, the pecking becomes allopreening and pair formation has occurred.



The Dusky White-eye, endemic to the Palau Islands, is a good example of a white-eye restricted to a small island group and about which very little is known. No information has been published about its breeding biology, so this photo provides a start. The nest appears to be larger, deeper and somewhat less neat than that of a typical Zosterops. The two nestlings visible within the normal clutch size for the family of 2–3. Caterpillars are fairly typical items for an adult white-eye to feed to its offspring.

[*Zosterops finschii*, Ulong Island, Rock Islands, Palau. Photo: Mandy Etpison]

White-eyes are cautious parents, not leaving the nest unattended for the first few days following hatching. Studies of the **Silvereye** reveal that breeding success is correlated to the length of time that pairs spend at the nest. Young Silvereyes are provisioned with grubs, caterpillars and fruits such as ripe figs. On occasion, parents return to the nest with spiders (Araneae) or adult insects, including moths (Lepidoptera). The adults consume any item that is too large for the nestlings to swallow. Some Silvereyes produce up to five clutches in a single breeding season, but only a quarter of individuals survive from year to year.

[*Zosterops lateralis lateralis*,
Christchurch,
New Zealand.
Photo: Don Hadden]



False feeding as part of courtship has been described for, among others, the Oriental and Cape White-eyes; even false nest-building, without nesting material, has been reported for some species. In contrast to the situation with many other bird species, this behaviour has only an appeasing function, and does not serve to strengthen the pair-bond. When a female threatens a male, she offers her open bill to him, and he then puts his bill partly inwards from the side, repeatedly touching the inner side of her bill with his tongue.

Wing-quivering, which often takes place shortly before and during the first stages of nest-building, is a means of pointing out the definitive nest-site, and the male performs it also while delivering nest building materials. Wing-whirring by the female is nearly always followed by copulation. In this, the male hops around the female and, after having vigorously preened the neck and cheeks that she offers to him, he mounts her. The male Seychelles Grey White-eye has been seen to peck at the female's white eyering before copulation. Copulation frequency of Silvereyes in the Capricorn Islands is low; only 14 such instances were recorded during 199 hours of observation of eleven pairs during the fertile period of the females.

Males of the Lemon-bellied White-eye prefer to sing from posts in a high branch of the nesting tree, actively singing especially at the onset of the breeding season, but more or less ceasing when they have young to attend. The Bonin White-eye has a very simple courtship display, which consists mainly of chases and mutual bowing, while singing is very rare.

Nests of the Zosteropidae are strikingly uniform throughout the family, and even the most atypical species, such as those in the genera *Heleia* and *Chlorocharis*, build typical white-eye nests. The work of building is undertaken by both members of the pair, although the female does most of the work in some cases and the male in others. It takes the Abyssinian White-eye 7–8 days to construct the nest, and some fine fibres are added after the first or second egg has been laid. Other construction periods reported are 5.5–11 days for the Cape White-eye and 7–10 days for the African Montane White-eye. During observations on the Seychelles Grey White-eye, it was found that one individual arranged the nest material, in this case bark strips, brought in by both partners from a source 60 m away. Both sexes of the Oriental White-

eye brought in material and manipulated this, without any obvious division of tasks. The stealing of nest material is common. The construction of the nest by the African Montane White-eye takes place in the following sequence: first, one end of the material is worked around the arm of a twig, and then the other end is secured to the opposite arm; long strands of moss are laid on the resultant sling, and finally strands of material are worked into a U-shape and gradually into a bowl.

A typical white-eye nest may be described as a small open, delicate but durable cup or hammock, fairly deep, and firmly attached between two horizontal arms of a forked twig or two parallel thin petioles, so that the rim of the nest is at same level as the supports. It is made from plant material, mainly tendrils, pieces of beard lichen (*Usnea barbata*), plant stems, and fine strips of bark from creepers, bound together with spider web and often decorated externally with spider cocoons, and lined with woolly vegetable down and sometimes one or two feathers. Occasionally, nests may incorporate other material, and one was made from pieces of string and threads, with cobweb, and lined with plant down topped with coir from a doormat. Material from an earlier nest is sometimes used. The nests of Golden White-eyes are exceptional, as they are not lined with any soft material. Nests of a largish species, such as the Seychelles Grey White-eye, have an external width of 6.7–8 cm and height of 5.7 cm, with an internal width of 5 cm and interior depth also of 5 cm. The nests of a smallish species, such as the African Yellow White-eye, are 5.2–5.5 cm in external diameter and 2.8–3.6 cm in height, and have an internal width of 4.4–3 cm and depth of 2.4–2.7 cm. Nest dimensions can vary considerably within one taxon.

Nests are typically suspended between twigs at varying heights above the ground, but those of the Citrine White-eye and of the Pohnpei subspecies *ponapensis* of the Grey-brown White-eye are reported as being sometimes placed on thick branches. The nest is usually sited away from the prevailing wind in a thick terminal clump of vegetation, sheltered from wind, rain and sun. Cape White-eye nests are typically placed at the end of branches of a leafy sapling in shady undergrowth, or hung in a spray of branches a metre or so above the ground in a gully. Rarely, an exposed site may be chosen, as illustrated by Oriental White-eye nests found in the side of a road cutting in south India, and nests



of Citrine White-eyes are frequently in very exposed locations, such as some 45 cm from the ground and without concealment or covering leaves in an isolated low roadside shrub. On Réunion, Mascarene White-eyes camouflage the nest in accordance with the environment, using green moss when the nest is placed in foliage and grey-white material when it is in more exposed sites. This tactic is apparently effective against predation by avian predators, such as the local race of the Madagascar Marsh-harrier (*Circus maillardi*), but much less so against predation by black rats (*Rattus rattus*) and the introduced snake *Lycodon aulicus* and oriental garden lizard (*Calotes versicolor*).

For each subsequent brood Oriental White-eyes build a new nest. Old nests are sometimes demolished, most likely so that the material can be used for building a new one. In addition, when eggs or whole clutches are lost, a new nest is built in a new location. African Montane White-eye nests are constructed in the very same site season after season. In the North Marianas, Rota White-eyes were not seen to reuse nests, but the recycling of nest material in the construction of a new nest certainly occurred. Fidelity to the breeding area is strong among African Yellow White-eyes, and a male of this species is believed to have occupied the same territory for at least eight seasons.

Clutch size of the Zosteropidae is normally two or three eggs, and sometimes five. The geographical rule that clutch sizes are larger in temperate regions, having seasonal food abundance, than they are in the tropics is generally applicable to the white-eyes, although not very prominently so. Clutches of two eggs are found in most populations near the equator, and the Oriental White-eye always lays two eggs in Java, but clutches of the Malaysian race of this species contain three or four eggs; clutches laid by Silvereyes in New Zealand likewise consist of up to 3–4 eggs. Some longitudinal differences exist, for instance among Cape White-eyes, with an average of two eggs in the south-west of its range but three eggs in the south-east. The Chuuk subspecies *owstoni* of the Citrine White-eye lays only a single egg, as do so many passerines of the Pacific islands, and this is explained by some authors as “a remarkable preventative of a too rapid multiplication”.

For those members of the family for which the relevant information is available, the eggs are laid early in the day, before 08:00 hours, just before or just after sunrise, one daily on con-

secutive days. They have a very fine texture and those of the Slender-billed White-eye are slightly glossy. The eggs are typically pale blue, but white eggs have been found in the nests of a number of species, either as complete clutches or, more rarely, as one white egg in a clutch of pale blue ones. Blue or creamy-white eggs have been found in nests of Oriental Mountain White-eyes, and white and blue eggs are equally common in Lemon-bellied White-eye nests. Although apparently dichromatic, these eggs appear, on closer inspection, to be subject to variation, as the colour shade varies from blue to very pale blue, approaching white. Further, in the Cape White-eye, the subspecies *capensis* has white eggs, whereas those of other races are pale blue to greenish-blue. With Japanese White-eyes, the eggs may vary in colour with age, white eggs being at first more transparent pinkish, and becoming darker to even bluish before hatching; sometimes the air cell is visible, and this can be used to estimate the age of the egg. White eggs are not uncommon among other *Zosterops* species. Speckled or spotted eggs are laid by several distantly related members of the family, having been documented for the Crested White-eye, the Golden White-eye and the Yellow-spectacled White-eye, and very faintly brown-spotted eggs are reported for the Seychelles Grey White-eye. In Sri Lanka, the eggs of the Sri Lanka White-eye are rather longer and less broad than are those of the co-existing Oriental White-eye.

Incubation generally begins after the third egg. Typically, the incubating bird sits deep inside the nest cup, with the back hidden, but with the tail and head above the nest rim so that it can keep watch on the immediate vicinity of the nest. There appears to be little uniformity in the duration of the incubation period, but the shortest documented period is about ten days. More precisely, the shortest time measured for the Cape White-eye was 10 days and 12 hours. At the other extreme is the Seychelles Grey White-eye, with incubation times of 13–15 days, and the Christmas White-eye, with an exceptionally long incubation period of 15–16 days and, moreover, a fledging period of 17 days or longer. Small tropical white-eyes, such as the Oriental White-eye, may have slightly shorter incubation periods than that of the large southern Silvereye in a much cooler climate. Captive Oriental White-eyes held in outdoor aviaries in Europe had an incubation of 12–13 days, but about ten days was reported for the same species in the wild. The longer incubation of the “European” birds is undoubtedly due to the colder climate, but also to the accumulative effect of interruptions inherent in a life in captivity.

Incubation by Oriental White-eyes normally starts immediately after the laying of the first egg, whereas Silvereyes begin after the second egg and, consequently, the young hatch at intervals of up to one day. Although the two parents share nest duties, incubation is done mainly by the female, and during the first days she is relieved only when she leaves the nest to forage. Change-over takes place at irregular intervals, every 20–30 minutes on average but the time ranging from 15 to 60 minutes, and at higher frequency during bad weather; the eggs are covered for 70–100% of the time. In the case of the Golden White-eye, the task of incubation is shared nearly equally between the sexes. In studies of this species, it was found that, at change-over, the approaching individual usually called and the sitting bird would leave the nest moments before its partner arrived. No observations of the feeding of a female by a male were made during the entire incubation period. During the night the female broods alone, while the male roosts on a perch in the immediate vicinity of the nest. Incubating Abyssinian White-eyes sit very tight, and will even allow the human observer to touch them without leaving the nest. Hours before hatching, the parents become extremely nervous, and search for live insects only.

Pipping of the egg starts up to 24 hours before hatching. On the day of hatching, the adults take the empty eggshells from the nest and drop them well away from it. African Yellow White-eyes and Abyssinian White-eyes hatchlings are naked and pink, except for a patch of whitish down above the eye; the bill, mouth and tarsus are yellow, and the gape-flanges creamy. Golden White-eye nestlings have a yellow skin on hatching, and those of Silvereyes have a bright orange or yellow tinge to the pinkish skin and have the gape-flanges bright yellow.

In white-eyes, both sexes feed the nestlings, and over the first few days the parents take it in turns to brood or forage. African Montane White-eye nestlings are fed with spiders and small caterpillars for the 15 or so days before leaving the nest. One or two prey items are brought to the nest every few minutes. African Montane White-eyes are considered diligent parents, cooling their offspring by shading them from the sun. The species does not appear to be particularly territorial as pairs often nests close to one another.

[*Zosterops poliogastrus kikuyuensis*, Kenya.

Photo: Michael Gore]

African Yellow White-eye chicks hatch pink-skinned and almost entirely naked, but they rapidly grow feathers during the two-week nestling period. Both parents feed the nestlings with a variety of small arthropods and, in the case of this well-grown nestling, a spider's egg sac. Breeding seasonality in the African Yellow White-eye varies considerably across its large range, probably depending on local climatic patterns; in many areas, breeding has been recorded throughout the year. This species demonstrates high levels of site-fidelity, one male having been recorded using the same territory for eight consecutive years.

[*Zosterops senegalensis anderssoni*, Stone Hills Game Sanctuary, Zimbabwe. Photo: J. R. Peek]



For the first 3–4 days one of the adults stays on the nest with the young, as the two are never away and foraging at the same time. When an adult arrives at the nest with food, the sitting partner leaves, making way for the arriving mate. On the arrival of a Mauritius Olive White-eye at the nest, the adults call with a soft “pip”, which is immediately followed by begging of the nestlings; one adult feeds the young and broods them until the next feed. After 3–4 days the parents forage together, without attending the nestlings continuously. From day nine or ten the chicks are brooded only irregularly, and not at all during the night; the adults roost together outside the nest on the two nights before the young finally leave the nest.

Nestlings of the Cape White-eye are fed by both parents, which forage together and make an average of 16 food deliveries per hour throughout the breeding period, but with the visits more clumped and with longer intervals between them later in the season. The feeding frequency of Mauritius Olive White-eyes increased after seven days and reached a peak of 19 visits per hour on the eleventh day. For the Seychelles Grey White-eye, the hourly rate of food deliveries varied between seven and 16. Abyssinian White-eyes feed their young continuously from dawn to dusk, but they ease off for two hours during the midday period. In studies of Japanese White-eyes, observers recorded 1–2 feeds per chick per hour on the first two days, and up to 14 feeds at fledging; several young may be fed on each visit. African Montane White-eyes are very attentive parents. When the nest is exposed to the full sun, one of the adults has been seen to stand above the chicks to provide them with shade. Every few minutes, food found among the leaves around the nest is brought in, one or two items at a time; rather than creeping in a roundabout way before delivering food to the nest, the adults of this species bring it directly to the nest. This attentiveness is in contrast with the inattentiveness of the birds during incubation, notably at times of heavy rain, which often causes nest failures.

Nest sanitation is generally undertaken by both parents. Adult Japanese White-eyes wait for the chicks to produce faecal sacs after each feeding session. The Rota White-eye swallows the chicks' faecal sacs, but the two parents do not simultaneously take part in nest sanitation. When the young are 5–6 days old, the parents remove the faecal sacs and drop them some distance from the nest, or, rarely, stick them to a branch. Dead chicks several

days old, and even considerably large young of up to eight days in age, are also removed from the nest and taken up to 2 m or more away from it.

Nestling white-eyes are fed with insects, and any of these which, having been offered, appear to be too large to be swallowed by the young are eaten by the adults. Young Abyssinian White-eyes are fed exclusively with insects on the first and second days, but after day six only fruits were presented to them. In observations on captive Oriental White-eyes, it was seen that larger prey items were fed to the young, while the smaller items were eaten by the parents themselves; at an age of 5–6 days each of the young consumed per day about 30 prey items, consisting of mealworms, butterflies and grasshoppers, and it would take a chick about 20 seconds to swallow the larger ones among these.

For the Cape White-eye, hatching takes place over a period of 12 hours, and the development of the chicks is described as follows. On the fourth day the quills of the wing-coverts and alula emerge, followed on day five by the quills of the tertials, back, rump, flanks, breast and belly, including the tibiotarsus feathers. On days 5–6 the eyes open, and on day six the quills of the forehead, chin and ear-coverts emerge, while those of the primaries and secondaries start to break open. On the eighth day most other quills are open. The growth and development of the feathers proceed very rapidly, but much depends on food availability and quality and on the intensity of parental attendance. Young Oriental White-eyes are fully feathered after 12 days, except for the upper thigh, the underwing-coverts and the throat, the throat acquiring its yellowish feathers at an age of 17 days. In the race *egregius* of the Oriental White-eye, the nestling plumage is similar to that of the adults but less intense, and the eyerings are not acquired until 24 days after the chick has left the nest; the white feathers constituting the eyering start to emerge on its fifth day out of the nest, coinciding with the time when it becomes capable of flying. Japanese White-eyes weigh 1.1 g on the day of hatching, gain about 1 g per day during the first week, and then 1 g or so until they fledge, at a weight of 8.3 g.

Nestling periods of zosteropids vary from 10 to 16 days, being longer in poor weather, as documented for Abyssinian and African Yellow White-eyes. A period of 11–14 days is reported for captive Oriental White-eyes, and of up to about 16 days for

Nest sanitation is an integral component of a breeding attempt, and both white-eye sexes rid the nest of faecal sacs excreted by their offspring. This **Malagasy White-eye** will probably fly a safe distance away from the nest prior to either dropping the gelatinous sac on the ground or smearing it onto a branch. Either way the desired result is the same: a nest free both from disease and from conspicuous white splashes that could catch the attention of potential predators. The nest of the Malagasy White-eye is comparatively deep and wide for the genus *Zosterops*, and is lined with soft material to provide comfort and warmth.

[*Zosterops maderaspatanus maderaspatanus*, Madagascar. Photo: Dominique Halleux/Bios]





The nestling period of most white-eyes is roughly 14–16 days, but parental care continues after the young have left the nest. Recently fledged **African Yellow White-eyes** beg for food from their parents by fidgeting their wings and imitating the contact call uttered by their parents. While brood parasites tend not to use white-eyes as hosts, the African Yellow White-eye is parasitized by two species, Klaas's Cuckoo (*Chrysococcyx klaas*) and the Eastern Green-backed Honeyguide (*Prodotiscus zambesiae*). The annual mortality rate in this white-eye is roughly two-thirds, but birds can live up to seven years.

[*Zosterops senegalensis toroensis*, Bwindi-Impenetrable Forest National Park, Uganda.
Photo: Greg & Yvonne Dean/World Wildlife Images]

captives kept in outdoor conditions in the UK. Short nestling periods of 10–12 days have been reported for Golden White-eyes. Young of, for example, Cape White-eyes and Silvereyes are more prone than are chicks of other bird species to leave the nest prematurely, at an age of just nine days. When undisturbed, young leave the nest and immediately scramble into the surrounding branches, where they wait, bunched together on a perch, to be fed; on the appearance of the parents, they break apart, approach, and quiver the wings while emitting hunger calls. Nestling Mauritius Olive White-eyes were watched as they were being enticed from the nest on day 13, the parents not feeding them but, on three occasions in the afternoon, calling from a perch 2 m from the nest, each time for three minutes. This behaviour was repeated in the morning, when a chick moved from the nest and was preened by one of the parents. The young stayed within 5 m of the nest on the first day.

Newly fledged African Montane White-eyes can fly very short distances, and they hide in leafy vegetation while waiting for the parents to feed them. At night the parents sleep with the fledglings, huddling close, one on each side of them, and they never return to the old nest. The young, clambering about, are guided into safe cover by continuous call notes from the adults, the latter often with food in the bill. Very young fledglings may fall to the ground and, because they cannot yet fly, they sometimes have to stay there for a while; it has been observed that one of the parents, despite a dislike of being on the ground, will then keep the youngster company during the night, while the other parent looks after the other young. Young African Yellow White-eyes, when out of the nest, solicit food from the parents by quivering their wings and giving a shrill call resembling the parental contact call. After fledging, the young of Abyssinian White-eyes are accompanied and fed for some days by the parents. They are duller above and below than the adults, and have a lax plumage, a thick yellow gape, a pinkish bill, and wispy white down at the rear end of the superciliary stripe. For about one week after fledging they cannot fly, but instead they hop and cling to branches. Similarly, Japanese White-eyes do not fly until one week after leaving the nest.

As already discussed, both sexes are involved in nest-building, incubation, brooding and feeding of the young, this having been observed for many well-studied white-eye species, such as the

Silvereye and the Cape, Oriental, Japanese and Rota White-eyes. Likewise, during the 2–3 weeks in which fledgling Silvereyes are dependent, no lasting brood division by the adults has been observed, although some unequal investment by male and female parents occurs. When renesting for a subsequent clutch, however, there is variable parental investment but no obvious transfer of responsibility within the Silvereye pair. Except for the laying of the eggs, by the female, and the territorial advertisement, by the male, the parental responsibilities of the two sexes seem to overlap completely. The development of brood division, in which fledglings accompany one particular parent away from the territory for prolonged periods, is precluded by the tendency among Silvereyes for young sibling fledglings to come together when unattended by the parents, as well as by the strong pair-bond between the adults, and also by the small brood size of two or three chicks. This brood size is similar to a single family unit in a large divided brood, as, for instance, that of Song Sparrows (*Melospiza melodia*) and Prairie Warblers (*Dendroica discolor*).

The strong motivation of parent birds to satisfy the demands of fledglings is illustrated by a case in which a male Silvereye lost both his mate and two fledglings. This male subsequently adopted two unrelated fledglings of similar age from a neighbouring nest; unaided, he raised these to independence, while the biological parents deserted their own young and renested. In captivity, a similar case of feeding assistance was observed in which an immature Japanese White-eye 56 days old fed two 22-day-old young as soon as they were put together in a cage; a fourth, recently fledged individual placed in the cage two weeks later was fed by the three older white-eyes until he became independent; and finally, one month later, a fifth fledgling was fed by the four older birds, after some conflict had developed and then been settled again. The feeding of parentless fledglings of the Japanese White-eyes by older white-eyes has been observed, and several cases of interspecific feeding assistance have been described for white-eyes (see General Habits).

In captivity, Oriental White-eyes begin the construction of a second nest when the young of the first brood have fledged only several days before, or, in exceptional cases, when they are still in the nest. Even so, the young are still fed intensively. At this stage the male takes the greater part of the feeding duties, although food is also delivered regularly by the female; the female

incubates more persistently and for longer periods than the male. After 26–28 days young Oriental White-eyes are independent, but they continue to beg for food for much longer. It is quite possible that the young of a subsequent brood have hatched by then, and that the parents are caring for two broods. The cohesion among the parent birds, the first brood and the second brood remains strong, and all individuals roost together in one row. Third broods are also included in the assembly, although less prominently. This has to do with the formation of natural flocks, including different families. In Nairobi, in Kenya, the African Montane White-eye is double-brooded in a long season, and third breeding attempts are undertaken when two earlier ones have failed. Up to five clutches per season are produced by the Silvereyes of the islands in the southern Great Barrier Reef.

The Oriental White-eye is, at best, an unusual foster parent of cuckoos. For the South-east Asian population of the nominate race, three cases of parasitization by the Common Cuckoo (*Cuculus canorus*) are known, and one each by the Asian Lesser Cuckoo (*Cuculus poliocephalus*) and the Plaintive Cuckoo (*Cacomantis merulinus*). None of the cuckoos in Java is known to parasitize white-eyes. In eastern and southern Africa, *Zosterops* species such as the Abyssinian and African Yellow White-eyes are the principal hosts for the Eastern Green-backed Honeyguide (*Prodotiscus zambesiae*); another Afrotropical brood parasite is Klaas's Cuckoo (*Chrysococcyx klaas*), which lays in nests of African Yellow White-eyes. Young of the Shining Bronze-cuckoo (*Chrysococcyx lucidus*) have been successfully raised in Silvereye nests, but for the large Pallid Cuckoo (*Cuculus pallidus*) and the even larger Long-tailed Koel (*Eudynamis taitensis*) no satisfactory white-eye host can be established, solely because the nest of the white-eye could not hold a full-grown cuckoo chick.

Breeding success among the members of this family is known only for some well-studied local populations. In a Lemon-bellied White-eye population on Sulawesi, 24 nests had a success of only 33%, and many nests remained empty. For Cape White-eyes, 50–57% of nestlings survive to the fledging stage, against an average adult mortality of 35%. During a 1972–1973 study of the Japanese White-eye in Hawaii, where this species is introduced, the proportion of hatched eggs that produced fledglings was 58.6%, resulting in a recruitment of 5.52 young per pair per year. In the case of the Abyssinian and African Montane White-

eyes it appears that few clutches are successful, as the eggs and young are heavily preyed on by shrikes, rats, mongooses and snakes, or the nests parasitized by the Eastern Green-backed Honeyguide, which may replace up to two of the white-eye's eggs with its own, one at a time.

Annual survival rates of Silvereyes are low, with a mean survival of 25%; in the African Yellow White-eye an annual survival rate of almost 34% was found. In the Heron Island population of Silvereyes in the southern Great Barrier Reef, difference in breeding success between dominant and lower-ranking pairs occurs when food supply, principally figs and arthropods, is poor. Because pairs that spend longer periods at the nest rear their nestlings better, and as successful defence of food resources near the nest probably means that more time can be allocated for attending chicks, dominant pairs raise heavier young. It was also shown that breeding success, expressed as the number of successful nests, depends on the behaviour of the birds in the previous non-breeding season. Solitary or paired foragers may be more specialized feeders or highly skilled foragers, not benefiting from flocking, and holding small ranges; this may, if enough food can be obtained, allow them to stay close to their summer territories and to start nesting early. Dominant first-year males may defend feeding territories more efficiently than subordinate birds, but, if such a male is paired with a less dominant female, the latter's submissiveness may mitigate the disruptive effects on breeding of the male's territorial fights. Finally, areas with *Pisonia* trees offer experienced birds, rather than unskilled ones, good-quality food, in the form of large insects, and also the most suitable nest-sites. In an earlier study of the same Silvereye population, it was shown that the greatest survival rate of young was in those derived from parents of intermediate dominance in a year with high population density; in other years with high population density, such a relationship between offspring mortality and the dominance status of parents has not been confirmed. There are more dominant individuals among young born early in the season than among those born later, and these dominant birds survived better in the austral winter months of May–August. No such dominance-related survival was found for adults. Although an individual's weight did not determine survival in either first-year or adult birds, large size may be selected for; its effects on dominance fluctuate over time with density and food availability.

The race *tephropleurus* of the **Silvereye** has often been treated as a distinct species. This is a restricted-range taxon, given that it is endemic to Lord Howe Island, which is just 17 km² in area. Having not been seen since 1914 and consequently feared extinct, it was rediscovered in 1963. It had managed to avoid the fate of another white-eye endemic to Lord Howe Island, the Robust White-eye (*Zosterops strenuus*). It had earlier succumbed following predation by ship-borne black rats (*Rattus rattus*).

[*Zosterops lateralis tephropleurus*, Lord Howe Island, off E Australia.
Photo: Robin Bush/
Oxford Scientific Films]



White-eyes are generally monogamous, solitary breeders. The pair-bond in Oriental White-eyes is known to be long-lasting, and Silvereyes remain paired outside the breeding season, while divorces are rare. In eleven pairs of Silvereyes in which both members survived, no change of mate occurred from one breeding season to the next. Mates are often selected soon after becoming independent. In a study of 23 pairs of Capricorn Silvereyes on Heron Island, ten pairs suffered the loss of one member, and the remaining adult remated in the following season; no extra-pair paternity was detected in DNA-fingerprinting studies among 122 offspring from 53 broods, despite high breeding densities and a synchronous start of breeding. Neither mate-guarding nor frequent intra-pair copulation explain this result, but it is consistent with the hypothesis that, with low levels of genetic variation in fitness, and thus variation in male quality, on small islands, sexual selection for good-quality males is reduced. The avoidance of pairing with siblings is the only mechanism for maintaining heterozygosity in Capricorn Silvereyes. A possible case of bigamy has been reported for captive Oriental White-eyes. One pair and a single female of this species both had nests in which young hatched, but in this case the possibility that clutches in both nests were laid by the mated female could not be excluded. The later recapturing of a possible pair of Cape White-eyes may suggest some level of monogamy in a species regularly occurring in flocks. DNA analysis indicates that flocks of this species form cohesive groups, with little gene exchange between populations.

Observations at nests of the Seychelles Grey White-eye have revealed co-operative breeding in which non-breeders help with nest-building, incubation and rearing duties, relative contributions of the individuals being similar. Nests with up to eight eggs have been found. This phenomenon indicates a saturated breeding habitat and could be the result of food limitation, which may restrict breeding opportunities and result in a lack of population growth. Helpers have been found also at Mascarene White-eye nests, but this strategy has not been confirmed for other species of white-eye.

Hybridization in the wild has been documented for a number of species. Silvereyes and Slender-billed White-eyes reportedly interbred on Norfolk Island in 1913, after the former had colonized, but subsequent studies showed no noticeable effect on the population of the latter species. Interbreeding between subspecies is more widespread. Examples can be found, for example, on

Kangaroo Island, in South Australia, where Silvereyes of the subspecies *pinarochrous* and *chloronotus* intermix, or in the hills in central-west Java, where Oriental White-eye subspecies *buxtoni* and *melanurus* occur in close contact. In captivity more instances of interbreeding are known, and may in fact be numerous.

African Yellow White-eyes and Silvereyes are known to breed at the age of 12 months, and this is probably applicable to most, if not all, members of the family.

A remarkably long lifespan has been documented for white-eyes, and the record seems to have been achieved by a captive male Oriental White-eye which was reportedly still in good condition when nearly 24 years old. Such a long lifespan is not unusual for birds having small clutch sizes and often rather indifferent breeding success, as is demonstrated by the Lemon-bellied White-eye. In the wild, ages of 5–7 years have been attained by African Yellow White-eyes, and for Silvereyes ringed in Australia ages of 7–8 years are not unusual, while Silvereyes up to 11 years old have been recorded on the Capricorn Islands. During a study of nine species of white-eye ringed in South-east Asia and East Asia, totalling 4272 individuals, only 23 birds of five species were recovered, none of which was older than 25 months, but this sample is insufficient to indicate survival in the wild.

On the islands of Saipan, Tinian and Aguijan, in the Northern Marianas, Bridled White-eyes reach what are among the highest densities ever reported for landbirds. On Saipan, the population has been estimated to occur at approximately 5950 individuals/km². Silvereyes have been found to have 3.4–8.7 breeding territories per 10 ha in suburban areas. Much higher densities, however, were found near food sources for Japanese White-eyes, with 11–30 pairs/ha in urban O'ahu, in the Hawaiian Islands, where the smallest successful territory was of 0.12 ha, nests were 15–854 m apart, and songposts were on average 91 m apart. Lemon-bellied White-eyes, too, breed in high densities. No territoriality or nest defence is known for the Mascarene White-eye, which sometimes nests in loose semi-colonial groups.

Movements

White-eyes are generally highly sedentary, yet there is the contradictory tendency for flocks to disperse over considerable distances. One of the most extraordinary examples is that of the Silvereye,



The propensity of white-eyes to colonize small islands and subsequently speciate means that three-quarters of zosteropids are classified as restricted-range species with a distribution of less than 50,000 km², a remarkably high proportion for a family containing so many species. The **Louisiade White-eye** falls into this category, its distribution spanning two Endemic Bird Areas: the Louisiade Archipelago; and New Britain and New Ireland. This species is common to abundant on most islands within its range, probably being the commonest species on Nissan Island, and is not at present at risk.

[*Zosterops griseotinctus eichhorni*, Nissan Island, Papua New Guinea. Photo: Don Hadden]

The **Yellow-spectacled White-eye** inhabits several islands in the Lesser Sundas, the largest of which are Sumbawa, Flores and Sumba. It is a restricted-range species, occurring in both the Sumba and Northern Nusa Tenggara Endemic Bird Areas. It is generally common throughout its range, with the population on Sumba thought to exceed 400,000 individuals. This relatively large population and the species' preference for forest edge and degraded habitat have led to its conservation status being listed as of Least Concern.

[*Zosterops wallacei*, Flores, Lesser Sundas.
Photo: Morten Strange]



the commonest bird in New Zealand, after it invaded in the 1850s from Australia, from which New Zealand is separated by 2000 km of sea. Many islands had double invasions of white-eyes, and Norfolk Island was invaded three times, resulting in the evolving of two different species, the Slender-billed and White-chested White-eyes. Tasmanian Silvereyes are known to cross Bass Strait and spend the winter in south-eastern Australia, some individuals migrating in some years but not in others. Moreover, it is not only the juveniles that migrate but also older birds. In late March and early April, up to 26% of the total Silvereye population in central Victoria is made up by the Tasmanian race.

Four white-eye taxa are known to migrate long distances. These are the Chestnut-flanked White-eye, the nominate race and the subspecies *simplex* of the Japanese White-eye, and the nominate race of the Silvereye. It is not surprising that the first, which lives at the highest latitude, is the most strongly migratory. In the Japanese White-eye, it is not the entire populations of the two races that migrate, but most likely the northern breeders do so, over distances of several thousands of kilometres, whereas the southern population is sedentary; *simplex* is more strongly migratory than the nominate race, and its more pointed wing is significant in this respect.

There is much to be learned about the movements and the non-breeding areas of the migratory white-eyes. The study is a very difficult one, because of the low recovery rates of ringed individuals. For example, during a ringing study in 1977–1985 of Silvereyes in Western Australia, 13,870 individuals were ringed, of which only 15, or 0.11%, were recovered, only four of these having travelled 100 km or more. In eastern Australia a recovery rate of just 0.075% was found for 100,000 Silvereyes ringed in a ten-year period. Higher recovery rates were found in southern Africa, where an estimated 15,000 ringed white-eyes in the 1970s and 1980s produced a recovery rate of 0.25–0.36%.

In experiments with captive Silvereyes, migratory restlessness, or *Zugunruhe*, develops in some individuals, whereas others develop restlessness only in the presence of actively "migrating" individuals. Whether or not a bird migrates, however, appears to have a genetic basis, and there seems to be an endogenous programme that determines the timing and direction of migration. Such a programme is present in migratory subspecies of Silvereyes: during experiments over 14 months with two closely related subspecies, the migratory nominate race and the non-migratory *cornwalli*, the first showed significant directional preferences during the spring and autumn migration periods, whereas the other did not. In the migration season, the birds are

most restless in the period between two hours before and four hours after sunrise, which is consistent with field observations. Vocalization has an important function in pre-migratory flocking, and food availability, weather conditions and various social stimuli also play a role. The switch from migratoriness to sedentariness takes place in young and old Silvereyes, and in both sexes.

In Silvereyes, it has been found that haematocrit, a measure of the relative volume of red blood cells as compared with total blood volume, and frequently used as an indicator of condition of wild birds, is low in March but high in September. Migration by Silvereyes takes place, as intimated in the preceding paragraph, during the two hours before sunrise and the four hours after; on the wintering grounds diurnal activity increases in relation to winter movements. Migratory movements by Silvereyes involve the combination of short journeys through vegetation, the choice of which is dependent on the availability of flowering trees, the presence and abundance of other Silvereyes, and visibility, and longer flights. Migrants exhibit more nocturnal restlessness than residents in winter, and in the autumn and spring migration seasons.

The pre-migratory lipid reserve of Silvereyes is equivalent to that of a short-distance migrant, and is consistent with the over-water distance to be covered of about 250 km between Cape Liptrap, on the coast of south Victoria, and Tasmania. Assuming an air speed of 6 m/sec for a 12-g bird, and that 1.5 g of lipid is enough for a distance of 570 km, Silvereyes should be able to cross the Bass Strait in about eleven hours in calm weather, during which only about 0.6 g of mobilizable fat is required of the 0.56–3.74 g found in the birds. The leaner individuals may stop over on islands along the migration route, whereas the fatter ones may fly non-stop. Any excess in the fat reserve may be viewed as a precaution against unpredictable weather in the Bass Strait, including changing cloud density and wind direction. Silvereyes are known to fly at altitudes of between 200 m and 600 m; through gaining favourable wind by altering their flight altitude, they would be able to reduce the flight time and energy expenditure. The overnight energy requirement and expenditure of the Silvereyes, and also the mean fat content of 8% of body weight, equivalent to 1 g for a 12-g bird and sufficient for one overnight fast, are generally less than found in northern passerines. This may be explained as being an adaptive response to long-term winter temperatures at low elevations, which are less severe than those in northern temperate regions. Moreover, the effects of a

The **Mascarene White-eye** is a restricted-range species that occurs in the two Endemic Bird Areas that cover the islands of Réunion and Mauritius. It is common on both islands, with local densities on Mauritius estimated to reach 150 pairs per square kilometre. Its large population and tolerance of a wide range of habitats, including man-made ones, mean that this it is not considered threatened. The species is unusual within its family in having a contrasting white rump, which is thought to act as a signal to encourage flock movement, along the lines of "follow-my-leader".

[*Zosterops borbonicus mauritanus*, Mauritius.
Photo: Roland Seitre]





low ambient temperature are mitigated by the Silvereyes' behaviour of huddling in groups and controlled hypothermia.

Interestingly, the lipid content accumulated in the late afternoon in order to survive through the night was the same for migrants at Armidale, in New South Wales, and for residents on Mount Nelson, in Tasmania, places with very similar temperatures. This makes one wonder why the birds should migrate at all. Better food conditions, higher daytime temperature and a longer daylength available for foraging may play a role. Various hypotheses can be put forward to explain the choice by Silvereyes to migrate or not to migrate. Only the "genetic" hypothesis can explain the phenomenon of partial migration, as some individuals migrate automatically, while others migrate only if stimulated to do so in the presence of other, already "migrating" individuals. The other possibilities are the "social-dominance" hypothesis, namely that unsuccessfully competing birds, that is females and juveniles, migrate; the "body-size" hypothesis, that smaller birds, females, migrate, having lower resistance to cold conditions; and the "arrival-time" hypothesis, that the sex-class or age-class responsible for establishing breeding territories is less migratory. These last three, however, are not consistent with the Silvereye's natural history and with observations made in the field.

Celestial clues, such as the patterns of polarized light at sunset, and magnetic clues are used by migratory birds for orientation. Experiments with Tasmanian Silvereyes suggest the existence of a hypothetical magnetite-based receptor in the head, serving as a navigational "map". This allows the migrating birds to measure local values of magnetic gradients, and provides them with information on their geographical position. These studies showed also that high-intensity pulse magnetization disrupts the orientation of adult birds with migration experience, but not that of inexperienced juveniles. Apparently, the juveniles make use of an innate magnetic compass, which is more robust than the map with regard to detection of small changes of intensity and inclination. Other experiments revealed that under red light, with a wavelength of 633 nanometres (nm), both age-classes are disoriented, but neither class is affected under white and green light, suggesting that light-dependent processes also are involved in the birds' magnetic compass. In experimentally generated conflicting situations, the white-eyes recalibrate the celestial clues on the basis of the altered magnetic field.

Migration on a more local scale is known for a much larger number of species. In north-west Bali, the Lemon-bellied White-eye makes seasonal movements between the mainland and its breeding sites on the offshore island of Menjangan, and similar

seasonal shifts have been noted on Bawean. Seasonal movements downslope and upslope are reported for Oriental White-eyes in India. As a further example, movements covering 164 km are recorded for Cape White-eyes in southern Africa, and seasonal immigration and emigration is suggested by the varying reporting rates within some western parts of this species' range.

In Hawaii, some juvenile Japanese White-eyes return to their natal territories, whereas most pairs return in the second year to breed either on their previous breeding territories or within 0.4 km of that; during breeding birds were observed up to 0.8 km from their territories visiting fruiting trees.

Relationship with Man

Because of their delightful personalities, their adaptable and inquisitive natures, a high degree of intelligence, hardiness, and their easy maintenance, white-eyes are popular as cagebirds. These birds seem to become accustomed to a life in captivity without any special problems, and they readily take food items previously unknown to them. In 1874, the first white-eyes were brought into the European bird trade by the wife of the animal-trader and zoo-owner C. Hagenbeck. First successful breeding was reported in 1910 or thereabouts, in England. Even in unheated large cages or aviaries in temperate countries white-eyes are easily persuaded to breed, and they seem extremely persistent in their attempts if circumstances are adverse; five or six nesting attempts in a single breeding season have been reported.

By far the most abundant member of this family in captivity is the Oriental White-eye, closely followed, according to 1980s figures for the UK, by the African Yellow White-eye and the Chestnut-flanked White-eye. The origin of many imported white-eyes, however, is difficult to ascertain because of the similarity of many of the species; moreover, their identity is often further obscured by a loss of yellow pigments, although these are easily restored by a diet of various plant extracts containing carotenoids. The Japanese White-eye is very popular as a cagebird in Japan, and is also a familiar image in art, usually depicted alongside camellia (*Camellia*) blossoms; in the Japanese language there is even an expression *mejro-oshi*, meaning "white-eye huddle", which indicates the familiarity of the people with this bird. Oriental White-eyes are popular with the ethnic Chinese inhabitants in Singapore, where this species is one of the five most popular cagebirds and may in fact be the most numerous one. The Singaporeans hold social gatherings at specific display grounds where the white-eyes are kept in small, narrow, bell-shaped cages, often richly ornamented with boxwood and ivory carvings that are traditionally auspicious. Formal birdsong contests began there in 1964. Among other criteria, loudness of volume and clarity of the individual's song are taken into account, as also is its variety; although rarely, as many as 20 varied tunes can be heard. A high-scoring white-eye song, which is short, has many rapid short notes joined together to form a tune, as a continuous flow of sound, but these are not always repeated in sequence; it has an opening consisting of a series of high-pitched sounds, and repetition of the same tune may occur, but other tunes must follow without too long a pause. The most sought-after white-eyes come from Johore, in Malaysia, and these can produce notes that rise to a strong staccato sound. Although white-eyes are kept in Hong Kong, China and the Philippines, it is in Singapore that they are most popular.

Captive white-eyes, because of their confidence with humans and their adaptability to life in an aviary or cage, have long been favoured as research subjects. The nominate race of the Japanese White-eye has been a favourite object for endocrinological studies in Japan; since the 1930s, but especially the 1960s, numerous papers have appeared on the relationship between daylength, activity of the neurosecretory cell groups of the hypothalamus and gonadal development. In Australia, experiments with captive Silvereyes have yielded much insight into the biology of migration (see Movements), but also other varied information, including fruit choice, and the predation of jumping spiders by Silvereyes.

Several white-eye species have been subject to intensive field studies. As they are readily baited and trapped, and common in certain areas, the colour-marking of individuals is not a problem.

For a family strongly represented in nearby Indonesia, there are remarkably few species of white-eyes in the Philippines. These include the **Black-masked White-eye**, endemic to submontane and montane forest on Mindanao, within the Mindanao and Eastern Visayas Endemic Bird Area. This restricted-range white-eye is locally common or not uncommon at 1250–2400 m. Moreover, high-altitude forest on Mindanao is relatively secure, so the species is not considered globally threatened.

[*Lophozosterops goodfellowi* goodfellowi, Baracatan, Davao, Mindanao, Philippines. Photo: Doug Wechsler/VIREO]

The **Crested White-eye** occurs only in the Northern Nusa Tenggara Endemic Bird Area. While locally common in primary forest at 700–1000 m, this restricted-range species is fairly intolerant of degraded habitat. Lowland forest is being destroyed rapidly in the zone, and this species cannot retreat upslope, as it is apparently outcompeted by the congeneric Yellow-browed White-eye (*Lophozosterops superciliaris*) at higher altitudes. These factors may justify upgrading the Crested White-eye's conservation status from of Least Concern to Near-threatened.

[*Lophozosterops dohertyi subcristatus*, Flores, Lesser Sundas. Photo: Morten Strange]



In the 1940s, the New Zealand Silvereye was therefore selected for a special study; this had been preceded in 1939–1940 by C. A. Fleming's ringing study of Silvereyes, 470 individuals in total, the first published ringing study of an Australian species and one that revealed much of its life history. Famous indeed are the Silvereyes of the 17-ha Heron Island, in the Capricorn Group of the southern Great Barrier Reef, off the Australian mainland, the ecology and biology of which have been studied by J. Kikkawa and his colleagues since 1965; the majority of the population has been colour-ringed for individual recognition.

In many areas white-eyes frequent birdtables, especially during the winter months. In New Zealand, a study of the energy needs of some 7500 Silvereyes showed that the natural population obtained at least one-third of its total calorie expenditure from artificial food, suggesting that artificial feeding had an important role.

The Oriental Mountain White-eye, the Oriental White-eye, the Sri Lanka White-eye and many other members of the family, apparently in Africa in particular, are strikingly confident with humans, and are approachable to within two metres or so in field conditions. Foraging flocks of Cape White-eyes will approach observers quite closely, but they retreat to the other side of the tree if themselves approached by the observer. The African Montane White-eye lives in gardens and is so accustomed to people that incubating individuals can be stroked without being disturbed; similar tameness is reported for the Abyssinian White-eye. The Japanese White-eye in Hawaii is easily attracted by an observer making squeaking sounds. Where birds are persecuted by people, they are, not surprisingly, much shyer. For instance, the Large Lifou White-eye of Lifou Island, in the Loyalty Islands, is reported to be shy. In the Caroline Islands, the Citrine White-eye is wary and easily frightened away by the shooting of a gun; on the other hand, the bird-collector W. F. Coultas reported from Pohnpei that the Long-billed White-eye was not in the least disturbed by the noise of a gun, and remained long enough for long series of specimens to be collected. Museum collectors in the early twentieth century reported that Oriental Mountain White-eyes were so tame that they had to be captured with a butterfly net, as they were too close to be shot with a gun. In the eighteenth century, a special relationship with humans was reported for Mascarene White-eyes on Réunion. The habit of these birds of mobbing ground animals such as the introduced partridges (Phasianidae), lagomorphs and cats, and giving a characteristic, very piercing, mobbing call on detecting them, gave the game away to local hunters. Apparently, the white-eyes are now accustomed to the animals, as this habit died out.

In New Zealand, Silvereyes have been called "Blight Birds", because of their effective destroying of the "American blight",

the aphid *Schizoneura lanigera*. Silvereyes in Western Australia make themselves useful to humans in summer because they devour large quantities of larvae of the potato moth (*Phthorimaea operculella*). Moreover, their mobility and the fact that they exist in large numbers make them potential vectors of a granulosis virus that controls the potato moth.

Not only their insect diet but also their nectar-eating and the consequent cross-pollination of a wide variety of flowers make the Zosteropidae potentially beneficial for agriculture. Indeed, studies in Kenya on the pollination of the exotic silky-oak, a popular tree for farm-planting, indicated an important role for the African Yellow White-eye and African Montane White-eye, even though these birds' habit of piercing the calyx bases would seem to diminish their usefulness as pollinators (see Food and Feeding). Any suspicion that they may fertilize flowers of mistletoe, which is regarded as a pest, is removed by the observation that white-eyes squeeze the flowers at the base of the corolla lobes to get at their nectar.

The Oriental White-eye is reported as becoming a pest locally in orchards, such as mango (*Mangifera*) and guava (*Psidium*) farms, and in vineyards. Cape White-eyes are more widely regarded as a pest, as they feed on small soft fruits by pecking and taking small amount of flesh from many fruits in turn, which are then prone to rot; one farmer claims to have shot 500 individuals of this species with an air-gun in one season. Similarly, Silvereyes are notorious pests of vineyards in Australia, where they are sometimes referred to by the name of "Grape-eater". Here, the broadcasting of sounds that totally envelop the frequency range of the Silvereye's contact calls, 4–5 kHz, have proved effective in encouraging the birds to move, as they were unable to hear their mates and this prompted them to avoid the vines. The Japanese White-eye is not considered a pest in Hawaii, although there is controversy because its dramatic increase contrasts with the simultaneous decrease of native bird species. In south-western Australia, the berries of the introduced bridal creeper (*Asparagus asparagoides*), an unwelcome environmental "weed", are mostly eaten by Silvereyes and thereby dispersed.

The only known reference to white-eyes being taken for human consumption comes from New Zealand, where the Maoris process these relatively newly arrived birds for food, but this is not significantly different from their behaviour in processing other small birds. Apparently, the small size of white-eyes and

Some 13 members of Zosteropidae are listed as Near-threatened on a global level. One such is the **Biak White-eye**, a restricted-range species endemic to two islands within the Geelvink Islands Endemic Bird Area, off the north-west coast of New Guinea. In recent surveys, only low numbers at best were recorded, which causes some concern for the species' survival. Nevertheless, its toleration of degraded forest and the existence of a relatively large protected forest on one of the islands suggest that it is not at immediate risk of extinction.

[*Zosterops mysorensis*, Biak Island, Geelvink Bay, New Guinea. Photo: Tony Tilford]





the difficulties in netting large quantities of them preclude the exploitation of them for mass human consumption, for instance in Japan, but in most of the family's range the occasional white-eye killed by slingshot or air-rifle generally disappears in the cooking pot. No special importance is known of white-eyes in human traditions, even in South-east Asia, where numerous illnesses are, according to local beliefs, cured by diverse parts of various bird species.

Many tribes have specific names for white-eyes, especially in places where the members of this family are among the most abundant species in the immediate surroundings of houses. Where they are not abundant, or where they co-exist with many other, similar-looking fine-billed birds, no specific names are given to them, as they are mostly united with sunbirds. On Muna and Butung, off south-east Sulawesi, where white-eyes are the most common birds, they are called "tomi-tomi", and names for the flowerpeckers and sunbirds are derived from this. The Duri people in south Sulawesi appear to have different names for the Lemon-bellied and Black-ringed White-eyes, calling them "cilele" and "läuelen", respectively.

Tribal names for birds are often descriptive, and the names for white-eyes are no exception. Names are given after their voices, morphology, nest shapes and habitat, but, strangely enough, rarely after their white eyering. On Flores, in the Lesser Sundas, Manggarai names refer to the shape of the white-eye's nest, such as "cik lékép", meaning "bird with cup-shaped nest", and "cik lewo lentap", meaning "bird with nest that is open above"; or to the bird's eyes, such as "cik mata mbé", the "goat-eye bird". The west Javan name for the Oriental White-eye, "éséngka" or "sikinangka", refers to this species' likeness to the yellow fruit parts of the jackfruit tree (*Artocarpus*); the Javan names of "pleci", "pêci", "prece" and the like describe its piercing contact calls. Similarly onomatopoeic names can be found in tribal nomenclature in Africa, where "siiriri" refers to the African Yellow White-eye on Bioko Island, and on Mauritius, where "oiseau pit-pit" is the name given to the Mauritius Olive White-eye. There are many other examples. Finally, colloquial names for white-eyes are sometimes derived from their food, such as "Cherrypicker" and "Grape-eater" for the Silvereye in Australia, or their habitat, such as the "oiseau manioc" for the Mascarene White-eye, indicating the latter's more artificial habitat compared with that of its olive congener.

Status and Conservation

A great many zosteropids are restricted to small islands, or are otherwise confined to a very small area, such as a mountain range, or coastal habitat. These species, having a very small global range of fewer than 500 km², are prone to extinction because additional threats may easily upset the balance of these often very small populations. Indeed, all 20 species and three distinct subspecies, which are sometimes treated as full species, that are globally threatened are inhabitants of small islands, mountain tops, or even mountain tops on small islands.

The largest concentrations of threatened zosteropids are in tropical and subtropical Africa, with eight species and three subspecies, and Oceania, with eight species. Near-threatened species also occur in these zones, with respectively one and six species. The Robust White-eye of Lord Howe Island became extinct in the early decades of the twentieth century, whereas at least some surviving species, such as the Giant White-eye, had larger ranges than they have at present, the consequence of pre-historic human activity.

One of the few fossil records of white-eyes is a femur of an Oriental Mountain White-eye, found at a cultural site of the Tarung-tung cave, on the Philippine island of Palawan, in a layer younger than 11,000 years before present (bp), and possibly indicative of human consumption. The site is at 250 m, considerably below the 1000 m above which the species is found nowadays, which may suggest a much wider distribution when the Palawan forests were still intact. Other zosteropid fossils found include a pre-human record (more than 3000 years bp) of now extinct white-eyes on 'Eua, in the Tonga Islands; and bones from Bridled and Golden White-eyes and from an unidentified white-eye have been found in a number of caves with deposits of up to 2500 years old on Tinian, Rota and Aguijan, in the Northern Mariana Islands. The Bridled White-eye is still found on these islands, but the Golden White-eye has disappeared from the first two.

Of the 98 species presently included in the family, no fewer than 20, more than one-fifth, are globally threatened. Six of these are categorized as Critically Endangered, these being the Rota White-eye, Sangihe White-eye, White-chested White-eye, Mauritius Olive White-eye, Faichuck White-eye and Golden White-eye. Each of these species is confined to one or a few small islands. In the next category, Endangered, are a further five species, namely the Bridled, Splendid, Slender-billed, Seychelles Grey and Rufous-throated White-eyes, each again restricted to one or two small islands. In the last threatened category, Vulnerable, are nine species, namely the Christmas White-eye, the Ranongga White-eye (*Zosterops splendidus*) and the Samoan White-eye (*Zosterops samoensis*), the Principe and Annobon White-eyes, the Mount Karthala White-eye, the Bonin White-eye, the Bioko Speirops (*Speirops brunneus*) and the Mount Cameroon Speirops. Apart from the last-mentioned species, in West Africa, these Vulnerable zosteropids are, once again, restricted to small islands, in one case to a single mountain on the island of Grand Comoro, off south-east Africa. A further 13 species are currently considered to be Near-threatened, and one species, the White-throated White-eye, is a Data-deficient species. Yet again, all of these have in common the fact that they are confined to one or a few islands.

The main cause of decrease in population size to dangerously low numbers is the removal of original habitat on which a certain bird species is dependent. It is believed that many islands in Oceania have lost species in this way, but in addition the Seychelles Yellow White-eye disappeared from Marianne following the wholesale destruction of that island's original vegetation. Other threats to extremely small islands, those smaller than 10,000 ha, and to small populations are climatic fluctuations; the rise in sea-level which is predicted to occur during the twenty-first century would have as yet unknown effects on the available habitat for a number of species. Hurricanes can have a disastrous impact on the vegetation, in particular flowers, and on smaller islands, especially, they may seriously disrupt the food availability of certain nectar-dependent species, such as the Reunion Olive White-eye. The Mount Karthala White-eye has its entire range

More than one-fifth of all the white-eyes are considered globally threatened. Six species are listed as Critically Endangered, five as Endangered and nine as Vulnerable. The last group includes the **Christmas White-eye**. This restricted-range species is naturally endemic to Christmas Island, in the Indian Ocean, but was introduced to Horsburgh in the Cocos Islands in the late nineteenth century. While still abundant on Christmas Island, its tiny range and increasingly threatened habitat justify its designation as globally threatened.

[*Zosterops natalis*,
Horsburgh Island,
Cocos Islands.
Photo: Don Hadden]

on the slope of an active volcano, where volcanic gases adversely affect leaf survival and reduce flowering activity in heavily damaged areas. In north Kenya, the distinct race *kulalensis* of the African Montane White-eye, sometimes regarded as full species, is believed to be threatened by, among other factors, the gradual disappearance of natural glades, a favourable habitat created naturally by large mammals such as buffalos and elephants, which have disappeared since the 1970s.

Four zosteropid taxa are now known or presumed to have become extinct. The Seychelles Yellow White-eye was restricted to an island of less than 100 ha in extent, where it was still present in 1890, but it seemed to have gone in 1940; although next to nothing is known about the ecological changes on the island, it can be assumed that the species' extremely small range and the clearing of the forest for coconut trees had a major influence on its presumed disappearance. The Robust White-eye was confined to Lord Howe Island, where it had been common until at least 1914; it is believed to have been extirpated by black rats, which swam ashore from a wrecked ship in 1918. The nominate race of the Bridled White-eye, found only on the island of Guam, in the Northern Marianas, has dwindled in numbers to almost certain extinction since the arrival on the island of the exotic brown tree-snake (*Boiga irregularis*). Finally, the nominate race of the Bonin White-eye, which inhabited the northern group of islands in this north-west Pacific archipelago, is believed to be extinct; it had disappeared from Nakôdo-jima by 1930, in which year the last specimens were taken on Muko-jima, and it appeared to have gone from the latter by 1941.

So, rats are known to have played a major role in the demise of the Robust White-eye on Lord Howe Island, and an introduced tree-snake has probably wiped out the nominate race of the Bridled White-eye on Guam. On islands elsewhere, the introduced Red-whiskered Bulbul (*Pycnonotus jocosus*) appears to be the major nest predator of the native Reunion Olive White-eye, which has not yet adapted its nesting strategy to counter this. Just to the north of Guam, on Rota Island, the introduced Black Drongo is known to prey on and harass small passerines of the size of the Rota White-eye, and possibly caused a decline of 89% of this Rota endemic in the 13 years since 1982.

Avian malaria and bird pox can also be serious problems (see General Habits), and avian malaria may already be determining

the distribution of olive white-eyes in the Mascarene Islands. Studies on Mauritius showed that introduced honeybees (*Apis mellifera*) could be interfering with interactions between the two endemic *Siderox* species and the Mascarene and Mauritius Olive White-eyes. This could have an impact on the island ecosystems, because the honeybees are less efficient pollinators of the two plant species, and may have strong competitive effects on the white-eyes.

In Hong Kong, where 100,000 or more birds are sold annually on the local market, the Japanese White-eye is one of the three most popular songbirds. In Japan, too, white-eyes were continuously supplied to local pet shops, without serious decreases in their abundance, until at least the 1950s. In South-east Asia, Oriental White-eyes are popular only in Singapore, where the subspecies *auriventer* is in most demand; it is imported in large numbers from the neighbouring Malaysian state of Johor, where it is protected, and from Indonesia. White-eyes are rarely bred in captivity as they are relatively inexpensive to purchase. During 211 surveys in 1991–1993, the 10,800 individuals counted in markets represented 8.4% of the total number of birds in the Singapore retail trade, and they were sold in 41 of 47 trade localities. Nevertheless, bird-capturing and hunting cannot so far be blamed for the demise of any single species of white-eye, although the local Singapore population of Oriental White-eyes has surely disappeared into the bird trade. If any of the latter do remain in the wild, the release of previously captured but unmarketable white-eyes, represented by females and silent males, may have an impact on the native avifauna. The Singapore race *auriventer* of the Oriental White-eye is likely to be mixed with the introduced subspecies *siamensis*, from Thailand and south Myanmar, *williamsoni*, from the northern part of the Malay Peninsula, and *buxtoni* and *melanurus*, from Sumatra and Java. White-eyes are much less popular as cagebirds in Indonesia and Vietnam, but the possible consequences should any of the many Indonesian endemic white-eyes suddenly become popular with bird-fanciers cannot be ignored. Even once common bird species have almost disappeared from many localities, and at least one species, the Straw-headed Bulbul (*Pycnonotus zeylanicus*), has already become extinct in much of its former range; more species may follow before too long.

In many aspects, being confined to a single mountain is similar to occurring only on a single island. The tiny global range constrains the species' population size, while dispersal possibilities may be negligible, so additional threats render the species more susceptible to extinction. One such threatened single-mountain endemic is the **Mount Cameroon Speirops**, which is restricted to a narrow altitudinal band on Mount Cameroon. While the species remains common, any increase in pressures could result in its conservation status being upgraded from Vulnerable.

[*Speirops melanocephalus*, Mann's Spring, Mount Cameroon, Cameroon.
Photo: Doug Wechsler/VIREO]





The high proportion of globally threatened species among the Zosteropidae reflects the frequently precarious conservation status of small-island endemics. The nominate race of the **Bonin White-eye**, endemic to the northern Bonin Islands, was last seen in 1941 and is probably extinct. The southern race *hahasima* is extant, but apparently occurs at a maximum of five sites in a total range of less than 100 km²; its current population is just a few thousand birds. Continued pressure from deforestation and perhaps from introduced mammals have led to the species being listed as Vulnerable.

[*Apalopteron familiare*
hahasima,
Haha-jima, Bonin Islands,
south of Japan.
Photo: Pete Morris]

A population viability analysis on the Capricorn subspecies *chlorocephalus* of the Silvereye was carried out in order to assess its extinction risk. This white-eye has its largest population, of about 375 individually colour-ringed birds, on Heron Island, and the analysis was based on 26 years of monitoring of this intimately known population, a comparative wealth of data. It is predicted that this small Silvereye population will be at risk of extinction within the next 100 years, threatened by the introduction of predators or diseases, inbreeding and storms but much less so by moderate loss of habitat, half of which has already been modified. The Silvereye has much smaller populations on islands near Heron Island, and movement or dispersal between these has a mitigating effect, although the smaller populations require unrealistically high immigration rates to enable them to remain viable in the long term.

Extreme weather, particularly heavy storms, and events determined by the El Niño Southern Oscillation are likely adversely to affect the survival chances of isolated populations. The effects of El Niño in 1991–1992 on the Japanese White-eye population of the Hawaii Islands were considerable, with significant decreases in mean monthly capture rates of the species, as well as noticeable reductions in fat scores of the individual birds.

Although only three, or possibly four, extinct white-eye taxa may seem to be a low number for a family with so many vulnerable species, there is no reason for complacency. A great number of white-eye taxa are restricted to small islands; indeed, a large proportion of all white-eye species are considered restricted-range species. There are still quite a few populations of otherwise wide-ranging and secure species which are confined to very small islands, and for which little information has been published. In the Philippines, the two subspecies *richmondi* and *meyleri* of the Golden-green White-eye have not been observed since they were initially described, at the beginning of the twentieth century. A large *Rukia* species is known to have become extinct on Saipan Island. During recent years, however, surveys of some of the most remote islands have “rediscovered” a number of supposedly lost taxa. For example, the nominate race of Everett’s White-eye (*Zosterops everetti*), restricted to the Philippine island of Cebu, was thought to be extinct because of the total deforestation of its native island, and because of a lack of observations since 1906, despite recent visits by ornithologists; in the 1980s, however, it was rediscovered on Cebu, where it has since been seen on sev-

eral occasions. Similarly, the Seychelles Grey White-eye, believed possibly extinct in the middle of the twentieth century, was subsequently rediscovered. Recent surveys in the Talaud Islands, north of the Moluccas, found the “lost” subspecies *babelo* of Everett’s White-eye to be still common. In an adjacent island group the Sangihe White-eye was likewise refound, but it appears to be very rare and is now listed as Critically Endangered. Its rediscovery also yielded new insight into its taxonomic status, which was upgraded to that of a full species.

Although most white-eyes are common where they occur, however restricted their range may be, some, such as the Sangihe White-eye, are exceptionally thinly distributed, and only very few records exist. Furthermore, because of their extreme mobility, lack of territorial displays and often secretive behaviour, white-eyes are not always easy to census. Sometimes indications of changing numbers may be found in the data on observed flock sizes. For the nominate Guam race of the Bridled White-eye, flock sizes appear to be related to population density: flocks of 10–20 individuals were reported at the beginning of the twentieth century, and of up to at most 15 in the 1970s, but in the 1980s parties held only 3–8, subsequently falling further to 3–6 birds.

Predictions on the vulnerability of woodland birds to local extinction in fragmented box-ironbark forest in Australia suggested intermediate risk values for Silvereyes, these values being based on mobility, population density and habitat specificity. This is in accord with findings for Oriental White-eyes, which, in a study in a number of Javan forest fragments, had a similar, more or less intermediate position. Whether this may be extended to the numerous white-eyes restricted to islands where the original vegetation is becoming increasingly fragmented merits investigation.

A few conservation programmes have been targeted at white-eyes. A scheme to eradicate the Black Drongos that threaten the endemic Rota White-eyes was temporarily mounted in 1991, and in eight mornings of shooting 1100 drongos were killed, while a captive-breeding programme for the white-eye was initiated in 1993, but with little success so far. The Critically Endangered White-chested White-eye has been included in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). The inclusion of the Oriental White-eye on CITES Appendix II (or at least on Appendix III) by some of the species’ range states, as well as documentation of trade levels and assistance for Malaysian efforts to stop illegal exports,

is required in order to control local extirpations of this popular cagebird; the encouragement of captive-breeding at commercial levels may also be worth consideration.

Reintroduction of extinct populations should be preceded by studies to determine the likely influences that interactions with existing species may have. Genetic studies indicate that, so long as the brown tree-snake can be controlled on Guam, reintroduction from the closely related and formerly interchanging population on Tinian or Saipan is warranted. The translocation in 2001 of Seychelles Grey White-eyes to the predator-free island of Frégate has proved successful. In translocation experiments with Japanese White-eyes on Hawaii, survival was good, but weight loss, food consumption and faecal production needed to be monitored individually.

General Bibliography

Abe & Hasegawa (2007), Adler (1994), Ali & Ripley (1987), Amidon *et al.* (2004), Austin & Kuroda (1953), Baker (1951), Balachandran (1999), van Balen (1991, 1998, 1999), Barnett & Briskie (2007), van Bemmelen & Voous (1951), Bock (1994), Borghesio & Laiolo (2004), Brandt (1962), Brazil (1991), Brinkmann (1978), Brook & Kikkawa (1998), Brown, E.D. & Hopkins (2002), Brown, K.J. & Downs (2003), Brown, M. *et al.* (2001), Brown, R.J. & Brown (1985), Bruce & Kikkawa (1988), Buden (2000), Bunning (1985), Burton (1996), Catterall (1989), Catterall *et al.* (1982), Chan (1994a, 1994b, 1994c, 1995a, 1995b), Chan & Kikkawa (1997), Chan & Sutton (1993), Cheke (1987a, 1987b), Clancey (1967b), Clegg, Degnan, Kikkawa *et al.* (2002), Clegg, Degnan, Moritz *et al.* (2002), Coates (1990), Colahan (1981), Collar & Stuart (1985), Collar, Andreev *et al.* (2001), Collar, Crosby & Stattersfield (1994), Coomans de Ruiter (1951), Coomans de Ruiter & Maurenbrecher (1948), Craig, A.J.F.K. & Hulley (1996), Craig, R.J. (1989, 1990, 1996, 1999), Craig, R.J. & Beal (2001), David-Beaulieu (1944), Dean (1990), Degnan (1993a, 1993b), Degnan & Moritz (1992), Diamond (1972a, 1975b, 1998), Dickinson (2003), Docters van Leeuwen (1954), Dowsett (1985), Dowsett & Dowsett-Lemaire (1993), Doyle (1933), Eck (1995), Eddinger (1967, 1970), Eguchi (1993), Engbring & Ramsey (1984), Engbring *et al.* (1986), Estoup & Clegg (2003), Falla *et al.* (1981), Feare (1975), Feiler & Nadler (1992), Finsch (1901), Fleming (1943), Forbes-Watson (1969), Franke *et al.* (1998), French (1996), Frentiu *et al.* (2007), Fry *et al.* (2000), Funnell & Munro (2007), Gibb (2000b), Gibb (1996b), Gibson-Hill (1947), Gill, B.J. (1994), Gill, F.B. (1971, 1973), Grant (1978), Greig-Smith (1978, 1979), Guest (1973a), Hachisuka (1930), Harris, A. (1998), Harrison (1968a), Hartert (1898a, 1898b), Hartlaub (1865), Haw *et al.* (2001), Higuchi *et al.* (1984), Hindwood (1940), Holmes & Wood (1980), Hoogerwerf (1967b), Home (1987), Hulley *et al.* (2004), Hutton *et al.* (2007), Indrawan *et al.* (2006), Jacobson (1919), Jahn (1942), Jansen (1990), Jenkins (1983), Kalinganire *et al.* (2001), Kikkawa (1961, 1962,



1963, 1980a, 1980b, 1987), Kikkawa & Catterall (1991), Kikkawa & Nuttall (1998), Kikkawa & Wilson (1983), Kikkawa *et al.* (1986), Knight & Robinson (1978), Kunkel (1962, 1975), Lack (1971), Layton (1991), Legge (1880), Lenz (1990), Li Guiyuan *et al.* (1982), Li Qingwei & Bian Xiaozhuang (1988), Lindsey *et al.* (1997), van Lummel (1932), Lunt *et al.* (2004), Mac Nally & Bennett (1997), Maddocks & Geiser (1997, 2000), Madoc (1956), Magsalay (1993), Marples (1944a, 1945), Marshall (1949), Matthiessen & Springett (1973), Mayr (1965, 1967), Mayr & Diamond (2001), Mayr & Meyer de Schauensee (1939a, 1939b), McCarthy (2006), McClure (1984), McFarland (1994b), McKean (1965), Mees (1951, 1953b, 1954, 1957, 1961, 1969, 1984, 2006), Melville & Round (1984), Micheneau *et al.* (2006), Miranda *et al.* (2000), Moreau (1957a, 1957b, 1960, 1966, 1967), Moreau & Kikkawa (1985), Moreau *et al.* (1969), Morioka & Sakane (1978), Munro, Funnell & Thomson (2006), Munro, Munro, Philips & Wiltchko (1997), Munro, Munro, Philips, Wiltchko & Wiltchko (1997), Nash (1993), Newton (1867), Page (1912), Pasquet *et al.* (2006), van der Pijl (1937), Pizzey & Knight (1997), Porter (1975), Poulsen (1956), Pratt *et al.* (1979, 1987), Puckey *et al.* (1996), Pyke & Recher (1988), Pyle & Engbring (1988), Radicke (1985), Ralph & Noon (1988), Rand & Gilliard (1967), Rasmussen & Anderton (2005a, 2005b), Rasmussen *et al.* (2000), Reis & Garong (2001), Rienks & Catterall (2000), Riley (1924), van Riper (2000), Robertson, B.C. (1996), Robertson, B.C. *et al.* (2001), Rocamora (1997), Rooke (1984), Rooke *et al.* (1983), Rutgers & Norris (1977), Safford (1991), Sarasin & Sarasin (1905), Schmalfuß (1977), Schuhmacher (1964), Scott, J.M. *et al.* (1986), Scott, S.N. *et al.* (2003), Seale (1901), Sharma (1989), Sheldon *et al.* (2001), Short *et al.* (1990), Shuxia Zhang *et al.* (2007), Sibley (1996), Sibley & Ahlquist (1990), Sibley & Monroe (1990, 1993), Skead (1967), Skead & Ranger (1958), Skerrett *et al.* (2001), Slater (1991, 1993), Slikas *et al.* (2000), Snouckaert van Schauburg (1931), Snow & Moreau (1955), Spennemann (1908), Stanley & Lill (2002a, 2002b, 2002c), Stanley *et al.* (2002), Stansbury (2001), Steadman (1995), Steinheimer (1999), Stinson & Stinson (1994), Stresemann (1931a), Stresemann & Heinrich (1940b), Stuart Baker (1934, 1942), Sundar & Chanda (2002), Swennen *et al.* (1986), Symes, Downs & Brown (2001), Tehsin & Tehsin (1998), Tree (2002), Tristram (1879), Trollope (1987), Verheijen (1961, 1964), Warren *et al.* (2006), White & Bruce (1986), Whitehead (1899), Whitelaw (1985), Wilson, J.M. (1994), Wilson, S.M. & Kikkawa (1988), Wiltchko, R. *et al.* (1999), Wiltchko, W. & Wiltchko (2000), Wiltchko, W., Munro *et al.* (1998, 2003), Wiltchko, W., Wiltchko & Munro (2000), Wiltchko, W., Wiltchko, Munro & Ford (1998), Winterbottom (1943), Wolff-Meternich & Stresemann (1956), Work *et al.* (1999).



Until its discovery on the tiny island of Conception in 1997, the **Seychelles Grey White-eye** was thought to occur only on Mahé. Following successful translocations to predator-free islands of other threatened Seychelles endemics, most famously the Seychelles Magpie-robin (*Copsychus sechellarum*), this white-eye was introduced to the island of Frégate in 2001. Further introductions were made to Cousine and North in 2007, by which stage the population of Frégate had risen to about 100 birds. In 2006, the species was downgraded to Endangered.

[*Zosterops modestus*, Cousine Island, Seychelles.

Photo: Jock Henwood]

The **Rufous-throated White-eye** is a highly distinctive white-eye in its own genus. Endemic to the island of Buru, in the Moluccas, the species is known only from two or three localities, and there have been only two records since the species was discovered in the 1920s. It is unclear whether it is very elusive or highly localized, or occurs at low densities. Despite the fact that Buru's montane forest is probably safe from destruction, this species is listed as Endangered on the basis of its apparently very small population and range.

[*Madanga ruficollis*, Buru, Moluccas.

Photo: Rob Hutchinson]



Subfamily ZOSTEROPINAE

Genus ZOSTEROPS Vigors & Horsfield, 1827

1. Chestnut-flanked White-eye

Zosterops erythropleurus

French: Zostérops à flancs marron

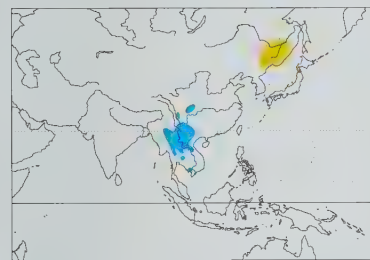
German: Rostflanken-Brillenvogel

Spanish: Antejitos Flanquirrofo

Other common names: Red-flanked/Chinese White-eye

Taxonomy. *Zosterops erythropleurus* Swinhoe, 1863, northern China = Shanghai and Tientsin. Presumably most closely related to either *Z. palpebrosus* or *Z. japonicus*. Monotypic.

Distribution. Breeds extreme SE Russia (E Amurland, Ussuriland) and NE China (Heilongjiang), possibly reaching extreme N Korea; non-breeding S China, Myanmar, Thailand, NW Vietnam, Laos and S Cambodia.



Descriptive notes. 10.5–11.5 cm; 10–13 g. Male has black lores, olive side of the head, well-developed white eyering broken at front; olive-yellow above, rump and uppertail coverts more yellow; closed wings like back; tail greyish-brown, feathers edged olive; throat bright lemon-yellow, clearly demarcated from pale grey side of breast, centre of underparts white, flanks chestnut (sometimes rather faint); iris dark brown; bill brown above, bluish below; legs greyish. Female is like male, but lores dusky, chestnut of flanks often very faint, sometimes no more than a faint pinkish suffusion. Juvenile undescribed. **VOICE.** Loud song.

Loud piercing, monosyllabic “tsee” (“lost-chick” call), or “tseeplee”.

Habitat. Breeding habitat includes groves, bushes, poplars (*Populus*), alder (*Alnus*) thickets, willow (*Salix*) jungles along riverbanks, streams and lakes. In non-breeding area deciduous or broadleaf evergreen forest, secondary growth; from foothills to 2590 m, most often above 800–1000 m.

Food and Feeding. Feeds on insects. Usually in flocks, sometimes mixed with other small passerines, e.g. Northern Long-tailed Tits (*Aegithalos caudatus*).

Breeding. Little known. Season probably end May to Aug; fledglings found in Aug, also four fledglings attended by three adults in elm (*Ulmus*) woodland in Jun. Nest in tree; clutch 5–6 eggs. No other information.

Movements. The most migratory species in family. Leaves breeding grounds in Sept, main stream of migrants passing S (mainly W of Korea) through S Gansu and E Sichuan; normal wintering areas include S China (Sichuan, Yunnan), W, C & E Myanmar (Nov–Apr), Cambodia, N & C Laos (regular visitor), N Thailand (fairly common), and N Vietnam (W & E Tonkin, where seems to prefer mountains). Small numbers sometimes found during summer in winter quarters. Accidental in coastal areas and islands in Sea of Japan (records in Oct, Nov, Feb, and May), but may prove to be a rare but annual migrant there. Distances flown, twice a year, up to 3500 km; one in Bokor (S Cambodia) would have migrated 5000 km from breeding area.

Status and Conservation. Not globally threatened. Fairly common locally; not numerous on its breeding grounds. Large numbers seen in China, where many captured for food and cagebird trade. Recorded as a migrant in Pangquangou National Nature Reserve, in China (Shaanxi).

Bibliography. Brazil (1991), Carey *et al.* (2001), Cheng Tsohsin (1987), David & Gosselin (2002b), Deignan (1963), Duckworth *et al.* (2002), Evans (2001), Flint *et al.* (1984), Inskipp *et al.* (1996), King (1989b), Kontorschikov (1997), Lekagul & Round (1991), Lethaby (1998), Li Guiyuan *et al.* (1982), MacKinnon & Philipps (2000), Mees (1957, 1969), Melville & Round (1984), Meyer de Schauensee (1984), Robson (2000b), Thomas & Poole (2003), Tomek (2002).

2. Japanese White-eye

Zosterops japonicus

French: Zostérops du Japon

German: Japanbrillenvogel

Spanish: Antejitos Japonés

Other common names: Dark Green/Chinese White-eye

Taxonomy. *Zosterops japonicus* Temminck and Schlegel, 1845, Decima, Nagasaki, Japan.

Forms a superspecies with *Z. meyeri* and *Z. palpebrosus*, and sometimes considered conspecific with either or with both, but all appear morphologically distinct; hybrids with *Z. palpebrosus* found in S China and N Vietnam; sometimes only N race *batanis* of *Z. meyeri* placed within present species. Affinity to *Z. erythropleurus* unclear. Geographical variation possibly partly clinal, as N races large, dark and with somewhat brownish or buffy flanks, whereas smallest and brightest races occur in S of range (Hainan I); curiously, races on small islands surrounding Japan (*insularis*, *stejnegeri* and *alani*) are larger and have longer, broader bill than average-sized nominate in mainland Japan; further study required. Races *stejnegeri* and *alani* interbreed in Bonin Is (where both were introduced); hybrids named as *boninsimae*. Other proposed races are *yessoensis* (described from Muroran, on Hokkaido), which is synonymized with nominate, and, in S Ryukyus, *iriomotensis* (from Iriomote) and *yokakuni* (Yonaguni-jima), which are subsumed in *loochooensis*. Eight subspecies recognized.

Subspecies and Distribution.

Z. j. japonicus Temminck & Schlegel, 1845 – S Sakhalin I, Japan (including Sado, Oki, Tsushima, Iki, and Goto Is) and coastal S Korean Peninsula.

Z. j. insularis Ogawa, 1905 – extreme N Ryukyu I (Tanegashima I, Yakushima I and Kume-jima).

Z. j. loochooensis Tristram, 1889 – Ryukyu Is (except extreme N) S to Yonaguni-jima.

Z. j. daitoensis Nagamichi Kuroda, 1923 – Borodino Is (Kita-daito-jima and Minami-daito-jima).

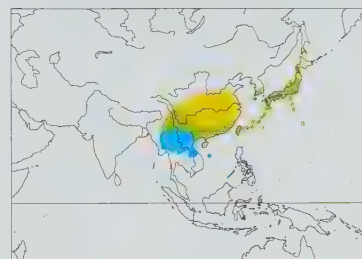
Z. j. stejnegeri Seebohm, 1891 – O-shima (Izu Is) S to Tori-shima (Nanpo Archipelago).

Z. j. alani E. J. O. Hartert, 1905 – Volcano Is (Kita-iwo, Iwo-jima).

Z. j. simplex Swinhoe, 1861 – breeds E China (extreme S Gansu E to Jiangsu, S to Sichuan, E Yunnan, Guangxi, Guangdong and Fujian) and Taiwan and extreme NE Vietnam (E Tonkin); non-breeding SE China S to Thailand and C Indochina.

Z. j. hainanus E. J. O. Hartert, 1923 – Hainan I.

Introduced on all main islands of Hawaii (nominate) and in Bonin Is (*stejnegeri* and *alani*).



Descriptive notes. 10–11.5 cm; 7.5–13.9 g. Male nominate race is olive-green above (without yellow on forehead or over lores), white eyering of average width interrupted at front by blackish spot (rarely absent), black lore line continuing under eyering; throat and upper breast lemon-yellow, rest of underparts pale grey, mostly buff to tawny-olive on flanks and often whole undersurface, except for whitish centre of belly; undertail-coverts pale lemon-yellow; iris brown or yellowish-brown; bill slate-grey; legs grey. Distinguished from *Z. palpebrosus* mainly by darker crown and upperparts and lack of yellow ventral stripe.

Sexes alike. Juvenile is like adult, but eyering greyer at first. Races differ mainly in colour depth and pattern, also in size: *insularis* is similar to nominate, but bill larger, and yellow colours often slightly richer, probably heightened by asymmetrically distributed rusty patches on head, nape and throat; *stejnegeri* is similar to nominate but slightly larger, and bill much larger; *alani* resembles nominate but slightly larger, less brownish on flanks, larger and broader bill; *loochooensis* is very like nominate, but underparts pure pale grey, little or no buff on flanks; *daitoensis* is very similar to previous but slightly larger, and has yellow patches above lores; *simplex* also is very similar, but has distinctly yellow forehead and supraloral region; *hainanus* is like last but distinctly smaller in size, has head and mantle slightly more yellowish. **VOICE.** Song of nominate race high-pitched and squeaky, but complex, resembling in pattern song of House Finch (*Carpodacus mexicanus*), often including mimicry of other species; song in Taiwan (race *simplex*) not so attractive as nominate, given from top of tall tree early in morning. Call notes (nominate) include high-pitched “tee” and nervous twitter, noticeably different from other races; *simplex* calls tiny staccato chirps, “tsip-tsip-tsip”, “chi-i, chi-i”, “jeet, jeet”; also trill like that of a cicada (Cicadidae).

Habitat. Deciduous or mixed forests, thickets, open woodland, secondary growth, also cultivated areas (e.g. urban parks, gardens, farmlands, groves, orchards); also tall forest trees in winter. Breeds mainly in lowlands, but occurs at up to 800 m in S China and c. 1000 m in Japan; to 2590 m in SE Asia non-breeding areas. Introduced population in Hawaii in wet to very dry habitats, from sea-level to tree-line, but less common in relatively undisturbed native forest.

Food and Feeding. Small insects, soft fruits and nectar. In Japan very fond of persimmons (*Diospyros kaki*), and in late winter and spring attracted to blossoms particularly of the Japanese apricot (*Prunus mume*), camellia (*Camellia japonica*), broad-leaved mangrove (*Bruguiera gymnorhiza*) and similar. Switches food sources often, and may prefer different fruits seasonally. In Hawaii more than 30 tree species visited for fruits, including exotic plants such as lantana (*Lantana camara*), banana poka (*Passiflora molissima*), firetree (*Myrica faya*), and raspberries and blackberries (*Rubus*), and nectar; native Hawaiian plants such as *Metrosideros polymorpha* and *Sophora chrysophylla* visited mainly for insects and nectar. Robs *Hibiscus* flowers of nectar by splitting corolla base. Efficient disperser of fruit seeds in Japan. Forages at all heights in vegetation, but particularly in forest subcanopy. Wanders about in flocks associated with tits (Paridae), Old World warblers (Sylviidae), Goldencrests (*Regulus regulus*) and Pygmy Woodpecker (*Dendrocopos kizuki*). In Hawaii, joins mixed-species flocks in winter (Jul–Feb) of up to 200 or more individuals.

Breeding. Season Mar/Apr–Aug; two broods in Japan, with eggs as late as Aug, probably two broods in subtropical part of range, but up to three (usually two successful) reported for Hawaii. Nest, constructed in 7–10 days, a solidly built cup-shaped structure, cup 56.2 mm in diameter and 41.7 mm in depth, of fine grasses woven together with spider web, exterior decorated with spider cocoons, bits of coloured string and paper, lined with moss, lichens and/or mammal hair, placed in fork of twigs of tree, mostly exotic banyan (*Ficus microcarpa*) or haole kow (*Leucaena leucocephala*) in Hawaii, or in bush or bamboo, usually 1–5 m (occasionally below 1 or above 30 m) above ground; smallest territory in Hawaii 0.12 ha. Clutch 2–6 eggs, usually 3–4, pale blue to greenish-blue, sometimes pure white, dimensions 15.5–16.3 × 12–13.5 mm; incubation period 11 days; nestling period 10–12 days, fledging period 15–20 or more days. Reported as host of Himalayan Cuckoo (*Cuculus saturatus*). In Hawaii, nests preyed upon by cats, mongooses (Herpestinae), lizards and House Sparrows (*Passer domesticus*).

Movements. Some N populations migratory; non-breeding range of race *simplex* includes C, S & E Myanmar, N & E plateaus in Thailand, Indochina (S to Viangchan, in Laos, and C Annam), Hainan I. and Parcel Is (S China Sea). Taiwan population possibly augmented in winter by visitors from mainland China; large flocks found during last days of Oct in lower Yangtze basin, apparently preparing to move S. In Japan, usually a post-breeding movement to open country and woodlands at lower levels, and frequently visits suburban and urban parks and gardens. Nominate race recorded as migrant in the Izu I and Ryukyu Is. On Hawaiian Is (introduced), individuals remain generally within 8 km of breeding territory, but sightings of birds flying over water indicate occasional dispersal attempts; juveniles may range farther during winter.

Status and Conservation. Not globally threatened. Common in most of range. The most common bird species in secondary forest of Hong Kong, with mean density of 12.4 birds/ha, accounting for 33% of total avian community; one of the three dominant species in Taipei Botanical Gardens, in Taiwan. Introduced in Bonin Is, where a hybrid population of races *alani* and *stejnegeri* survives; no information on numbers. In Hawaiian Is, nominate race introduced on Oahu in c. 1930 and became established in 1933; by late 1950s had spread throughout main islands, where it became the most abundant, widespread and omnivorous forest passerine, with 1.3 million individuals counted in 1980s on main island of Hawaii alone; it has been seen as far S as Johnston Atoll; 82 pairs/50 ha in urban Oahu. May play potential role in depressing populations of native Hawaiian bird species such as Elepaio (*Chasiempis sandwichensis*), Iiwi (*Vestiaria coccinea*), Hawaii Amakihi (*Hemignathus virens*) and Akikiki (*Oreomystis bairdi*), but convincing evidence lacking; moreover, has been suggested as being important agent of dispersal of exotic plants, in particular firetree, which readily invades open-canopy forests and alters the ecosystem. Possibility of these intro-

On following pages: 3. Lowland White-eye (*Zosterops meyeri*); 4. Oriental White-eye (*Zosterops palpebrosus*); 5. Sri Lanka White-eye (*Zosterops ceylonensis*); 6. Rota White-eye (*Zosterops rotensis*); 7. Bridled White-eye (*Zosterops conspicillatus*); 8. Citrine White-eye (*Zosterops semperi*); 9. Plain White-eye (*Zosterops hypolais*); 10. Enggano White-eye (*Zosterops salvadorii*); 11. Black-capped White-eye (*Zosterops atricapilla*); 12. Everett's White-eye (*Zosterops everetti*); 13. Golden-green White-eye (*Zosterops nigrorum*); 14. Oriental Mountain White-eye (*Zosterops montanus*).

duced birds also acting as reservoirs for disease (avian malaria, bird pox) has been raised. One of the most popular cagebirds in China. Individuals of this species occurring regularly in Singapore are imported birds released at religious festivals (suspected breeding once recorded).

Bibliography. Austin & Kuroda (1953), Brazil (1991), Carey *et al.* (2001), Cheng Tsohsin (1987), David & Gosselin (2002b), Deignan (1963), Ely (1971), Fisher (1951), Gore & Won Pyong-Oh (1971), Guest (1973a, 1973b), Inskipp *et al.* (1996), Jahn (1942), Kikkawa & Kakizawa (1981), Koh Chaoen (1998), Kondo *et al.* (1991), Kwok Honkai & Corlett (1999), LaRosa *et al.* (1985), Lekagul & Round (1991), Lethaby (1998), Lever (1987), Li Guiyuan *et al.* (1982), MacKinnon & Phillips (2000), McCarthy (2006), Mees (1957, 1969), Melville & Round (1984), Meyer de Schauensee (1984), Molisch (1926), Mountspring & Scott (1981), Moyer (1957), Nechaev (1991), Noma & Yumoto (1997), Pratt *et al.* (1987), Riley (1938), van Riper (2000), Robson (2000b), Schmitt (1931), Scott *et al.* (1986), Sibley & Monroe (1990), Sonobe (1982), Vaurie (1958), Vuilleumier (1993), Woodward *et al.* (1990), Yoshii *et al.* (1989).

3. Lowland White-eye

Zosterops meyeri

French: Zostérops des Philippines **German:** Luzonbrillenvogel **Spanish:** Antojitos Filipino
Other common names: Luzon/Philippine White-eye

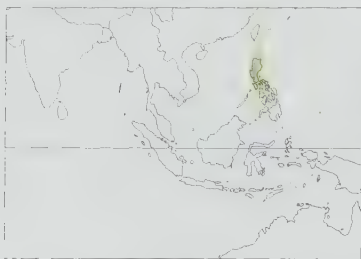
Taxonomy. *Zosterops meyeri* Bonaparte, 1850, Luzon, Philippines.

Forms a superspecies with *Z. japonicus* and *Z. palpebrosus*, and sometimes considered conspecific with either or with both, but all appear morphologically distinct; sometimes only N race *batanis* is placed within *Z. japonicus*. In Philippines, birds of this species recently discovered on Mindoro of uncertain racial identity, provisionally included in nominate; birds from Marinduque described as race *gilli*, and formerly placed with *Z. montanus*, but now regarded as a synonym of nominate race of present species. Originally named as *Dicaeum flavum*, but that name preoccupied. Two subspecies recognized.

Subspecies and Distribution.

Z. m. batanis McGregor, 1907 – islands of Lan Yü and Lü Tao, off SE Taiwan, and Batan Is, in extreme N Philippines.

Z. m. meyeri Bonaparte, 1850 – Calayan, Luzon, Lubang, Verde, Mindoro, Caluya, Marinduque and Banton, in N & NC Philippines.



Descriptive notes. 10.2–12 cm; one female 10 g. Nominative race has forehead lemon-yellow, crown and upperparts yellowish-green; white eyering interrupted at front by blackish spot, darkish loreal line; throat and upper breast lemon-yellow, rest of underparts pale grey except for rather faint yellow longitudinal streak over centre, pale lemon-yellow undertail-coverts; iris yellowish-brown to stone-grey; bill blackish to horn-brown, bluish at base, or black above and bluish-horn below; legs slaty brown or lead-blue. Sexes alike. Juvenile undescribed. Race *batanis* is larger than nominate, brighter yellow, and has more yellow on forehead.

Voice. Male described as “an excellent songster”, singing frequently near nest. Call “swit” or “swit-tee”, varying to more complicated series of twittering and wheezy notes, lasting 5–6 seconds.

Habitat. Forest, forest edge, scrub, bamboo thickets, gardens, cultivated areas, and other places near open country in lowlands; on Mindoro, absent from plantation areas and cultivated lands. Altitudinally segregated from *Z. montanus*, which occurs above 1000 m.

Food and Feeding. No details on diet. Forages in groups and mixed flocks, associating with eight or nine other species.

Breeding. Season Apr–Aug, occasionally from Jan. Nest said to be typical of genus, placed a few metres above ground in small tree. Clutch 3–4 eggs, occasionally 5, pale sky-blue or white, 15 × 12.1 mm. No other information.

Movements. Not known.

Status and Conservation. Not globally threatened. Common in lowlands. Race *batanis* widespread in Batan Is, where present on Batan, Sabtang and Y’ami, and recently discovered also on Ivojos and Itbayat. Nominative race only recently found on Caluya and Mindoro. A common cagebird locally in Philippines, e.g. Manila (Luzon).

Bibliography. Dickinson *et al.* (1991), Gonzales (1993), Hachisuka (1930), Inskipp *et al.* (1996), Kennedy *et al.* (2000), McGregor (1909), McGregor & Gardner (1930), Mees (1957, 1969), Meyer de Schauensee (1984), duPont (1971b), Sibley & Monroe (1990), Wolfe (1938).

4. Oriental White-eye

Zosterops palpebrosus

French: Zostérops oriental **German:** Gangesbrillenvogel **Spanish:** Antojitos Oriental
Other common names: Indian/Ceylon Small/Ceylon (Hill)/Sri Lanka(!) White-eye; Yellow-bellied/Siamese White-eye (*siamensis*); Hume’s White-eye (*auriventer*)

Taxonomy. *Sylvia palpebrosa* Temminck, 1824, Bengal, India.

Forms a superspecies with *Z. japonicus* and *Z. meyeri*, and sometimes considered conspecific with either or with both, but all appear morphologically distinct; interbreeding with *Z. japonicus* occurs in S China and N Vietnam. Was formerly considered to form a species complex with *Z. salvadorii* and *Z. everetti*; in that arrangement, race *siamensis* treated as a full species, *auriventer* (together with race *tahanensis* of *Z. everetti*) as another species, *melanurus* and *unicus* then constituting a third species, and remaining races of present species (together with *Z. salvadorii* and remaining races of *Z. everetti*) forming the fourth species. *Z. salvadorii* and *Z. e. everetti*, however, now believed to be more distantly related to present species. Otherwise, populations in neighbourhood of Mt Pangrango, in W Java, are intermediate between races *buxtoni* and *melanurus*. Races *egregius* and *salimalii* possibly better subsumed in nominate. Birds of this species recorded in Cambodia of uncertain racial identity, provisionally included in *williamsoni*; those in Andaman Is currently included in *nicobaricus*, but possibly represent an as yet undescribed race. Proposed races *joannae* (described from SE Yunnan, in China) and *occidentis* (Shimla, in N India) are synonymized with nominate, and *amabilis* (Kathiawar Peninsula, in W India) is merged with *egregius*. Eleven subspecies currently recognized.

Subspecies and Distribution.

Z. p. palpebrosus (Temminck, 1824) – SE Arabia (Mahawt I, in Oman); NE Afghanistan, Pakistan and N India E to S China (SE Xizang, SW Sichuan and Yunnan E to SW Guangxi) and Myanmar (except S & E).

Z. p. nilgiriensis Ticehurst, 1927 – S Western Ghats (hills of S Karnataka and W Tamil Nadu), in SW India.

Z. p. salimalii Whistler, 1933 – S Eastern Ghats (Shevaroy, Chitteri, Seshachalam, Nallamalai), in SE India.

Z. p. egregius Madarász, 1911 – lowlands of India, Laccadive Is and Sri Lanka.

Z. p. siamensis Blyth, 1867 – S Myanmar (Pegu, Kayah, Kayin), N, E & SE Thailand and NW Indochina.

Z. p. nicobaricus Blyth, 1845 – Andaman Is and Nicobar Is (except S).

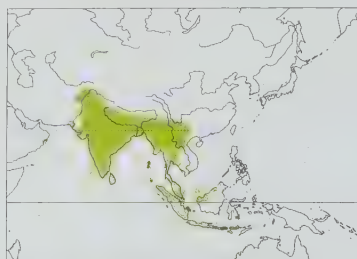
Z. p. williamsoni Robinson & Kloss, 1919 – Gulf of Thailand coast (from Bangkok S to Pattani) and W Cambodia.

Z. p. auriventer Hume, 1878 – extreme S Myanmar (S Tenasserim), W coast of S Thailand, W & SE Peninsular Malaysia (including islands of Ra, Libong, Pinang, Kelang estuary Group and Pisang off W coast, and Tioman off E coast), Singapore, E coastal areas of Sumatra, Riau Is (Kundur), Bangka I, S Natuna Is and Borneo (W Sarawak, Brunei).

Z. p. buxtoni Nicholson, 1879 – highlands of Sumatra, and extreme W Java (Bantam and Bogor).

Z. p. melanurus Hartlaub, 1865 – Java and Bali.

Z. p. unicus E. J. O. Hartert, 1897 – Lesser Sundas (Sumbawa and Flores).



Descriptive notes. 9.6–11 cm; 5.6–11 g. Nominative race has forehead and supraloral region yellowish, black loreal line extending to halfway under white eyering, latter broken at front by blackish spot; crown and upperparts olive-green, rump more yellowish; flight-feathers and tail blackish-brown, the former edged with olive-green; chin, throat, upper breast and undertail-coverts yellow, remainder of underparts pale greyish-white, sometimes with yellow mesial longitudinal streak over abdomen; iris yellowish-brown or brown; bill dark brown to black, bluish-grey base of lower mandible; legs slate-coloured or plumbeous.

Differs from *Z. japonicus* in having brighter yellow-green upperparts and uniformly yellow-green crown, more extensive yellow on forehead, grey and yellow of underparts paler. Sexes alike. Juvenile is like adult but duller. Races differ mainly in colour tone, in colour pattern of underparts and in biometrics, also SE races tend to have more blackish primaries and rectrices without greenish edges, relatively short tail and darker grey flanks than W races: *nilgiriensis* is largest, has relatively longest tail; *salimalii* is very bright yellow above, yellow mesial streak below present but rather weak, bill finer than that of others; *egregius* is close to nominate, but slightly less green, more yellowish, upperparts, generally lacks yellow mesial streak on abdomen; *siamensis* is similar to nominate, but entire underparts yellow; *nicobaricus* is very like nominate, but larger bill; *williamsoni* is close to nominate, but has brighter yellow supraloral region, similar also to following race but has more yellow above lores, slightly paler throat and undertail-coverts, mid-ventral stripe less distinct or lacking; *buxtoni* is smallest, generally slightly darker and greener above than nominate, with very distinct yellow median streak on underparts; *auriventer* is similar to previous but slightly larger, with paler underparts and more yellowish upperparts; *melanurus* also is similar but slightly larger, and has entire underparts yellow; *unicus* is very similar to last, but has slightly yellower lower back. **Voice.** Song, heard only in breeding season, short, thin and wispy, of slurred call notes, that of race *egregius* described as a rather feeble tinkling jingle beginning almost inaudibly but growing louder and soon fading; lasts 4–5 seconds, starts with some melodious rising and falling whistles followed by some querulous notes, uttered in continuous accelerating and decelerating strophes, “qwee-qwoor-quawarr tu-cheer-tu-cheer-cheer, tu-cheer-cheer-tu-cheer-cheer”. Flock-members call persistently; usual call a repeated, monotonous querulous sibilant “jieww” or “cheuw”, or “(tu) cheer) cheer cheer cheerr” like cheeping made by a day-old domestic chick; a series of weak sibilant high-pitched, rapidly twittering notes (0.7 seconds) repeated at intervals of 1–2 seconds; also an unobtrusive yet distinctive nasal, raspy, gradually downslurred guttural “djééééé”. **Habitat.** Deciduous forest, broadleaf evergreen/semi-evergreen forest and swamp-forest, also forest edge, secondary growth, woodland, farmland, thickets, all zones of mangroves (mature and regenerating), scrub and wooded cultivation (orchards, parks, gardens, cardamom plantations); also open strand woodland, especially with stands of casuarinas (*Casuarina*), and coastal scrub of all kinds. From plains to 2500 m, in Himalayas to 4000 m; generally 200–1600 m but locally in true lowlands in Java; from 850 to 1730 m on Sumbawa and above 500 m on Flores. In Borneo restricted to mangroves, swamp-forest and non-forest (edges of wet rice fields and scrub along riverbanks), mainly adjoining coastal areas. Along Gulf of Thailand coast confined to belt of mangroves and scrub; frequents mangroves also in Malay Peninsula, where race *auriventer* occurs also 15–45 km (to an extreme 80 km) inland in gardens and rubber plantations in SW part of peninsula. In Sumatra, *auriventer* is a coastal race in mangroves and other low forests, rubber plantations and gardens, whereas *buxtoni* occurs on higher ground inland in primary and secondary forests, tall turpentine trees in hills, plantations and gardens in villages and towns at 400–1400 m. This species is apparently the only passeriform found in the mangroves of the Sind coast (Pakistan).

Food and Feeding. Omnivorous. Vegetable matter includes small buds, seeds, fruits and nectar; animal food mostly insects. Fruits taken include those of the trees *Trema orientalis*, *Trema cannabina*, *Elaeocarpus sphaericus*, *Ficus religiosa*, of the shrubs *Rhamnus*, *Vaccinium variegatum*, the liana *Zizyphus oenopia*, and the exotic shrub *Lantana camara*; reported also as swallowing unexpectedly large fruits of the introduced *Cordia cylindrostachya*. Nectar taken from *Erythrina subumbrans*, *Erythrina orientalis*, *Elaeocarpus grandiflorus* and *Madhuca* trees, *Woodfordia* shrub, flowering coconut and mangrove trees (including *Sonneratia alba* and *Bruguiera*), strandline bushes (e.g. *Hibiscus tiliaceus*), the mistletoe *Dendrophloe pentandra*; also from the exotic *Grevillea robusta*, *Bombax* and eucalypt (*Eucalyptus*) trees, *Holmskioldia sanguinea* and *Calliandra haematocephala* shrubs, and *Euphorbia pulcherrima* hedge plants. Especially favours the exudation of petioles of banyan trees and ripe peepul figs (*Ficus religiosa*). Seen to take fleshy arils of *Acacia mangium* fruits and to feed fledgling with those of *Acacia auriculiformis* fruits. Animal food includes praying mantis larvae (Mantodea), weevils (of genus *Tanymecus*), stick-insects (of genus *Phyllium*), predatory bugs (Anthocoridae), the ants *Camponotus compressus*, *Pheidole malinsi* and *Polyrhachis simplex*, caterpillars (bagworms and other moth larvae, possibly tiny moths), flower-bugs, and small *Drosophila*-like flies, also spiders (Araneae) and mites (Acarina). In a study in India in Feb–Mar and Oct–Nov, only five out of 15 stomachs contained insects (including small weevils, ants and small caterpillars), but also held buds and small leaves; the remaining ten had only seeds, *Ficus* fruits and small buds, but no trace of insects. Highly gregarious, in flocks of 3–30, and flocks of more than 100 have been seen; often a member of mixed-species foraging flocks, e.g. in Sumatra seen with nuthatches (*Sitta*), tits (Paridae), Old World flycatchers (Muscicapidae) and minivets (*Picrocotus*). Where there is an abundant food supply may be encountered in foraging flocks of 40 or more individuals, but in less favourable (e.g. drier) habitats parties of 4–6 birds more usual. Often forages by hover-gleaning, and generally found high up in tree canopy. In Java, the exotic *Sesbania grandiflora* is favourite tree for insect-hunting.

Breeding. Season Feb–Sept in Indian Subcontinent, mainly Mar–Jun in Pakistan but extending right up to outbreak of monsoon (to as late as Aug), and mainly Mar–May in S India; Dec–Sept in SE Asia; Dec–April in Borneo, Jan–Oct (peak May–Jun) in Java and May–Oct (peak Apr/May–Jun) on Flores; often two or more broods. Pair-bond long-lasting. Nest built by female, or by both sexes, taking c. 4–6 days, a delicate-looking, thin-walled tiny cup 5 cm high, 6–7 cm wide and 3 cm deep, woven from vegetable floss (grass, plant fibre and bryophytes), strengthened with spider webs, moss, animal hair and fine grass strips, sometimes only willow (*Salix*) and poplar (*Populus*) seed floss or jute (*Corchorus*) cord used; suspended from bifurcating (nearly) horizontal twigs, or even leaf petioles at end of twig, and often small enough to hang between two adjoining leaves, usually not very high up (1–2 m in Pakistan, 1–6 m in India) but sometimes up to 18 m above ground in small bush, shrub or bamboo thicket. Clutch 2–4 eggs, most commonly 3 in N Punjab, almost always 2 in Java, initially turquoise-blue (fading to pale blue) to greenish-blue, in Lesser Sundas (race *unicus*) very pale blue to white, average dimensions 15.5 × 11.6 mm (*egregius*), 15.2 × 11.4 mm (*willamsoni*, *buxtoni*/*melanurus*), 15.5 × 11.5 mm (*unicus*); incubation by both sexes, period 10–11 days; fledging period 10–11 days; care of young by both parents, fledglings totally dependent on parents for 10–14 days.

Movements. Mostly resident, but continental races (especially nominate, *salimalii* and *nilgiriensis*) subject to some seasonal (winter) movements. In NE Pakistan, many make post-breeding descent to Punjab, where common Oct–Mar. In W Borneo, after breeding in mangroves of R Sarawak, moves farther inland (even into centre of Kuching city) from Jul to Dec, but returns in flocks each night to roost in mangroves. Single individual found on Rakata I (Krakatau Is), W of Java, suggests capability of crossing extensive waterbodies.

Status and Conservation. Not globally threatened. Generally or locally common to very common throughout range. In Pakistan appears to be gradually spreading S into N Sind with the spread of irrigation, and to be more sedentary in N plains regions. Locally common in Thailand, where roost of 750–1000 individuals recorded on small island of Hard Toop (Trang Province, in SW peninsula) in Oct 1986; presence of a population in Khao Yai National Park requires confirmation. Scarce in parts of N Vietnam (E Tonkin and N Annam). In gardens of Penang I, in NW Malaya, increase in numbers and an outward expansion from its original mangrove habitat was reported in 1950s. Widespread and abundant on 39 of 45 surveyed islands of Andaman Is. Scarce in Borneo. In W Java, now locally common in Jakarta, where formerly absent; race *buxtoni* a relatively recent arrival from Sumatra, and interbreeds with *melanurus*. Excessive capturing for cagebird trade eliminated the species in Singapore, where last breeding record in 1944; began to be reported again in 1970s, but still very scarce, and present population probably originates from captivity; also, especially by late 1980s, there may have been confusion between this species and feral *Z. japonicus*. Recently colonized Mahawt I, off Oman; whether this a genuine W expansion of 1000 km or the result of human actions (bird trade) requires investigation. Considered a pest locally; reported as causing damage to ripe mangoes (*Mangifera*) and guavas (*Psidium*) by piercing holes in order to reach the juice.

Bibliography. Ali & Ripley (1987), Balachandran (1999), van Balen (1998, 1999), Bartels (1937), Becking (1989), Cairns (1955), Chasen & Hoogerwerf (1941), Cheng Tsohsin (1987), Coates & Bishop (1997), David & Gosselin (2002b), Davidar *et al.* (1996), Deignan (1963), Docters van Leeuwen, H. (1929), Docters van Leeuwen, W.M. (1931, 1954), Doyle (1933), Duckworth *et al.* (1996), Eriksen *et al.* (2001), Fogden (1965, 1966), Gregory-Smith (1994), Grimmett *et al.* (1998), Hellebrekers & Hoogerwerf (1967), Henry (1998), Holmes (1997), Holmes & Nash (1989, 1990), Hoogerwerf (1949, 1950), Inskipp *et al.* (1996), Johnstone *et al.* (1996), Kuroda (1933a), Li Guiyuan *et al.* (1982), Lim Kim Seng (1992), MacKinnon & Phillipps (1993, 2000), Madoc (1956), Mann (2008), van Marle & Voous (1988), Mayr (1967), McCarthy (2006), Medway & Wells (1976), Mees (1951, 1954, 1957, 1969, 2006), Melville & Round (1984), Meyer de Schauensee (1984), Meyer de Schauensee & Ripley (1940), Nisbet (1968), Noske (1995b), Parkes (1971), van der Pijl (1936, 1937), Radicke (1985), Rasmussen & Anderton (2005b), Riley (1938), Ripley & Beehler (1989, 1990), Roberts (1992), Robinson & Kloss (1924), Robson (2000b), Schmalffuß (1977), Sheldon *et al.* (2001), Smythies & Davison (1999), Sody (1955), Strange (2000, 2001), Strange & Jeyarajasingam (1993), Stressemann (1931a, 1939), Swennen *et al.* (1986), Thomas & Poole (2003), Thornton *et al.* (1993), Tilford (2003), Verheijen (1964), Ward (1968), Wells (1984, 1990, 2007).

5. Sri Lanka White-eye

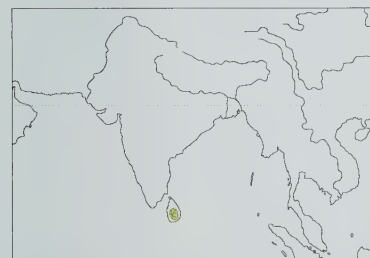
Zosterops ceylonensis

French: Zostérops de Ceylan **German:** Ceylonbrillenvogel **Spanish:** Antojitos Cingalés
Other common names: Sri Lanka Hill/Ceylon (Hill)/Large Sri Lanka White-eye

Taxonomy. *Zosterops ceylonensis* Holdsworth, 1872, Nuwara Eliya and on the upper hills, Sri Lanka.

Closest to *Z. palpebrosus*, and may have originated from ancestors of latter following their double colonization of Sri Lanka. Morphologically (long tail and bill, large wing, greener upperparts) and ecologically (restricted to hills) apparently closest to race *nilgiriensis* of *Z. palpebrosus*. Monotypic.

Distribution. Hills and mountains of Sri Lanka.



Descriptive notes. c. 11 cm; one female 12.6 g. Male has top of head and upperparts between olive-green and dark citrine; lores and streak under eye dusky grey, some grey also on ear-coverts; white eyering of average width, interrupted at front by dark grey spot continuous with lores; flight-feathers and tail feathers blackish-brown with broad dark greenish margins; greenish-yellow throat and breast, becoming greenish towards margins, undertail-coverts pure yellow, remainder of underparts greyish-white, darker on flanks, usually a trace of yellow streak over belly; iris light brown; bill blackish above, bluish-grey below; legs

dark greyish. Differs from *Z. palpebrosus* in somewhat larger size, much duller and greener plumage, yellow extending over whole breast, and longer bill, tarsus and tail. Female is like male, but less dark on forehead. Juvenile is slightly paler above than adult, and has narrower eyering, and slightly brighter yellow on throat and breast. **VOICE.** Jingling song, heard before sunrise, reminiscent of sound made by shaking bunch of keys, repeated 8–9 times; described also as fairly prolonged, syncopated strophe of short, sharp couplets or triplets, roughly alternating in pitch but at constant tempo, e.g. “chik chik chuk chik chuk-chuk chik”. Common call note “cheep”, like the chirp of a sparrow (*Passer*), or a slightly downturned short reedy chirp, “chisip”, stronger, deeper and less nasal than that of *Z. palpebrosus*.

Habitat. Forest, forest edge, low isolated bushes, tea plantations, *patna* jungle, and gardens; above 1000 m, sometimes as low as c. 450 m in SW (e.g. Sinharaja), and with mountain tops as upper limit. Overlaps locally with *Z. palpebrosus*.

Food and Feeding. Nectar, berries, and insects; insects include tiny moths and small caterpillars (Lepidoptera), in particular those of the tea tortrix (*Homona coffearia*). Outside breeding season forages in flocks of 10–15, sometimes of hundreds; also in mixed flocks, including *Z. palpebrosus* where the two species co-occur. At lower elevations of its distribution (at 450–600 m), is an alternative nuclear species in flocks where both nuclear species Orange-billed Babbler (*Turdoides rufescens*) and Greater Racket-tailed Drongo (*Dicrurus paradiseus*) are absent; here it occurs in 19% (dry season) to 31% (wet season) of mixed-species flocks.

Breeding. Feb–Jul, with peak in Apr, and renewed activity in Aug–Sept, occasionally in other months. Nest built by both sexes, a small deep cup made from green moss, rootlets, fine grass and fibres, lined with rootlets, suspended by rim in slender fork 1–7 m (mostly 2–4 m) above ground among foliage of tea bush (*Camellia thea*), often in *Grevillea robusta* (a shade tree in tea plantations), or in bushy sapling or bush at forest edge, or in fir tree (*Abies*), often in comparatively low shrub or tree growing in open; more often a lower site is selected than those chosen by *Z. palpebrosus*. Clutch 2 eggs, occasionally 3, pale bluish-green, 16.5 × 12 mm; care of young, probably also incubation, by both sexes; no information on duration of incubation and nestling periods.

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species: present in Sri Lanka EBA. The most common bird species in higher parts of Sri Lanka.

Bibliography. Grimmett *et al.* (1998, 1999), Henry (1955, 1998), Inskipp *et al.* (1996), Kotagama & Goodale (2004), Legge (1874, 1983), Mees (1957, 1969), Phillips (1951), Rasmussen & Anderton (2005b), Ripley (1949), Ripley & Beehler (1990), Stuart Baker (1926).

6. Rota White-eye

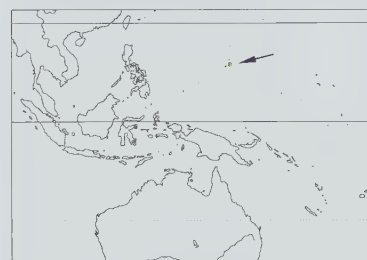
Zosterops rotensis

French: Zostérops de Rota **German:** Rotabrillenvogel **Spanish:** Antojitos de la Rota

Taxonomy. *Zosterops semperi rotensis* Takatsukasa and Yamashina, 1931, Rota Island, in Northern Marianas.

Forms a superspecies with *Z. conspicillatus*, *Z. semperi* and *Z. hypolais*; all formerly considered conspecific, but differ in plumage, vocalizations and behaviour, and treatment as separate species supported by DNA–DNA hybridization and analyses of mitochondrial DNA. Monotypic.

Distribution. Rota I, in Northern Mariana Is.



Descriptive notes. 10 cm; 10 g. Has top of head and upperparts greenish-yellow, forehead and supraloral region tinged bright yellow, narrow white eyering; auriculars concolorous with upperparts; remiges and tail feathers blackish-brown with light yellowish-green edges; chin, throat and entire underparts yellow; iris olive; bill light brown above, light yellowish-brown below; legs light brown to yellow-orange. Differs from similar *Z. conspicillatus* mainly in having brighter coloration above, yellower lores, uniformly yellow throat and underparts. Sexes alike. Juvenile undescribed. **VOICE.** Reported as having complex

song, but no further details. Calls with rolling chirps, similar to but higher-pitched than call of Eurasian Tree Sparrow (*Passer montanus*); harsh, rolling, low-pitched “tsheip”, buzzy “zee-zee-zee-e-e”, and less buzzy “see-tseep”.

Habitat. Wet native forest of primarily tall trees at c. 400–490 m (occasionally down to 200 m) on Sabana Plateau; ranging from stunted open forest on plateau summit to closed mature forest on upper slopes. Dominant trees include *Elaeocarpus joga*, *Hernandia labyrinthica*, *Ficus prolixa*, *Intsia bijuga*, *Guettarda speciosa*, *Psionia umbellifera*, *Claoxylon marianum*, and *Pandanus* species; found breeding also in *Merrilliodendron megacarpum* and (introduced) *Acacia confusa* forests.

Food and Feeding. Insects. Forages mostly on small branchlets in outer tree crown; gleans insects from leaves. Lives in family groups or extended families in isolated flocks within home range.

Breeding. Breeds Dec–Aug, in both dry and wet seasons, thus possibly throughout year. Nest cup-shaped, mean external height 40 mm, diameter 59 mm, internal diameter 46 mm, depth 28 mm, constructed from woven grass and *Pandanus* fibres, *Asplenium* rootlets, spider webs, and a yellow cottony material, covered with moss, the inner cup composed of *Pandanus* fibres and woven grass, suspended at 3.3–14.6 m (average 10.3 m) between branch and branchlet/leaf petioles, occasionally from ferns below branches, in native *Elaeocarpus joga*, *Hernandia labyrinthica* or *M. megacarpum* tree, or in introduced *Acacia confusa*. Clutch 1 or 2 eggs, light blue, 17.1 × 13 mm; incubation period 10–12 days; nestling period 10–12 days; post-fledging dependence at least 8 days.

Movements. Relatively sedentary.

Status and Conservation. **CRITICALLY ENDANGERED.** Restricted-range species: present in Mariana Islands EBA. Confined to Sabana Plateau region of Rota I, where once (e.g. 1945) common and widespread, but considered uncommon by 1960s; population declined from 10,763 individuals in 1982 to 300–1500 in 1991, a reduction of 87% in period of ten years. Most recent surveys, in 1995 and 1999, yielded 1167 and 1100 individuals, respectively. Maximum flock sizes dropped from 23 in 1988 to about ten in 1991, which can be linked to population decline. Black Drongo (*Dicrurus macrocercus*), introduced in 1935, very likely implicated in this decline, as the drongos became abundant in 1960s, which coincided with decrease of present species; latter’s very small size and its habit of feeding in exposed micro-habitat make it susceptible to predation. Programme to eradicate the drongo was mounted in 1991, and a captive-breeding programme for present species initiated in 1993. Predation by rats, both Polynesian rat (*Rattus exulans*) and introduced Tanezumi rat (*Rattus tanezumi*), an additional threat. Typhoons of common occurrence in Northern Marianas, and known to damage forest habitat; a single event can have severe adverse impact.

Bibliography. Aidon *et al.* (2004), Anon. (2004, 2007n), Baker (1948, 1951), Butchart & Stattersfield (2004), Collar *et al.* (1994), Craig (1999), Craig & Taisacan (1994), Engbring *et al.* (1986), Fancy & Snetsinger (1996), Lusk & Taisacan (1997), Mees (1969), Pratt *et al.* (1987), Slikas *et al.* (2000), Stattersfield & Capper (2000), Yamashina (1932).

7. Bridled White-eye

Zosterops conspicillatus

French: Zostérops bridé **German:** Guambrillenvogel **Spanish:** Antojitos Embridado
Other common names: Marianas Bridled/Spectacled White-eye; Saipan Bridled White-eye (*saypani*)

Taxonomy. *Dicaeum conspicillatum* Kittlitz, 1833, Guam, Northern Mariana Islands.

Forms a superspecies with *Z. roseni*, *Z. semperi* and *Z. hypoleis*; all formerly considered conspecific, but differ in plumage, vocalizations and behaviour, and treatment as separate species supported by DNA–DNA hybridization and analyses of mitochondrial DNA. Race *sapayni* sometimes treated as a full species, but this not supported by mtDNA data, although differs vocally from nominate; further study required. Two subspecies recognized.

Subspecies and Distribution.

Z. c. sapayni A. J. C. Dubois, 1902 – N Northern Mariana Is (Saipan, Tinian and Aguijan).

Z. c. conspicillatus (Kittlitz, 1833) – Guam.



Descriptive notes. 10 cm; 7.9–10.5 g. Male nominate race has forehead and supraloral region yellowish-white, crown and upperparts greenish, often with greyish tinge, uppertail-coverts very slightly brighter; dark grey line from gape to below eye, where ends in black blotch, white eyering of average width, greyish cheek; flight-feathers and tail blackish-brown with broad greenish margins; throat pale yellowish, underparts amber-yellow; iris light amber, outer ring white; bill yellow, upper mandible with black-brown tip; legs dark olive-green. Distinguished from all others of genus by combination of pale throat and yellow

underparts. Female is like male. Juvenile is similar to adult. Race *sapayni* is slightly smaller than nominate, has narrower supraloral line, green cheeks (like mantle), uniform pale buffish-yellow underparts but citron-yellow undertail-coverts, and darker bill. **Voice.** Song of nominate race a lilting series of buzzy notes, “zeeep-zee-zee-zoo-zip”, and calls a buzzy chirp “cheep” or “tszeep”, lacking high-pitched calls of *sapayni*. Race *sapayni* has higher-pitched, less buzzy calls, with chirps often rapidly uttered and organized into loose song; “confusion” chorus described. Calls of both races, especially in flight, sound like those of House Sparrow (*Passer domesticus*); in flocks a series of “chit-chit” notes, and whining vocalizations, which used also in agonistic interactions.

Habitat. Nominat race found in all habitats from beach strand to disturbed habitats; edges of forest, grasslands in hills, secondary growth (rather than true forest). Race *sapayni* in sugar-cane fields, common in casuarina (*Casuarina*) stands and semi-wooded hillsides, gardens and shrub in villages.

Food and Feeding. Seeds, nectar, flowers and fruit of 22 vine, tree and herb species; also insects, small snails. Recorded as taking fruits of the vines *Momordica* (also seeds), *Passiflora*, and *Jasminum* (also flowers), and the trees *Premna* (also nectar), *Ficus*, *Melanolepis*, *Artocarpus*, *Pipturus*, *Lantana*, *Carica* and *Muntingia*; nectar and/or flowers of the vines *Mikania*, *Operculina*, the trees *Pisonia*, *gulos* (*Cynometra ramiflora*), coral tree (*Erythrina variegata*), *Psychotria*, *Morinda*, *Hibiscus*, *Albizia* and *Leucaena*; seeds of the herb *Bidens*. Insects include, among others, caterpillars and ants (Formicidae), rarely grasshopper (Orthoptera) parts. Versatile in its foraging, including every micro-environment from ground to treetops, but primarily in canopy, shows marked preference for small leaves and leaflets in trees and bushes, using smaller perches of taller trees, especially *Cynometra ramiflora*. Nominat race was usually encountered in flocks of 10–40 individuals, and flocks of 100 observed; sometimes in (non-territorial) pairs away from flocks; forages by gleanings, probing, hovering and sallying, principally on outer crown of trees and shrubs; favourite foraging sites are the small *Linovia trifolia* bushes growing by roadside and waste places throughout Guam. Race *sapayni* found typically in flocks of 10–40 birds, and up to 50 at flowering and fruiting trees, throughout year, even when some are nesting. One observation of an individual following a foraging Rufous Fantail (*Rhipidura rufifrons*).

Breeding. Mostly Jan–Oct (race *sapayni*); bred throughout year on Guam (nominate). Not territorial except near nest, but birds remain in home range. Nest of nominate race a fairly deep woven cup of fine grass and roots, with cobwebs, wool and cotton wool on outside (all identifiable material from introduced plants), external diameter 40–50 mm (occasionally to 80 mm), height 48 mm, internal depth 25 mm, suspended in fork of branch 1–4 m above ground in *Leucaena leucocephala* or *Pithecellobium dulce* tree; nest of race *sapayni* similar, external diameter 55–65 mm, height 40–55 mm, internal diameter 40–45 mm, depth 25–30 mm, placed at 2–6 m in *Pithecellobium* or *Casuarina equisetifolia* tree, or in reeds (*Phragmites karka*). Clutch of nominate race usually 2 eggs, sometimes 3, pale blue, 16.9 × 12.9 mm, of *sapayni* 1–3 eggs, 15.2 × 11.4 mm; no information on incubation and nestling periods. Collared Kingfisher (*Todiramphus chloris*) possibly a regular predator, has been observed to take a probable fledgling from a branch.

Movements. Sedentary. Many ringed individuals known to stay for up to 14.5 months in study area (radius 300 m).

Status and Conservation. ENDANGERED. Nominat race of Guam almost certainly Extinct. Restricted-range species: present in Mariana Islands EBA. On Guam, nominate race reported by early visitors as being fairly common and widespread in 1828, but more restricted in distribution in middle of 20th century; by 1945 still a few in S Guam, and in 1981 an estimated 2200 remained in 2% of known historical range in N Guam and none in former range in C & S Guam. Most recent observation in Jun 1983 in Pajon Basin; a few individuals may survive in forests near Ritidian Point. Reasons for sudden decline unclear, but most likely became a victim of introduced brown tree-snake (*Boiga irregularis*). Saipan race (*sapayni*) was fairly common to abundant in 1887 and first half of 20th century on Saipan and Tinian; numbers estimated at 229,138 individuals in 1982; population extremely dense, and likely at saturation point. Reintroduction of species to Guam, using this race, should be considered, but only when brown tree-snake eradicated or under control, and when extinction of nominate confirmed beyond doubt.

Bibliography. Amidon *et al.* (2004), Anon. (2007n), Baker (1951), Butchart & Stattersfield (2004), Craig (1989, 1990, 1996, 2002), Craig & Beal (2001), David & Gosselin (2002b), Downs (1946), Engbring & Ramsey (1984), Engbring *et al.* (1986), Fancy & Snetsinger (1996), Hartert (1898b), Jenkins (1983), Marshall (1949), Martin & Kremer (2006), Mayr (1945b), Mees (1969), Owen (1977), Pratt *et al.* (1979, 1987), Scale (1901), Slikas *et al.* (2000), Stopplet (1946), Stott (1947), Wiles *et al.* (2003), Yamashina (1932).

8. Citrine White-eye

Zosterops semperi

French: Zostérops de Semper **German:** Semperbrillenvogel **Spanish:** Antojitos de las Carolinas
Other common names: Caroline (Islands) White-eye

Taxonomy. *Zosterops semperi* Hartlaub, 1868, Palau Islands.

Forms a superspecies with *Z. roseni*, *Z. conspicillatus* and *Z. hypoleis*; all formerly considered conspecific, but differ in plumage, vocalizations and behaviour, and treatment as separate species supported by DNA–DNA hybridization and analyses of mitochondrial DNA. Geographical variation minimal, but races separated by large geographical distances. Three subspecies recognized.

Subspecies and Distribution.

Z. s. semperi Hartlaub, 1868 – Palau Is.

Z. s. owstoni E. J. O. Hartert, 1900 – Chuuk (high islands within the atoll: Weno, Udot, Fefan, Fana, Dublon, Uman and Fanabeguets), in E Caroline Is.

Z. s. takatsukasai Momiyama, 1922 – Pohnpei I, in EC Caroline Is.



and having paler yellow underparts, darker upper mandible and legs. Sexes similar. Juvenile undescribed. Race *owstoni* has darker olive and less yellowish-green upperparts and duller yellow underparts than nominate, also slightly more yellow on forehead; *takatsukasai* is similar to previous but slightly smaller, and brightest underneath of all races, also has brown eyes. **Voice.** No song described. High clear whistles “tee dee, tee dee, tee dee-dee-dee”, or squeaky, high-pitched contact call.

Habitat. Variety of forest and scrub habitats.

Food and Feeding. Small insects. Forages in pairs and small flocks, sometimes with *Z. finschii* or *Z. cinereus*. Seeks food in foliage of small trees, around yellow-flowering bushy trees. Fixed daily circuits described for nominate race in Palau.

Breeding. Breeds Feb–Mar in Palau (nominate race), and nests found throughout year in Chuuk (*owstoni*). Nest thinly woven of grass, small tendrils, pieces of dead leaves, plant down or cobweb, lined with fine soft grasses, placed 1.2–2.4 m above ground in bush, tree (e.g. *Hibiscus*) or reed (*Phragmites*) tangle, at edge of forest, in garden or close to house, frequently in extremely exposed location, e.g. low bushes adjoining roadway with no surrounding vegetation in Chuuk (race *owstoni*); nests in Palau (nominate) sometimes placed on thick branch, instead of suspended between twigs. Clutch in Palau 2 eggs, pale green; in Chuuk 1 egg, light blue, sometimes with more intense band of blue at widest point, 17.3 × 11.7 mm; on Pohnpei 1–2 eggs, glossy light blue, 17 × 13 mm. No other information.

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species: present in Palau EBA and in East Caroline EBA. Widespread and common (but less common than *Z. finschii*) throughout main islands in Palau Is; common also in Chuuk and on Pohnpei. Nominat race uncommon in Palau in 1931; numerous on Peleliu I, where not found in 1945, when 25 individuals located on Ngergoi (Garakayo). On Pohnpei race *takatsukasai* rare in 1931; more recently, encounter rates (birds per hour) in Pohnpei forest above 200 m 6.1 in 1983 and 0.9 in 1994 (85% decrease), and below 200 m 10 in 1983 and 1.2 in 1994 (88% decrease).

Bibliography. Baker (1951), Brandt (1962), Buden (2000), Finsch (1880), Hartert (1900a), Marshall (1949), Mees (1969), Nehrkorn (1879), Owen (1977), Pratt, Bruner & Berrett (1987), Pratt, Engbring *et al.* (1980), Slikas *et al.* (2000), Yamashina (1932).

9. Plain White-eye

Zosterops hypoleis

French: Zostérops hypolaïs

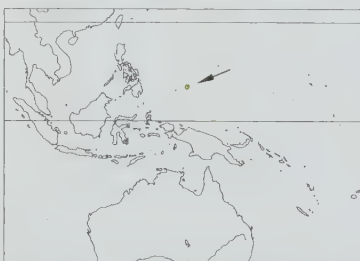
German: Schlichtbrillenvogel

Spanish: Antojitos Liso

Taxonomy. *Zosterops hypoleis* Hartlaub and Finsch, 1872, Yap, Caroline Islands.

Forms a superspecies with *Z. roseni*, *Z. conspicillatus* and *Z. semperi*; all formerly considered conspecific, but differ in plumage, vocalizations and behaviour, and treatment as separate species supported by DNA–DNA hybridization and analyses of mitochondrial DNA. Monotypic.

Distribution. Yap I, in extreme W Caroline Is.



Descriptive notes. 10 cm. Rather nondescript white-eye with pale eye; crown feathers often ruffled, creating big-headed profile. Plumage is greenish-grey above, slightly more greenish on crown and uppertail-coverts; narrow dirty-white loreal line, very narrow white eyering, traces of dusky under eyering; remiges and rectrices blackish-brown with citrine outer margins; throat, upper breast, centre of belly and undertail-coverts yellow, flanks washed pale buff; iris white; bill fuscous, paler basal part of lower mandible; legs plumbeous. Sexes alike. Juvenile undescribed. **Voice.** Song of short, chirping phrases, “chee-twee-chulip...”

and so on, slower than those of related congeners. Calls with thin trilled “chee” notes, and buzzy “zee-up”.

Habitat. Wide variety of habitats, from forest canopy to grassy fields; at edge of jungle is usually confined to undergrowth.

Food and Feeding. No details of diet. Forages in small flocks, but not so conspicuous and noisy as other members of genus. Flocks often feed in grass less than 1 m tall. Movements slower and more deliberate than those of other white-eyes, e.g. *Z. conspicillatus*.

Breeding. One nest found, woven from grasses, suspended c. 3 m above ground in fork of tree at edge of dense forest. No other information.

Movements. Not known.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Yap Islands EBA. Widespread and common on Yap, where 2–15 individuals found in every c. 100-m stretch of forest edge. Although not at any immediate risk, this species, because of its tiny global range, could suffer greatly from any adverse meteorological event or accidental introduction of predators.

Bibliography. Anon. (2007n), Baker (1951), Butchart & Stattersfield (2004), Fisher (1950), Hartlaub & Finsch (1872), Kuroda (1933b), Mayr (1945b, 1967), Mees (1969), Pratt *et al.* (1977, 1987), Sibley & Monroe (1990), Slikas *et al.* (2000), Stattersfield & Capper (2000).

10. Enggano White-eye

Zosterops salvadorii

French: Zostérops d'Enggano **German:** Salvadoribrillenvogel **Spanish:** Antojitos de Enggano

Taxonomy. *Zosterops salvadorii* A. B. Meyer and Wilesworth, 1894, Enggano Island.

Relationships unclear. Formerly considered conspecific with *Z. palpebrosus*, or united with race *auriverter* of latter in a separate species with race *tahanensis* of *Z. everetti*. Monotypic.

Distribution. Mega I and Enggano I (including tiny satellite island of Dua), off SW Sumatra.



Descriptive notes. 10 cm. Top of head and upperparts are olive-green; white eyering fairly wide, interrupted at front by blackish spot, broad blackish loreal line continuing as streak backwards beneath and to behind eye; primaries and tail feathers blackish-brown, edged olive-green; throat, upper breast, undertail-coverts and indistinct streak over centre of belly lemon-yellow; remainder of underparts pale grey, almost white on belly, darker on flanks; iris reddish-brown or yellowish-brown; bill black; legs leaden. Sexes similar. Juvenile undescribed. **VOICE.** Little information. Apparently similar to that of *Z. palpebrosus*.

Habitat. Coconut groves and other lowland wooded areas.

Food and Feeding. No information. Flock of six individuals seen on Mega I.

Breeding. No information.

Movements. No information; presumably sedentary.

Status and Conservation. Not globally threatened. Restricted-range species: present in Enggano EBA. Abundant in 1983. Confined to island of Enggano (444 km²), one of its satellite islets and the remote Mega I (c. 170 km NW of Enggano). Latest information available, from early 1990s, indicates Enggano still quite extensively forested; it contains a large hunting reserve, and it has been recommended that four small game reserves be established.

Bibliography. Gill (1969), Holmes (1994), Inskipp *et al.* (1996), Junge (1938), MacKinnon & Philipps (1993), van Marle & Voous (1988), Mees (1957), Ripley (1944), Salvadori (1892), Stattersfield *et al.* (1998), Stresemann (1931a, 1939).

11. Black-capped White-eye

Zosterops atricapilla

French: Zostérops à calotte noire **Spanish:** Antojitos Capirotado **German:** Schwarzstirn-Brillenvogel

Taxonomy. *Zosterops atricapilla* Salvadori, 1879, Mount Singgalang, central-west Sumatra.

Closely related to *Z. everetti*. An old species that must formerly have been more widespread in Borneo, as latter population not even racially distinct from that in S Sumatra; reasons for species' limited and patchy distribution not known. Two subspecies recognized.

Subspecies and Distribution.

Z. a. viridicatus Chasen, 1941 – N Sumatra (Leuser Mts, in Aceh; region of Berastagi, in Sumatera Utara).

Z. a. atricapilla Salvadori, 1879 – C & S Sumatra; N, NE & SE Borneo (Mt Kinabalu, Mt Mulu, Batu Patap, Ulu Sabai, Tutoh; upper Kayan region; Meratus Mts).



Descriptive notes. 9.5–10 cm; 8.5–11 g (*viridicatus*). N nominate race has forecrown, forehead, area around eyering, and submoustachial region black, white eyering of average width broken at front with black; rear crown to back olive-green, rump much yellower; flight-feathers and tail feathers blackish-brown, more or less edged with olive-green; chin, undertail-coverts and broad streak up to lower breast chrome-yellow, throat more greenish-yellow, remainder of underparts rather dark grey; iris yellowish-brown to hazel or orange; bill horn-black, base of lower mandible grey; legs feet slate-coloured, blue

or grey. Sexes alike. Juvenile is duller throughout, with almost no black on forehead and no white eyering, has greyish-brown iris, pinkish-grey bill and grey legs. Race *viridicatus* is very like nominate, but has slightly more greenish, less yellow, throat. **VOICE.** Loud twinkling series of calls (race *viridicatus*); nominate race has trembling call note, more like that of genus *Tephrozosterops* than voice of typical white-eye.

Habitat. Upper hill forest and lower montane forest, ascending into upper montane bush and alpine ericaceous meadows, where one of very few small bird species to be found. In Sumatra from 700 m up to 3000 m on Mt Leuser, but more restricted in altitudinal range and far less abundant where *Z. montanus* occurs at upper limit (e.g. 1300–2500 m on Mt Kerinci); in Borneo at 900–2100 m on Mt Kinabalu, where it meets *Chlorocharis emiliae* at higher altitudes, and mostly between 1200 and 1900 m elsewhere.

Food and Feeding. Mainly insects, grubs, fruits, nectar. Fruits taken include those of mistletoes (Loranthaceae), wild raspberry (*Rubus*), small purple figs (*Ficus*) 4 mm in size; nectar includes that of *Eugenia* species, and buds of *Homalanthus* also consumed. During drought in 1983, grass seeds found in stomachs of Bornean individuals. Young fed with grubs and smaller insects. Forages in small flocks of 4–12 individuals; associates in mixed flocks with minivets (*Pericrocotus*), Blue Nuthatch (*Sitta azurea*) and others in Sumatra. Flocks visit fruiting trees and forage through lower and middle storeys of forest, along shrubs at forest edge and among clumps of tall bushes and low trees. Gleans insects from outer foliage; probes among moss hanging from twigs and petioles.

Breeding. Birds in breeding condition recorded in Apr, adult carrying nesting material in May and fledgling in Jun in Sumatra; nest with young in early Mar and fledglings in Apr and Jul in Borneo. One nest known, built of fine roots, placed on moss-covered bough. No other information.

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species: present in Bornean Mountains EBA and in Sumatra and Peninsular Malaysia EBA. Locally very common on high

mountain tops in Sumatra. Common at 1600 m in Meratus Mts, in SE Borneo, where found relatively recently; discovered recently in upper Kayan region (E Kalimantan).

Bibliography. van Balen (1997), Chasen & Hoogerwerf (1941), David & Gosselin (2002a, 2002b), Davison (1992, 1997a), Fodgen (1965), Holmes (1996, 1997), Inskipp *et al.* (1996), MacKinnon & Philipps (1993), van Marle & Voous (1988), Mees (1954, 1957, 1969), Meyer de Schauensee & Ripley (1940), Robinson & Kloss (1918, 1924), Sheldon *et al.* (2001), Smythies (1957), Smythies & Cranbrook (1981), Smythies & Davison (1999), Stattersfield *et al.* (1998), Strange (2000, 2001), Whitehead (1893).

12. Everett's White-eye

Zosterops everetti

French: Zostérops d'Everett **German:** Everettbrillenvogel **Spanish:** Antojitos de Everett

Taxonomy. *Zosterops everetti* Tweeddale, 1878, Cebu, Philippines.

Probably derived from *Z. atricapilla*. Proposed race *forbesi* (from Camiguin Sur, in SC Philippines) is lumped with *basilanicus*. Birds of this species found on Panay, in WC Philippines, possibly represent an undescribed race. Eight subspecies currently recognized.

Subspecies and Distribution.

Z. e. wetmorei Deignan, 1943 – NE & S Thailand (S to Trang); probably also S Myanmar (Tenasserim).

Z. e. tahanensis Ogilvie-Grant, 1906 – extreme S Thailand (Yala), Peninsular Malaysia, and Borneo (Sabah, and locally C, E & S Kalimantan).

Z. e. boholensis McGregor, 1908 – Samar, Calicoan, Biliran, Leyte and Bohol, in EC Philippines.

Z. e. everetti Tweeddale, 1878 – Cebu, in C Philippines.

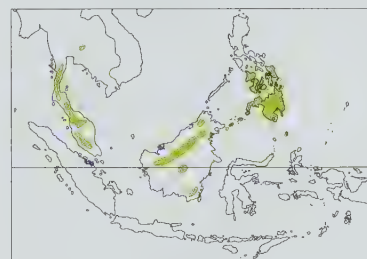
Z. e. siquijorensis Bourns & Worcester, 1894 – Siquijor, in SC Philippines.

Z. e. basilanicus Steere, 1890 – Dinagat, Siargao, Camiguin Sur, Mindanao and Basilan, in S Philippines.

Z. e. mandibularis Stresemann, 1931 – Sulu Archipelago (Jolo, Tawitawi, Sanga Sanga, Bongao, Papahag).

Z. e. babelo A. B. Meyer & Wilesworth, 1895 – Talaud Is (Karakelong and Salibabu), S of Philippines.

Also (race unknown) on Panay, in WC Philippines.



Descriptive notes. 11–11.5 cm; 7.8–12 g. N nominate race has forehead and supraloral region yellow, lores dusky, white eyering of average width interrupted at front by dark spot and with black line underneath; crown and upperparts olive-green; chin to upper breast yellow, connected to yellow of undertail-coverts by broad yellow mesial streak, remainder of underparts pure grey, dark grey flanks; iris yellowish-brown or brown; bill brownish-grey to black; legs pale brown. Distinguished from similar *Z. palpebrosus* mainly by slightly darker grey side of breast and flanks, colder green upperparts (especially

crown and rump), yellow of throat more greenish-tinged, ventral stripe and undertail-coverts deeper yellow. Sexes alike. Juvenile is duller than adult, with paler, less pronounced ventral stripe and greener wing-feather fringes. Race *basilanicus* differs from nominate in having dusky (instead of black) line under eyering, and black bill, size rather variable, some of largest and, conversely, smallest populations in species; *boholensis* is close to previous, but has brighter, slightly more yellowish upperparts, and deeper yellow underparts; *siquijorensis* is brightest, similar to previous but more yellow on forehead and over pale yellow lores, eyering with pale yellow spot at front, paler yellow below, yellow ventral line narrower, flanks paler grey; *mandibularis* is very like smallest populations of *basilanicus* but with paler grey flanks; *babelo* also is similar, but is yellower above, has much paler bill and legs; *tahanensis* is likewise close to *basilanicus*, but has relatively short tail, rectrices without greenish margins, no yellow on forehead and over black lores, legs blue-grey; *wetmorei* is like last, but with slightly larger bill. **VOICE.** Song in Philippines a rather complex series of metallic whistles of 8–13 notes, loud and somewhat raspy, 1.5–2.5 seconds in duration, repeated two or more times per minute, that in S (*basilanicus*) as a clear pleasant, though rather weak, whistle; in SE Asia (*tahanensis*) described as a clear, pleasant sweet but rather weak series of twittering notes, thinner and higher-pitched than those of *Z. palpebrosus*. Calls include “tee-tee” metallic “sreet” or “peet” whistle while perched and when flying in flocks; high-pitched buzzing “dzee” and rather more musical, inflected “dzee-ap”, mainly in flight.

Habitat. Low thick brush, evergreen forest, forest edge on mountain slopes, also secondary growth and scrub, cocoa plantations; in remnants of upper hill dipterocarp forest mixed with secondary growth around villages, and at edges of clearings for cultivation (hill rice, *Albizia* and cocoa). From foothills to 1800 m in Thailand and to 2000 m on main range of Peninsular Malaysia; submontane resident at 130–1700 m, mainly 200–1100 m, in Borneo, where common at 1450–1700 m on Mt Kinabalu; sea-level to 1000 m in Philippines, and sea-level to 500 m in Talaud Is (Karakelong I). Overlaps locally in altitude at c. 1000 m with *Z. montanus*.

Food and Feeding. Generalist: eats fruits (e.g. of *Macaranga*), tiny insects, caterpillars (on *Albizia*) and nectar (e.g. of *Rhodamnia*). Gregarious, usually in single-species flocks of 5–20 individuals, sometimes up to 50 or more, and up to 100 in low montane forest; also joins mixed-species flocks, e.g. with tailorbirds (*Orthotomus*) and sunbirds (Nectariniidae). Forages in subcanopy, crown foliage, tree-fern fronds etc., and attracted to flowering crowns; recorded at mass fruitings of fig trees (*Ficus*), *Macaranga*, etc. Flocks flight up and down hillsides above treetop level. Feeds also in cocoa.

Breeding. Season Feb–Sept in Philippines (e.g. Jun on Cebu, Apr on Bohol, Sept on Jolo, Jul on Bongao), and Feb–Jul in Malay Peninsula; recently fledged juvenile begging for food in Oct in Talaud Is (Karakelong). Nest a delicate cup, slung from twigs of tree branch, sometimes in top of bamboo 13 m tall. Clutch 2 eggs, white, one egg 14 × 11.4 mm. No other information.

Movements. Not known.

Status and Conservation. Not globally threatened. Uncommon in Thailand; fairly common and sufficiently abundant over a wide altitudinal stretch of montane forest in Peninsular Malaysia; common on Karakelong, in Talaud Is; locally fairly common in Borneo; locally common in Philippines, e.g. common on Bohol. N nominate race recently rediscovered on Cebu, where had been believed to be extinct; no observations since 1906 until seen again in 1985, since when it has been observed at various locations throughout the island. Occurs in several protected areas, e.g. Kaeng Krachan National Park, in Thailand, and Kinabalu Park, in Borneo.

Bibliography. van Balen (1997), Brooks *et al.* (1996), Coates & Bishop (1997), Curio *et al.* (2001), David & Gosselin (2002b), Davison (1997a), Deignan (1963), Dickinson *et al.* (1991), Dupond (1942), Hachisuka (1930),

Holmes (1997), Jeyarajasingam (1990), Kennedy *et al.* (2000), Lekagul & Round (1991), Magsalay (1993), Mann (1987, 1991), McGregor (1909), Medway & Wells (1976), Mees (1954, 1957, 1969), Parkes (1971), Peterson (2006), Pierce & Round (2006), duPont (1971b), Potter (1953), Rand & Rabor (1960), Riley (1997), Robson (2000b), Sheldon *et al.* (2001), Smythies (1957), Smythies & Cranbrook (1981), Smythies & Davison (1999), Thompson (1966), Wells (2007), Wilkinson *et al.* (1991).

13. Golden-green White-eye

Zosterops nigrorum

French: Zostérops jaunâtre **German:** Philippinenbrillenvogel **Spanish:** Antojitos Amarillento
Other common names: Philippine (Yellow)/Yellow/Yellowish/Golden-yellow White-eye

Taxonomy. *Zosterops nigrorum* Tweeddale, 1878, Valencia, Negros, Philippines.

Possibly closely related to *Z. everetti*. Race *imminatus* sometimes merged with *luzonicus*. Proposed race *sierramadrensis* (from Mt Cagua, in extreme NE Luzon) synonymized with *imminatus*. Eight subspecies recognized.

Subspecies and Distribution.

Z. n. meyeri McGregor, 1907 – Camiguin Norte (N of Luzon), in extreme N Philippines.

Z. n. aureilioris Ogilvie-Grant, 1895 – N & NW Luzon.

Z. n. imminatus Finsch, 1901 – NE & C Luzon.

Z. n. luzonicus Ogilvie-Grant, 1895 – SE Luzon (Mt Mayon, Sorsogon) and Catanduanes.

Z. n. mindorensis Parkes, 1971 – N Mindoro (recorded from N slope of Mt Halcon).

Z. n. nigrorum Tweeddale, 1878 – Cresta de Gallo, Masbate, Ticao, Caluya, Panay and Negros.

Z. n. richmondi McGregor, 1904 – Cagayan (Cagayancillo), in Sulu Sea W of Negros.

Z. n. catarmensis Rand & Rabor, 1969 – Camiguin Sur.



Descriptive notes. 10.8–12 cm; 6–9.2 g. Male nominate race has band on forehead and lores bright yellow; blackish spot (sometimes absent) in front of white eyering, narrow blackish line under eye; crown, upperparts, side of head and neck yellowish-olive; flight-feathers and tail feathers blackish-brown, edged yellowish-olive; chin, throat and middle of breast, belly and undertail-coverts lemon-yellow, merging into yellowish-olive (paler than upperparts) on side of breast and flanks; underwing white, washed yellow; iris greenish-white or brown; bill blackish above, bluish-grey below, lighter base; legs greyish-brown. Female is overall paler

than male. Juvenile is much duller than adult. Races differ chiefly in tone of colours, nominate race duller; *aureilioris* is very bright, has distinctly defined yellow area between crown and bill, is small in size; *luzonicus* is greener, less yellow, than previous, brighter on rump, uniformly yellow below; *imminatus* is similar to last but somewhat yellower above, rump more concolorous with back, has well-defined yellow forehead, and throat brighter and richer yellow than undertail-coverts; *richmondi* is largest race, also brightest, with deep yellow underparts; *meyeri* is similar to last, but has wider eyering, especially under eye; *mindorensis* is richest and deepest yellow of all races, both above and below, black mark under eye slightly more extensive, and white eyering slightly broader than in *aureilioris* and *imminatus*; *catarmensis* has larger bill than others. Voice. Series of “pi-it tit” or “sit-it si-it” or “sip-it sip-it”, some series lasting c. 1.5 seconds and given 5–10 times per minute.

Habitat. Forest, forest edge, second growth, clearings and lower storeys of dipterocarp forest, isolated growth in grassland areas. From sea-level mostly to c. 500–600 m, much less common to 900 m; rarely to 1250 m, but not in mossy forest. Locally overlaps with *Z. montanus* at c. 1000 m.

Food and Feeding. Small insects, and berries and other tiny fruits. Forages in flocks of up to 20 individuals; often one of the core species in mixed flocks with Flame-templed Babbler (*Dasyrotapha speciosa*), Arctic Warbler (*Phylloscopus borealis*), Blue-headed Fantail (*Rhipidura cyaniceps*), Elegant Tit (*Periparus elegans*) and Balicassiao (*Dicrurus balicassius*). Searches for food in lower storeys of forest. Foraging said to be accompanied by a great deal of singing.

Breeding. Birds with enlarged gonads in Jan on Negros and late Mar in S Luzon; also recorded in May, with no locality given. No other information.

Movements. Not known.

Status and Conservation. Not globally threatened. Fairly common throughout most of range; common to abundant on Luzon. Status of races *meyeri* (confined to Camiguin Norte) and *richmondi* (Cagayan) uncertain; neither has apparently been observed since first described, in 1907 and 1904, respectively.

Bibliography. Danielsen *et al.* (1994), David & Gosselin (2002b), Dickinson *et al.* (1991), Goodman & Gonzales (1990), Inskipp *et al.* (1996), Kennedy *et al.* (2000), McGregor (1909), Mees (1957, 1969), Parkes (1971), Peterson (2006), duPont (1971b), Rabor (1977), Rand & Rabor (1969), Ripley & Rabor (1956, 1958).

14. Oriental Mountain White-eye

Zosterops montanus

French: Zostérops montagnard **German:** Gebirgsbrillenvogel **Spanish:** Antojitos Montano
Other common names: Mountain White-eye

Taxonomy. *Z[osterops] montana* Bonaparte, 1850, Mount Merapi, west Sumatra.

Montane sibling of *Z. palpebrosus*. Despite enormous number of proposed names and the isolation of many populations, hardly any constant geographical variation exists; some authors prefer to recognize only two races (nominate and *obstinatus*) in Wallacea, and some even include most or all of Sumatran, Javan and Philippine races in nominate. Race *pectoralis* seems to represent a population in transition from pale-bellied to yellow-bellied, but sufficiently homogeneous to justify own name. Birds of this species recorded on Panay (WC Philippines) may represent an as yet unnamed race; some differentiation exists among the various populations of nominate; further study required. Birds of this species in Sula Archipelago of uncertain racial identity, provisionally included in nominate. Birds from Marinduque (NC Philippines) described as race *gilli* and formerly placed with present species, but now regarded as synonym of nominate race of *Z. meyeri*. Otherwise, proposed Moluccan races *seranensis* (described from Mt Pinaia, on Seram) and *ternatanus* (Ternate) both synonymized with *obstinatus*; *sarasinorum* (Mt Klabat, in NE Sulawesi), *oriochares*

(Latimojong Mts, in SC Sulawesi), *origenes* (Wawa Karaeng, in S Sulawesi), *foghaensis* (Mt Madang, on Buru), *korinchi* (Mt Kerinci, in Sumatra), *sindorensis* (Mt Tjerima, in W Java), *minimus* (Mt Papandayan, in W Java), *neglectus* (near Tosari, in E Java), *floreus* (Geli Mutu, on Flores) and *steini* (Mt Ramelan, in E Timor) all subsumed in nominate; and, in Philippines, *finitimus* (Mt Cuernos de Negros, in S Negros) merged with *pectoralis*. Nine subspecies currently recognized.

Subspecies and Distribution.

Z. m. whiteheadi E. J. O. Hartert, 1903 – highlands of N Luzon, in N Philippines.

Z. m. halconensis Mearns, 1907 – Mindoro (NC Philippines).

Z. m. parkesi duPont, 1971 – mountains of Palawan, in W Philippines.

Z. m. pectoralis Mayr, 1945 – Negros (Canlaan Volcano, Cuernos de Negros), in WC Philippines.

Z. m. diuatae Salomonsen, 1953 – N & NW Mindanao (Diuata Mts, Mt Malindang, Civolig, Daggayan, Misamis Oriental), in S Philippines

Z. m. vulcani E. J. O. Hartert, 1903 – C Mindanao (Mt Kitanglad, Mt Apo).

Z. m. difficilis Robinson & Kloss, 1918 – Mt Dempo, in S Sumatra.

Z. m. montanus Bonaparte, 1850 – mountains in C Sumatra, Java (E from Mt Papandayan), Bali, Lesser Sundas (Lombok, Sumbawa, Flores, Timor), Sulawesi (including Taliabu, in Sula Archipelago) and S Moluccas (Buru).

Z. m. obstinatus E. J. O. Hartert, 1900 – Ternate and Bacan (off Halmahera) and Seram.

Also (race unknown) on Panay, in WC Philippines.



Descriptive notes. 11.5–12 cm; 9.4–12.6 g. Nominative race has forehead and supraloral region yellow, white eyering of medium width interrupted at front by blackish spot, black lores, black stripe under eyering; crown and upperparts olive-green, rump slightly more yellow; flight-feathers and tail feathers blackish-brown with greenish outer edges; throat, upper breast and undertail-coverts yellow, rest of underparts greyish-white, flanks sometimes washed buff; iris greyish or yellowish-white; bill horn-black, base of lower mandible grey; legs plumbeous. Sexes alike. Juvenile is duller than adult, with more greenish throat, forehead

less differentiated from rest of head, and brownish-ashy flanks not so well marked. Races differ mainly in colour tones, pattern of underparts and size: *whiteheadi* is smaller and greener above than nominate; *parkesi* is larger than previous and much yellower-tinged above, has forehead and face golden-green, eyering bolder, richer yellow on chin, throat and undertail-coverts; *vulcani* is close to nominate, but with less yellow on forehead; *diuatae* is very like previous but slightly yellower above; *halconensis* also is similar but perhaps larger than *vulcani*, and sometimes with weakly developed yellow median streak on belly; *pectoralis* differs from nominate in having broad yellow streak over underparts, and flanks more or less washed with yellow; *obstinatus* is yellow-bellied; *difficilis* is entirely yellow below, paler yellow on flanks. Voice. Song in Sulawesi a two-syllable “peet-peet” followed by light trill, in Sumatra low but melodious song on 3 notes, in Java a longer distinctive warble similar to that of Mountain Leaf-warbler (*Phylloscopus viriviratus*). Contact calls soft and high-pitched, with distinctive “elastic” quality, or somewhat metallic.

Habitat. Primary montane forest, moss forest and ericaceous shrubs, forest edge, secondary growth, and in isolated bushes almost to barren mountain summit, and as high as the fumes, fires and eruptions of volcanoes permit vegetation to approach; here it is often most numerous bird species. Also in casuarina (*Casuarina*) stands, pine (*Pinus*) forests on Timor, Java and Luzon, *Dodonaea* shrubs on Sumbawa, and wooded cultivation on Flores. Found no lower than 500 m, generally above 900–1200 m; above 1000 m in Philippines, 2200–3100 m in Sumatra, 1600–3300 m in Java, 1500–3500 m (occasionally down to 900 m) on Sulawesi; fairly common between 1000 m and 1300 m, common above 1000 m to at least 2300 m on Sumbawa, scarce at 2300 m on Seram. The lowest mountain on Java on which it is known to occur is Mt Papandayan (2660 m). Overlaps altitudinally with *Z. nigrorum* in N & C Philippines, *Z. everetti* in E & S Philippines, and with *Z. palpebrosus* in E Java and Bali.

Food and Feeding. Fruits and small insects. Recorded fruits include those of the tree *Myrica javanica*, the herb *Polygonum chinense*, and the shrub *Vaccinium varingaefolium*; nectar of *Gaultheria*, *Vaccinium forbesii* and other species, including century plant (*Agave americana*), also taken; one specimen with much pollen under chin, suggesting possible feeding on flowers of rhododendron (*Rhododendron*) and *Vaccinium*. Insects include small beetles (Coleoptera), moths (of family Noctuidae) and caterpillars, and “jumping plant lice” (Psyllidae). Gregarious, travelling in noisy, fast-moving, usually small flocks of 4–5 to a dozen or so individuals, often also in large flocks; often seen also in mixed-species foraging flocks, in Java and Bali with *Z. palpebrosus*, in many places with *Lophozosterops* species. Old World flycatchers (Muscicapidae) and whistlers (*Pachycephala*), in Philippines also with Elegant Tits (*Periparus elegans*), Red Crossbills (*Loxia curvirostra*), nuthatches (*Sitta*) and fantails (*Rhipidura*) when present. Frequents upper tree levels.

Breeding. Birds with enlarged gonads in Jan–May in Philippines, where also nest with two young ready to fly in Jan in N Luzon, and on Negros one nest with newly hatched young in Apr and another with eggs in Apr/May; breeding recorded Aug and Oct in W Java, Apr–Jun and Aug on Flores, and eggs in Aug on Sulawesi. Nest almost unknown, material said to include lichens and bits of seeding grass-heads; nests have been found in dense reeds outside forest on Sulawesi. Clutch 2 or 3 eggs, white or creamy, sometimes with faint suggestion of bluish tint, to pale blue (Sulawesi) or pale greenish (W Java), dimensions 17.5 × 12 mm on Negros, 17.2 × 12.7 mm in Java and 16.6 × 12.3 mm on Flores. No other information.

Movements. Not known.

Status and Conservation. Not globally threatened. Common throughout range. Generally common to very common in Wallacea, but uncommon on Sumbawa; in Sulawesi rare in Mt Mengkoka and Mt Matinan, but recently discovered on Taliabu I (Sula Is), where common in montane forest. Occurs in several protected areas, e.g. Lore Lindu National Park, in Sulawesi.

Bibliography. Becking (1989), David & Gosselin (2002b), Dickinson *et al.* (1991), Docters van Leeuwen, H. (1929), Docters van Leeuwen, W.M. (1933), Goodman *et al.* (1995), Hachisuka (1930), Hellebrekers & Hoogerwerf (1967), Hoogerwerf (1949), Johnstone *et al.* (1996), Kennedy *et al.* (2000), Kuroda (1933a), MacKinnon & Phillips (1993), van Marle & Voous (1988), Mason (1989), McGregor (1909), Mearns (1907), Mees (1957, 1969, 1996, 2006), Meyer & Wiglesworth (1898b), Miranda *et al.* (2000), Nicholson (1883), Parkes (1971), duPont (1971a, 1971b), Rand & Rabor (1960), Ripley & Rabor (1956, 1958), Robinson & Kloss (1918, 1924), Robson (2000b), Robson & Davidson (1996), Stones *et al.* (1997), Strange (2000, 2001), Stresemann (1914a), Stresemann & Heinrich (1940b), Tilloff (2003), Trainor (2002a), Verheijen (1964), Verhoeve & Holmes (1999), Watling (1983), White & Bruce (1986), Whitehead (1893, 1899).



15. Yellow-spectacled White-eye

Zosterops wallacei

French: Zostérops à lunettes jaunes

Spanish: Antejitos Ojigualdo

German: Gelbring-Brillenvogel

Other common names: Wallace's White-eye

Taxonomy. *Zosterops wallacei* Finsch, 1901, Flores.

Relationships uncertain; seems to be distantly related to *Z. atricapilla*, *Z. everetti*, *Z. nigrorum* and others. Very different from other members of genus in several features, e.g. wing formula (with short primary P2, as small as or smaller than P10), head pattern (trace of superciliary stripe) and speckled eggs. Although birds from Flores slightly smaller on average than those from Sumba, difference considered too trivial to warrant naming of geographical races. Treated as monotypic.

Distribution. Lesser Sunda Is: Sumbawa, Moyo, Komodo, Rinca, Sumba, Flores, Besar, Adonara, Lomblen.



Descriptive notes. 11.5 cm; male 11.1 g, female 10.6 g. Distinctive. Has orange-yellow forehead, traces of yellow supercilium; otherwise olive-green with brownish-yellow wash above, crown and nape more yellowish, more yellow on ear-coverts; yellow eyering, black spot in front of eye, anterior part of lores yellow; remiges and rectrices blackish-brown with broad greenish margins; chin, throat, upper breast and undertail-coverts yellow, remainder of underparts pure grey, with white longitudinal streak over belly; iris dark brown; bill dark greyish; legs greyish-blue. Distinguished from similar *Z. montanus* and *Z. citrinella* mainly

by yellow (not white) eyering, from *Z. palpebrosus* and *Z. chloris* also by lack of yellow on belly. Sexes alike. Juvenile has pale brown iris. **VOICE.** Song on Komodo a rapid series of 12 warbled notes starting with 2 short unmusical notes, then a single upslurred loud whistle and a jumble of fairly high-pitched sweet notes, the whole 3 seconds in duration; on Sumba a descending, tinkling warble, sometimes beginning with harsh notes; on Flores 2 indistinct short insect-like notes followed immediately by sweet warbled series of 10–14 rapidly ascending and descending notes, duration of whole 3–4 seconds. Contact call on Sumba a plaintive “chiuw”, also churring notes when agitated; also dreary whistled notes on Flores.

Habitat. Coastal savanna habitats, including cashew (*Anacardium occidentale*) and coffee plantations, under *Duabanga* forest, also dry scrub, low bushes, semi-open shrub country, light monsoon forest, forest edge, thickets of Siam weed (*Chromolaena odorata*), secondary growth, primary and secondary forest, heavily degraded forest, woodland, bamboo thickets, vine forest and lightly wooded cultivation; also tolerant of very dry habitat, and occurs in scrub away from main blocks of forest; on Adonara I, found in coconut plantations but unrecorded from closed-canopy forest. Sea-level to 800 m, locally to 1050 m. Sympatric with *Z. citrinella* on Sumba and with *Z. chloris* on Flores.

Food and Feeding. No details of diet. Visits fruiting and flowering trees and vines, mainly middle to upper tree levels, usually in outer foliage. Singly, in pairs and in flocks of 10–15 individuals, and sometimes up to 20 or more; sometimes in mixed-species foraging flocks with Old World flycatchers (Muscicapidae), monarch-flycatchers (Monarchidae), Sumba Myzomela (*Myzomela dammermani*) and Arctic Warbler (*Phylloscopus borealis*). Utilizes very similar habitats to those exploited by *Z. chloris*, but rarely mixes in flocks with latter species.

Breeding. Season Apr–Oct (peak Apr/May–Jul) on Flores. Eggs very pale blue, with numerous very small brown spots mostly concentrated near blunt end, 17.3 × 12.6 mm. No other information.

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species: present in Northern Nusa Tenggara EBA and in Sumba EBA. Generally common on larger islands of range (Sumbawa, Sumba and Flores); moderately common on Komodo and abundant on Besar; uncommon on Moyo. Population on Sumba estimated as exceeding 400,000 individuals. As a result of its preference for forest edge, dry forest and degraded habitat, present species is believed not to be at any immediate risk.

Bibliography. Butchart *et al.* (1996), Coates & Bishop (1997), Hoogerwerf (1955), Jones *et al.* (1995), Mayr (1965), Mees (1961, 1969, 2006), Pilgrim *et al.* (1997, 2000), Rensch (1931a), Stattersfield *et al.* (1998), Strange (2001), Trainor (2002a, 2002b, 2002c, 2003a), Verheijen (1964), Verhoeve & Holmes (1999), White & Bruce (1986).

16. Javan White-eye

Zosterops flavus

French: Zostérops flavescent

German: Horsfieldbrillenvogel

Spanish: Antejitos Amarillo

Other common names: Yellow White-eye

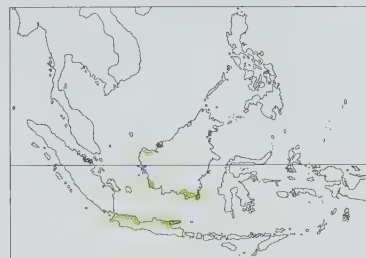
Taxonomy. *Dicaeum flavum* Horsfield, 1821, Java.

Sometimes united with *Z. chloris*, *Z. citrinella* and *Z. luteus*, but generally considered a well-marked species without certain close relatives. Monotypic.

Distribution. W & S Borneo, including Laut I (off SE Kalimantan); coastal N Java and Madura I.

Descriptive notes. 9.5 cm. Very small white-eye with relatively very short tail. Has frontal area yellow, crown and upperparts between pyrite-yellow and olive-green, rump more yellowish; lores pale yellow, white eyering of average width; primaries and tail feathers brownish-black, edged yellowish-green; entire underside yellow, on flanks and breast side merging into colour of mantle; iris bright yellowish-brown; bill dark horn above, plumbeous below; legs leaden blue. Differs from *Z. chloris* in lack of black on lores. Sexes alike. Juvenile has narrower eyering than adult. **VOICE.** No song known. Call notes “trrieew” and short, soft “trip”; alarm “wiwiwiwi”.

Habitat. In Borneo inhabits mangrove forest and dryland forest edge along coast, locally low waterside trees in small towns and nearby wet coconut groves upriver (up to 10 km inland), also



fledged young at end of Jul in W Java, and fledged young and juvenile in Aug in S Borneo. Small, neatly built nest of thin grass blades, lined with many fine stalks, and covered externally with much cobweb, placed 1 m above ground. Clutch 2–3 eggs, very pale blue, 15.4 × 11.4 mm.

Movements. Resident.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Javan Coastal Zone EBA and in Bornean Coastal Zone Secondary Area. Locally common. Moderate to large numbers recorded at night-time roosts, from which they disperse during day. In Java and on Madura I, this species' favoured habitat of mangroves is now much reduced and remains under continuous threat.

Bibliography. Allport & Milton (1988), Anon. (2007n), Bartels, M. (1931), Bartels, M.E.G. (1915–1930), Becking (1989), Butchart & Stattersfield (2004), Collar *et al.* (2001), David & Gosselin (2002b), Davison (1997b), Delacour (1947), Heath (1991), Hellebrekers & Hoogerwerf (1967), Holmes (1997), Holmes & Burton (1987), Hoogerwerf & Rengers Hora Sicama (1938), Inskipp *et al.* (1996), Kuroda (1933a), Kuschel (1895), MacKinnon & Phillips (1993), Mayr (1944a), Mees (1954, 1957, 1969), Milton & Marhadi (1985), Nash & Nash (1988), Rusila & Enis (1995), Smythies (1957), Smythies & Cranbrook (1981), Smythies & Davison (1999), Stattersfield & Capper (2000), Stattersfield *et al.* (1998), Sunarto & Melisch (1995), Telford (2003), Vorderman (1883).

17. Lemon-bellied White-eye

Zosterops chloris

French: Zostérops à ventre citron

Spanish: Antejitos Ventrilimón

German: Molukkenbrillenvogel

Other common names: Moluccan/Banda/Yellow/Yellow-bellied/Large Bridled/Mangrove White-eye; Pale White-eye (sometimes includes *Z. citrinella*)

Taxonomy. *Z[osterops] chloris* Bonaparte, 1850, Banda Archipelago, Banda Sea.

Forms a superspecies with *Z. citrinella*, and sometimes *Z. grayi* and *Z. uropygialis* included in same superspecies; relationship with *Z. consobrinorum* uncertain. Has sometimes been treated as conspecific with *Z. flavus*, *Z. citrinella* and *Z. luteus*. Described races *majauensis* (from Mayu I) and *tudjuensis* (Tujuh I) merged with nominate; *solombensis* (Masalembu Is), *zachlora* (Laut Kecil Is) and *periplectus* (Lombok) subsumed in *maxi*; and *sumbawensis* (Bima, in E Sumbawa) and *kalaotuae* (Kalaotoa I) synonymized with *intermedius*. In Sulawesi, racial identity of birds in NE arm of mainland, on Dodepo I (in N Tomini Bay) and on Kabaena I (off SE Sulawesi) unclear; all provisionally placed with *intermedius*, but those on Dodepo and Kabaena possibly represent undescribed races. Five subspecies currently recognized.

Subspecies and Distribution.

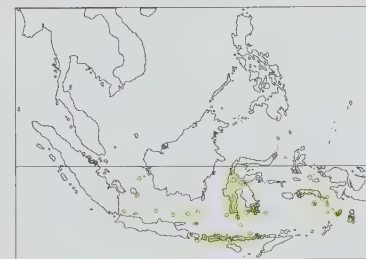
Z. c. chloris Bonaparte, 1850 – Mayu I (half-way between Sulawesi and Halmahera), Schildpad Is (N of Misool), Tjujuh (off N Seram), Banda, Manuk, Seram Laut, Tayandu, Kai, Taam (off Kai), and outliers of Aru Is (Babi, Karang, Enu).

Z. c. mentoris Meise, 1952 – NC Sulawesi.

Z. c. flavissimus E. J. O. Hartert, 1903 – Tukangbesi Is, off SE Sulawesi.

Z. c. intermedius Wallace, 1864 – E & S Sulawesi, Dodepo I, Kabaena, Muna, Butung (but not recorded from SE peninsula), small islands in Flores Sea (Tanakeke, Salayar, Tanahjampea, Kalao, Bonerate, Kalaotoa, Madu), and C Lesser Sundas (Sumbawa, Komodo, Rinca, Flores, Palu, Besar, Sabolan Besar).

Z. c. maxi Finsch, 1907 – Karimata Is (off W Borneo), islets S & E of Belitung, islands in Bay of Jakarta (Seribu Is), Karimunjawa Is, Gili (off Bawean I), Laut Kecil Is, Kangean Is, Menjangan (off NW Bali), Nusa Penida, and Lombok.



Descriptive notes. 11–12 cm; 9–14 g. Nominative race has base of forehead and supraloral line almost pure yellow, eyering white, lores and streak below eyering dusky, ear-coverts olive-yellow; crown and upperparts yellowish-green; flight-feathers and tail feathers blackish-brown, edged yellowish-green; throat and underparts deep yellow with greenish flanks; iris brown to reddish-brown or pale yellow-brown; bill black or brownish-black above, bluish-grey below; legs slaty greyish-blue. Sexes similar. Immature is somewhat more greenish below and somewhat more greyish-green above. Race *intermedius* is smaller than

nominate, has finer bill, paler underparts, less dark greenish flanks (variable); *mentoris* is very close to previous but with smaller wing and bill, and rich yellow underparts as nominate, relatively long tail; *flavissimus* is yellowest, yellow (not blackish or dusky) lores, below which dusky-black stripe extending to under eyering, very yellow on rump, tail feathers edged yellowish; *maxi* is duller, more greenish above and paler yellow below than *intermedius*, but colour of underparts rather variable in both races. **VOICE.** Song a weak, though rich and beautiful jumbled mixture of rapid high-pitched musical seesawing and more sibilant short “si-si” notes, given in short burst of 1–3–1.5 seconds, repeated, sometimes monotonously, at intervals of 6–8 seconds; in Sulawesi sound-

On following pages: 18. Ashy-bellied White-eye (*Zosterops citrinella*); 19. Pale-bellied White-eye (*Zosterops consobrinorum*); 20. Pearl-bellied White-eye (*Zosterops grayi*); 21. Golden-bellied White-eye (*Zosterops uropygialis*); 22. Black-ringed White-eye (*Zosterops anomalus*); 23. Creamy-throated White-eye (*Zosterops atriceps*); 24. Black-crowned White-eye (*Zosterops atrifrons*); 25. Togian White-eye (*Zosterops somadikartai*); 26. Sangihe White-eye (*Zosterops nehrkorni*); 27. Seram White-eye (*Zosterops stalkeri*); 28. Black-fronted White-eye (*Zosterops minor*); 29. White-throated White-eye (*Zosterops meeki*); 30. Black-headed White-eye (*Zosterops hypoxanthus*); 31. Biak White-eye (*Zosterops mysorensis*); 32. Capped White-eye (*Zosterops fuscicapilla*); 33. Buru Yellow White-eye (*Zosterops buruensis*).

ing as “eechew-weecherechitche-chew-chicherechee-ew-cheep”; on Kalaotoa I described also as a whistle which ascends sharply and continues in very pleasant twittering. Gives real concerts at dawn and, especially, at sunset. Call a loud “ship” or “chiew” reminiscent of that of House Sparrow (*Passer domesticus*).

Habitat. Secondary forest and open woodland, scrub, mangroves, strand forest and coastal thickets, casuarinas (*Casuarina*), *Ficus* thickets in open coastal woodlands, thickets under coconut plantations, cultivation; readily found in village centres and suburban gardens; often on small islands, even those overcrowded with humans. Mainly near sea-level, but locally to 1200 m (Flores), 1660 m (Lombok), 1000 m (NC Sulawesi) and 1800 m (S Sulawesi), where it meets edge of closed forest.

Food and Feeding. Varied. Fruits from banyan tree *Ficus benjamina*, and *Eugenia* trees, also from shrub *Lantana camara* and herb *Tacca leontopetaloides*; insects taken include plant lice (Phytophthires), small white cicadas (Cicadoidea). Usually in small flocks, flying from tree to tree; often in company of flowerpeckers (Dicaeidae) and sunbirds (Nectariniidae). In non-breeding season may form larger flocks of up to 25 or more individuals. Restless. Forages at all levels of vegetation. Visits fruiting trees.

Breeding. On Sulawesi Jan–Feb in C. Sept–Apr (possibly throughout year) in S. Sept–Oct on Muna and Butung; in Java and Apr–May/Jun on Flores; possibly within Nov–Apr wet season (and dependent on climatic conditions) on islets off Bali; small fledglings in Apr in Banda Is. Nest small, c. 6–7 cm across and 2.5–2.8 cm high, with rather strong walls but thin bottom, made from tender fibres, shallow cup entirely lined with black fibres of *Arenga sacchifera* palm, attached to surrounding branches with spider web; in S Sulawesi generally suspended between two twigs 1.5–4 m above ground, but sometimes high in canopy of tree (e.g. *Anona*, *Cassia*, *Erythrina*, *Mangifera* and *Arcocarpus*) or shrub (*Vitex*, *Lagenaria* and *Lantana*) or in *Lanea* hedge, preferably in shady dense vegetation. Clutch in S Sulawesi 2–3 (occasionally 4) eggs, pale blue or snow-white, 15–15.9 × 11.9–12.4 mm, on Flores 1–4 (usually 3) eggs, pale blue to white, 16.3 × 12.6 mm, on islets in Java Sea 2 bluish-green eggs; no information on incubation and nestling periods. Breeding success of 21 nests on islets in Java Sea 33 %.

Movements. Resident; some local movement. On Menjangan (off NW Bali) some post-breeding movement in dry season (Jun–Sept) to mainland, less than 500 m away. On Bawean I (off C Java) the species was entirely absent, but in May it was found on small satellite island of Gili, where it was absent again in Nov.

Status and Conservation. Not globally threatened. Generally common. Locally abundant, e.g. Tanahjampea I, Madu I, Besar I, outliers of Aru Is. Taam; most common bird species on Butung and Kalaotoa. Apparently rare at periphery of distribution on Sulawesi (Morowali, in N Sulawesi). Density of 4–6 nest territories in 75 m² reported in S Sulawesi. Has its core distribution on mainland Sulawesi and Lesser Sunda; in E (islets off Kai Is, Aru and Seram, Banda Is) and W parts (islets off Bali, and in Java Sea) the species is distributed sporadically and occurs only on small islands, normally shunning even moderately sized ones.

Bibliography. Alvard & Winarni (1999), Andrew & Holmes (1990), van Balen (1991), Bartels (1908), Beeking (1989), van Bemmelen & Voous (1951), Coates & Bishop (1997), Coomans de Ruiter (1951), Coomans de Ruiter & Maurenbroeker (1948), David & Gosselin (2002b), Diamond & Bishop (1994), Hartert (1896), Holmes & Phillips (1996), Hoogerwerf (1949, 1967b), Inskipp *et al.* (1996), Jany (1955), Johnstone & Jepson (1996), van Lummel (1932), MacKinnon & Phillips (1993), Mason (1993), Mayr (1944a), McKean (1982), Mees (1954, 1961, 1969, 2006), Meise (1929), Meyer (1879), Meyer & Wieglesworth (1988b), Moores *et al.* (1996), Rand & Gilliard (1967), Riley (1924), Verheijen (1961, 1964), Verhoeve & Holmes (1999), Watling (1983), White & Bruce (1986).

18. Ashy-bellied White-eye

Zosterops citrinella

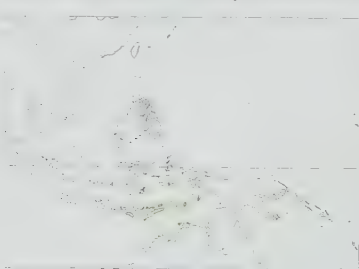
French: Zostérops pâle **German:** Zitronenbrillenvogel **Spanish:** Antojitos Pálido
Other common names: (Australian) Silvereye(1); (Australian) Pale White-eye (sometimes includes *Z. chloris*); Alor White-eye (*harterti*); White-bellied White-eye (*albiventris*)

Taxonomy. [*Zosterops*] *citrinella* Bonaparte, 1850, Timor.

Forms a superspecies with *Z. chloris*, and sometimes *Z. grayi* and *Z. uropygialis* included in same superspecies; possibly closely related to *Z. consobrinorum*. Has sometimes been treated as conspecific with *Z. flavus*, *Z. chloris* and *Z. luteus*, and sometimes with *Z. palpebrosus*. Birds of this species recorded on Lomblen (EC Lesser Sunda) of uncertain racial identity, provisionally included in *harterti*; those from Lucipara Is (in Banda Sea) provisionally included in *albiventris*. Proposed race *intercalaris* (from Sumba) merged with nominate; *griseiventris* (Tanimbar Is), *bassetti* (Damar I) and *letitiensis* (Leti I) subsumed in *albiventris*. Three subspecies currently recognized.

Subspecies and Distribution

Z. citrinella Bonaparte, 1850 – Sumba, Savu, Timor and Roti (including islets of Ndana and Ndao).
Z. harterti Stresemann, 1912 – Lomblen and Alor, in EC Lesser Sunda.
Z. albiventris Reichenbach, 1852 – Lucipara Is and Gunungapi (in Banda Sea), Wetar, Romang, Damar, Teun, Kisar, Leti, Moa, Luang, Sermata, Babar, Tanimbar Is (Molu, Lutu, Yamdena, Larat, Selaru); islands in Torres Straits (Warrior, Deliverance, Cairncross), and islets off extreme NE Australia off (Eborac S to Rocky Islets, off NE Cape York Peninsula).



Descriptive notes. 10–11 cm. Nominative race has forehead and supraloral region distinctly yellow, blackish loreal line extending under white eyering, eyering of average width and broken at front by blackish spot of loreal line; crown and upperparts pale olive-yellow, slightly more yellow on rump; flight-feathers and tail feathers blackish-brown with broad greenish margins; chin, throat, upper breast and undertail-coverts pale yellow, rest of underparts pale greyish, darkest on flanks, almost pure satin-white towards centre of belly, sometimes a mesial yellow longitudinal streak; iris pale brown or dark sandy brown; bill blackish-grey; legs dark blue-grey. Sexes alike. Immature is paler than adult. Race *harterti* has yellower rump than nominate; *albiventris* is hardly distinguishable from nominate, but has slightly heavier and larger bill. Voice. Song on Timor a series of rather weak, sweet, moderately high-pitched twittering notes, 0.8–1.2 seconds in duration, interspersed with rapidly repeated warbles, trills and slurs; on Sumba similar to that of *Z. wallacei*, but shorter and at constant pitch; in Tanimbar Is a moderately rapid rising and falling series of 10–16 relatively loud, clear notes with fairly sweet warbling quality, 2 seconds long, repeated at intervals of 2–3 seconds; on the smaller islands song heard in large choruses. Contact calls similar to those of *Z. lateralis* but louder and less plaintive.

Habitat. Scrub, forest edge, secondary growth, primary and secondary forest, heavily degraded forest, open woodland, monsoon thickets, lightly wooded cultivation, scrubby farmland, mangroves,

coastal casuarinas (*Casuarina*); often on small islands. Sea-level to 1000 m on Alor, to 1200 m on Timor; nominate race reported as reaching to 2000 m in Lesser Sunda.

Food and Feeding. Insects, berries. Gregarious, forms roaming flocks of 3–10 individuals, sometimes up to 20; also singly and in pairs. Also in mixed-species flocks. Forages actively in outer foliage of canopy; also in lower canopy, middle storey and low scrub.

Breeding. Probably Dec–Jun on Timor and islets off NE Australia; Jan in Tanimbar Is and Apr on Roti; laying female in May on Sumba. Nest a small neat cup of fine grass or long threads from *Palmira* leaves and fine stalks, bound with spider web and cocoons, lined with fine grass, suspended by rim 1.5 m above ground in slender fork of shrub or foliage of tree. Clutch 2–4 eggs, pale bluish-green/grey or white, recorded measurements 16.5 × 13 mm, 18.1 × 12.5 mm (race *albiventris*), 15.2–18.5 × 11.1–12.5 mm. No other information.

Movements. Resident; record from Booby I (in Torres Strait), lacking suitable habitat, suggests some local movement. Reported sightings on Australian mainland (at Byfield and Yeppoon) never confirmed.

Status and Conservation. Not globally threatened. Generally common. Common and widespread on Roti I; common in Tanimbar Is; status on Alor not known.

Bibliography. Bishop (1992), Bishop & Brickell (1999), Blakers *et al.* (1984), Coates & Bishop (1997), David & Gosselin (2002a, 2002b), Finsch (1898), Higgins *et al.* (2006b), Inskipp *et al.* (1996), Johnstone & Jepson (1996), Macgillivray (1914), Mason (1991), Mathews (1923), Mees (1961, 1969), Noske (2003), Pitzey & Knight (1997), Rand & Gilliard (1967), Rensch (1929), Schodde & Mason (1999), Strange (2001), Trainor (2005b, 2007b), Verheijen (1976), Verhoeve & Holmes (1999), White & Bruce (1986).

19. Pale-bellied White-eye

Zosterops consobrinorum

French: Zostérops à ventre pâle **German:** Celebesbrillenvogel **Spanish:** Antojitos Ventripálido
Other common names: Peninsular/Sulawesi/Celebes/Laoumera White-eye

Taxonomy. *Zosterops consobrinorum* A. B. Meyer, 1904, eastern mountain chain of south-east peninsula, Sulawesi.

Possibly closely related to *Z. citrinella*, or perhaps even conspecific. Birds from Butung differ vocally and morphologically from those in rest of species' range, and very likely represent an undescribed race. Monotypic.

Distribution. SE Sulawesi (L. Matano S to E coast and Mekong Mts), Kabaena I and Butung I, and possibly also Muna I.



Descriptive notes. 11.5–12 cm; 9.8–10.4 g. Plumage is olive-green above, forehead and supraloral region as mantle or slightly more yellowish; rather narrow eyering white, broken at front by blackish spot, lores and streak under eye blackish; remiges blackish fringed olive-green, rectrices blackish; golden-yellow chin, throat, upper breast and undertail-coverts, remainder of under parts white, more greyish on flanks and breast; iris light brown; bill black, grey base of lower mandible; legs dark grey. Differs from *Z. montanus* in smaller size, much brighter yellow throat and undertail-coverts. Sexes alike. Juvenile undescribed. Voice.

Loud, very pleasing song strophe, lacking trilling notes of *Z. atrifrons* and *Z. anomalus*.

Habitat. Scrub, cultivation, remnant patches of lowland forest, forest edge, scrubby vegetation close to forest patches, forestry plantations, gardens, and small woodland plots in deforested lowlands; locally in wooded savanna and around villages. Sea-level to 300 m and above. Apparently the ecological and altitudinal counterpart of *Z. chloris* (of race *intermedius*), which is absent from most of SE Sulawesi, but co-exists with present species on islands of Butung and Kabaena.

Food and Feeding. No information on diet. Found in pairs or small family parties, sometimes joining mixed-species flocks. Forages in canopy of tall forest trees, but more commonly in understorey and thickets along forest edge.

Breeding. Nest found in early Aug, an untidy cup of grasses placed in low bush a few metres from main road; adult feeding juvenile in Oct. No other information.

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species: present in Sulawesi EBA. Locally common, e.g. on Butung, but generally uncommon. Poorly known species. Discovered relatively recently on Butung and Kabaena; possibly occurs also on underexplored island of Muna, lying between those two. Report from Kendari region of mainland Sulawesi considered dubious. Appears able to utilize secondary habitat, and unlikely to be threatened in near future so long as some forest, even degraded, remains.

Bibliography. Catterall (1997), Coates & Bishop (1997), Holmes & Holmes (1985), Holmes & Wood (1980), Inskipp *et al.* (1996), Mees (1961), Stattersfield *et al.* (1998), Stresemann & Heinrich (1940b), Wardill (2003), Wardill *et al.* (1999), White & Bruce (1986).

20. Pearl-bellied White-eye

Zosterops grayi

French: Zostérops de la Grande Kai **Spanish:** Antojitos de la Gran Kai
German: Graybrillenvogel
Other common names: Great Kai/Great Kei White-eye; Kai/Kei White-eye (with *Z. uropygialis*)

Taxonomy. *Zosterops grayi* Wallace, 1864, Kai Islands.

Forms a superspecies with *Z. uropygialis*, and these two sometimes treated as conspecific; both sometimes considered to belong to the superspecies comprised of *Z. chloris* and *Z. citrinella*. Monotypic.

Distribution. Kai Besar I, in E Banda Sea.

Descriptive notes. 13 cm. Has yellow frontal band, broad white eyering interrupted at front by blackish spot; anterior crown dark brownish, rest of crown and upperparts bright yellowish-citrine; primaries and tail feathers blackish-brown with broad yellow-citrine edges; throat, upper breast and undertail-coverts lemon-chrome, upper breast somewhat greener; satin-white belly with yellow median stripe connecting yellow of throat with that of vent; iris chocolate-brown; bill black, grey base of lower mandible; legs yellowish-plumbeous or grey. Sexes alike. Juvenile undescribed. Voice. Song a series of strident, squeaky chattering notes punctuated by 3 short, sharp, high-pitched notes repeated in quick succession, the whole lasting c. 7 seconds. Call notes a series of rapid,



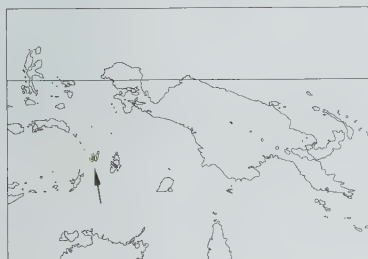
Breeding. No information.
Movements. Presumably resident.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Banda Sea Islands EBA. Moderately common in all wooded habitats.
Bibliography. Anon. (2007n), Butchart & Stattersfield (2004), Coates & Bishop (1997), Collar *et al.* (2001), Hartert (1903b), Inskipp *et al.* (1996), Johnstone & van Balen (2008), Mees (1961, 1969), von Rosenberg (1867), Salvadori (1879), Sibley & Monroe (1990), Stattersfield & Capper (2000), Stattersfield *et al.* (1998), White & Bruce (1986).

21. Golden-bellied White-eye

Zosterops uropygialis

French: Zostérops de la Petite Kai **German:** Tualbrillenvogel **Spanish:** Antojitos de la Pequeña Kai
Other common names: Little Kai/Little Kei White-eye; Kai/Kei White-eye (with *Z. grayi*)

Taxonomy. *Zosterops uropygialis* Salvadori, 1874, Kai Kecil.
Forms a superspecies, and sometimes considered conspecific, with *Z. grayi*; both sometimes thought to belong to the superspecies comprised by *Z. chloris* and *Z. citrinella*. Monotypic.
Distribution. Kai Kecil I, in E Banda Sea.



Descriptive notes. 12.5 cm. Has fuscous cap extending anteriorly over entire forehead and loreal region; eyering reduced to a number of very small scaly feathers, and therefore skin around eye partly bare; upperparts bright yellowish-citrine, primaries and tail feathers blackish-brown with broad yellow-citrine edges; throat and underparts entirely bright yellow, flanks tinged olive; iris light brown; bill brownish; legs leaden grey. Distinguished from similar *Z. grayi* by having whole forehead dusky (no yellow), eyering barely indicated, and entire underside bright yellow with more olive on the flanks, also slightly smaller in wing and tail. Sexes alike.

Juvenile undescribed. **VOICE.** Variety of calls, including squeaky nasal chatters, harsh rasping squeaks, and brief bubbling notes, by individuals and partners; loud and mellow, nasal "chow".

Habitat. Forest, and cleared land with scattered trees.

Food and Feeding. No details on diet. Usually seen in pairs and in groups of up to six individuals. Forages deliberately in canopy; moves along branches and from perch to perch in hops of c. 20 cm; posture rather upright, almost like that of an Old World flycatcher (Muscicapidae). Most food items obtained by hover-gleaning.

Breeding. No information.

Movements. Presumably sedentary.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Banda Sea Islands EBA. Recent surveys indicated that this species is scarce to rare, is found in only a few places, and may be vulnerable to forest loss within its small range. Formerly was generally considered moderately common in most wooded habitats.

Bibliography. Anon. (2007n), Butchart & Stattersfield (2004), Coates & Bishop (1997), Collar *et al.* (2001), Hartert (1903b), Inskipp *et al.* (1996), Johnstone & van Balen (2008), Mees (1953a, 1961, 1969), Sibley & Monroe (1990), Stattersfield & Capper (2000), Stattersfield *et al.* (1998), White & Bruce (1986).

22. Black-ringed White-eye

Zosterops anomalus

French: Zostérops à gorge citron **German:** Sulawesibrillenvogel **Spanish:** Antojitos Anómalo
Other common names: Celebes/Makassar/Lemon-throated White-eye

Taxonomy. *Zosterops anomala* A. B. Meyer and Wieglesworth, 1896, Ujung Pandang (Makassar), south Sulawesi.

Closest relatives uncertain; *Z. consobrinorum*, *Z. atrifrons* and present species apparently replace one another geographically, but they differ too greatly in plumage coloration for close relationships to be likely. Monotypic.

Distribution. S peninsula of Sulawesi (S from Bolong and Rantepao, in Quarles Mts).



Descriptive notes. 12 cm. Has forehead and supraloral region yellow, broad dull black loreal line continuing backwards to encompass whole eye, thus black eyering (white feathers that would make eyering are greatly reduced); crown and upperparts generally olive-green, more yellowish on uppertail-coverts; remiges and rectrices brownish-black with greenish outer edges; chin, throat and upper breast yellow, undertail-coverts somewhat paler yellow, remainder of underparts pale grey, whitish on belly; iris light brown; bill black, pale base of lower mandible; legs pale grey to bluish-grey. Sexes alike. Juvenile undescribed. **VOICE.** Song

a muted series of slightly musical, teetering, chattering notes, 1–2 seconds in duration, repeated two or three times, or several trilling notes preceded by a prelude, e.g. "chewchicheruit-chewticherui-uu rrr", not unlike a soft version of Common Chaffinch (*Fringilla coelebs*) song. Call a peculiar quivering whistle, likened to sound made by a police whistle.

Habitat. Scrubby deforested hills, disturbed primary forest, secondary forest with open canopy, forest edge, low secondary scrub, bushes, village gardens and orchards, though seldom in immediate neighbourhood of settlements. Sea-level to 1370 m. Occurs next to *Z. chloris* but occupies different biotope (i.e. open secondary forest, low trees), especially in hills, and tends to avoid human settlements.

Food and Feeding. No details of diet. Singly, in pairs or in single-species flocks of up to 12 individuals; also in mixed-species foraging flocks. Forages in both canopy and understorey vegetation, including coffee, low scrub; visits flowering trees.

Breeding. Old nest in Apr; adults carrying nest material observed in Aug or Sept; courtship seen in Jan. Nest a relatively flat cup, exterior entirely covered with spiky *Mimosa* twigs. No other information.

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species: present in Sulawesi EBA. Locally common. Rather common north to Rantepao in 1987. Appears to be adaptable and not dependent on primary habitats.

Bibliography. Andrew & Holmes (1990), Coates & Bishop (1997), Collar *et al.* (1994), Coomans de Ruiter (1950, 1951), David & Gosselin (2002b), Fraser & Henson (1996), Holmes & Phillips (1996), Inskipp *et al.* (1996), Lack (1971), Mees (1961, 1969), Sarasin & Sarasin (1905), Stattersfield *et al.* (1998), Stresemann & Heinrich (1940b), White & Bruce (1986).

23. Creamy-throated White-eye

Zosterops atriceps

French: Zostérops à gorge crème **German:** Braunscheitel-Brillenvogel **Spanish:** Antojitos Moluqueo
Other common names: (Bacan) Black-fronted(!)/Batjan Black-fronted/Green-throated/Halmahera (Black-fronted) White-eye

Taxonomy. *Zosterops (?) atriceps* G. R. Gray, 1861, Bacan, Moluccas.

Forms a superspecies with *Z. atrifrons*, *Z. somadikartai*, *Z. nehrkorni*, *Z. stalker*, *Z. minor*, *Z. meeki* and *Z. hypoxanthus*. Three subspecies recognized.

Subspecies and Distribution.

Z. a. dehaani van Bemmelen, 1939 – Morotai, in N Moluccas.

Z. a. fuscifrons Salvadori, 1878 – Halmahera.

Z. a. atriceps G. R. Gray, 1861 – Bacan and Obi.



Descriptive notes. 12 cm; 12 g. Nominat race has entirely fuscous-black forehead, becoming more fuscous olive-green on crown and fuscous grey on nape; supraloral region blackish. Lores dusky grey, rather narrow to wide grey eyering interrupted at front by dusky spot, ear-coverts light fuscous with citrine wash; upperparts olive-green, remiges and rectrices blackish-brown with greenish margins; whitish below, almost pure white on throat and centre of belly, slightly greyer on breast, and with lemon-yellow undertail-coverts; iris light brown; bill black, yellow basal half of lower mandible; legs grey. Differs from *Z. montanus*

in e.g. white (not yellow) throat. Sexes alike. Juvenile undescribed. Race *fuscifrons* is smaller than nominate, nape and crown olive-green like back, and fuscous only on forehead; *dehaani* is distinctive, larger and heavier-billed than others, has darker, blackish crown and more extensively dark ear-coverts, pale lores, wider eyering. **VOICE.** Rather thin, high-pitched series 1.5 seconds in duration, of fairly sweet whistles, each note alternating rapidly up and down, each phrase ending with 1 or 2 upslurred, whistled disyllabic "tu-wit" notes; phrases repeated at intervals of 4–5 seconds. A slightly louder, harder version of song, lacking concluding disyllabic notes, on Halmahera (race *fuscifrons*).

Habitat. Primary and secondary lowland forest and hill forest, forest edge and cultivation; also mangroves (Halmahera). Sea-level to 1050 m on Halmahera, lowlands to 700 m on Bacan, and 220–700 m on Obi.

Food and Feeding. No details of diet. Usually in small groups of up to six individuals; also singly and in pairs. Relatively inconspicuous and skulking. Forages in thickets 1–2 m above ground; also in middle storey and canopy.

Breeding. Juvenile in Nov. No other information.

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species: present in Northern Maluku EBA. Moderately common. Recently discovered on Obi I, where uncommon and may be a fairly recent arrival.

Bibliography. van Bemmelen (1939, 1948), Coates & Bishop (1997), Lambert (1994), Mees (1961, 1969), Poulsen *et al.* (1999), Stattersfield *et al.* (1998), Strange (2001), White & Bruce (1986).

24. Black-crowned White-eye

Zosterops atrifrons

French: Zostérops à front noir **German:** Wallacebrillenvogel **Spanish:** Antojitos Frentinegro
Other common names: Moluccan (Black-fronted) White-eye; Black-fronted White-eye(!) (within *Z. atrifrons-minor* species group)

Taxonomy. *Zosterops atrifrons* Wallace, 1864, Manado, north Sulawesi.

Forms a superspecies with *Z. atriceps*, *Z. somadikartai*, *Z. nehrkorni*, *Z. stalker*, *Z. minor*, *Z. meeki* and *Z. hypoxanthus*. Was formerly sometimes treated as conspecific with all except first two of those. Is ecologically and behaviourally close to *Z. anomalus*, with vocal resemblance also, and has in the past been considered its sibling species in N Sulawesi. Races may constitute two separate species, nominate race and *surdus* representing one species and *sulaensis* and *subatrifrons* the other; latter would then include birds of this species found near L Matano (N end of SE peninsula of Sulawesi, more than 100 km from nearest known population), having relatively long tail and distinctive plumage (distinct yellow rump, golden-yellow throat, yellow undertail-coverts, white

rest of underparts, legs dark grey), which presumed to represent an undescribed race. Four subspecies currently recognized.

Subspecies and Distribution.

Z. a. atrifrons Wallace, 1864 – N Sulawesi.

Z. a. surdus Riley, 1919 – NC Sulawesi.

Z. a. subatrifrons A. B. Meyer & Wigglesworth, 1896 – Banggai Archipelago (Peleng, Banggai), off E Sulawesi).

Z. a. sulaensis Neumann, 1939 – Sula Is (Taliabu, Seho, Mangole, Sanana).



alike. Juvenile has duller throat than adult, black on crown less extensive and somewhat mottled with olive, and eyering smaller. Race *surdus* is somewhat larger and with more greenish upperparts than nominate, and has yellow throat more greenish-tinged; *subatrifrons* is larger than nominate, with cheeks and throat pure yellow; *sulaensis* is close to nominate, but has broader white eyering, rich orange-yellow throat. VOICE. On Sulawesi, usual call a loud and characteristic double note followed by rapid tinkling twitter, descending and trailing off; noisy twittering chirrup, very different from normal call, from small flocks; also an excited twittering consisting of repeated brief high-pitched, rising double note by members of small flock; also a high-pitched "tittiti" trill, a wheezy "zzzzz", and "zi-zi-zi-zi" call; song a distinctive shrill warble (unusual for a white-eye). On Taliabu (race *sulaensis*), high-pitched sweet notes in rapid series lasting 1.8–2.2 seconds, also clear high-pitched, rapid, rolling series (2 seconds) of 8–9 sweetly whistled notes; relatively weak, plaintive, high-pitched single "pee", "tiuw" or "teew" given as contact by members of small group.

Habitat. Primary and secondary lowland forest and hill forest, selectively logged and heavily degraded forest, forest edge, scrub, cultivated highlands; lowlands to 1500 m. Readily penetrates forest along rivers or roads. Occurs together with *Z. consobrinorum*, the two not completely replacing each other geographically. In N Sulawesi nominate race inhabits Mt Empung, whereas *Z. montanus* found on nearby, slightly higher Mt Lokon.

Food and Feeding. Arthropods, fruits; seeds found in stomach contents. Not very gregarious, sometimes in small flocks (Sulawesi), or in flocks of up to 20 individuals (Taliabu), but also flocks of up to 100 birds reported from Minahasa (N Sulawesi). Has broad vertical foraging niche, ranging from substage to canopy levels. Actively gleans and probes under leaves and epiphytes for arthropods; also hover-gleans, and plucks small fruits.

Breeding. Apr–May; male with enlarged gonads in Jan. Nest a cup-shaped structure suspended in fork of twig by means of fibres, cobweb, etc. Clutch 2–3 eggs, uniform blue. No other information.

Movements. Not known.

Status and Conservation. Not globally threatened. Generally common. Common in C Sulawesi to 1400 m. and common on Taliabu I. Occurs in Lore Lindu National Park.

Bibliography. David & Gosselin (2002b), Holmes, D.A. & Phillips (1996), Holmes, P.R. & Holmes (1985), Holmes, P.R. & Wood (1979), Inskipp *et al.* (1996), Lack (1971), Mees (1961, 1969), Meyer & Wigglesworth (1895, 1898b), Rasmussen *et al.* (2000), Rozendaal & Dekker (1989), Sarasin & Sarasin (1905), Stones *et al.* (1997), Strange (2001), Stresemann & Heinrich (1940b), Watling (1983), White & Bruce (1986).

25. Togian White-eye

Zosterops somadikartai

French: Zostérops des Togian **German:** Togianbrillenvogel **Spanish:** Antojitos de las Togian

Taxonomy. *Zosterops somadikartai* Indrawan *et al.*, 2008, Malenge, in Togian Islands.

Forms a superspecies with *Z. atriceps*, *Z. atrifrons*, *Z. nehrkorni*, *Z. stalker*, *Z. minor*, *Z. meeki* and *Z. hypoxanthus*. Monotypic.

Distribution. Togian Is (Malenge, Talatakoh and Batudaka), in N Sulawesi.



Descriptive notes. c. 11 cm. Has forehead and forecrown (to above eye) and lores black, bare fleshy eyering dark slaty grey with some tiny white feathers (visible only at extremely close range), surrounded by black feathered eyering; upperparts from rear crown to back citrine, more olive on side of head, rump yellow-tinged olive-green; upperwing-coverts olive-green, flight-feathers and tail feathers with yellowish olive-green edges and blackish tips; chin and throat sulphur-yellow, upper breast pale grey, lower breast and belly white, vent sulphur-yellow; white underwing-coverts; iris dark red; bill black, pale flesh base of lower mandible; legs metallic horn. Differs from other members of the superspecies in lacking clearly marked white eyering, and has slightly heavier bill than most others. Sexes believed similar. Juvenile undescribed.

VOICE. Song a thin sweet warble, similar to that of *Z. atrifrons* but less modulated; twittering chirrups heard from small moving flocks.

Habitat. Low bushes near mangroves, gardens, coconut groves, secondary scrub (e.g. *Lantana*) in logged-over forest, from sea-level to 100 m. Typically roosts in shrubs (*Macaranga*, larger bamboos etc.) 5–15 m tall.

Food and Feeding. Insects, including caterpillars, gleaned from branches and beneath leaves. Forages in pairs or small flocks of up to five individuals; often visits dense, low shrubs.

Breeding. No information.

Movements. No information; presumed sedentary.

Status and Conservation. Not assessed. Very poorly known; described only recently. Believed to be uncommon and localized. Although apparently tolerant of habitat disturbance, considered to merit conservation status of Endangered; restricted to three small islands on which extent and

quality of habitat likely to decrease owing to conversion and overexploitation of resources. The Togian Islands have been declared a National Park, including all the islands.

Bibliography. Indrawan (2004), Indrawan, Rasmussen, & Sunarto (2008), Indrawan, Somadikarta *et al.* (2006), Rasmussen *et al.* (2000).

26. Sangihe White-eye

Zosterops nehrkorni

French: Zostérops de Sangihe **German:** Nehrornbrillenvogel **Spanish:** Antojitos de la Sangihe
Other common names: Black-fronted White-eye(!) (within *Z. atrifrons*–*Z. minor* species group)

Taxonomy. *Zosterops nehrkorni* A. W. H. Blasius, 1888, Sangihe Island.

Forms a superspecies with *Z. atriceps*, *Z. atrifrons*, *Z. somadikartai*, *Z. stalker*, *Z. minor*, *Z. meeki* and *Z. hypoxanthus*. Formerly considered conspecific with *Z. atrifrons*, but re-examination of the single type specimen (previously thought to have been lost) and recent field observations indicate clear differentiation, particularly in coloration of bill and legs, measurements and some other characters; differs also in song and in being restricted to pristine habitats at higher altitudes. Monotypic.

Distribution. Mt Sahendaruman and adjacent Mt Sahengbalira, on Sangihe I, N of Sulawesi.



Descriptive notes. 10.5–12 cm. Has black forehead and forecrown, contrasting sharply with bright golden-olive of rear crown; upperparts rich yellowish olive-green (paler than *Z. atrifrons*), brighter on lower back, rump and uppertail-coverts; white eyering rather narrow (on skins) to wide (in the field), olive side of face clearly demarcated from throat by almost blackish moustachial streak; tail feathers brownish-black, edged greenish; chin, throat and undertail-coverts bright canary-yellow, remaining underparts pearly white, flanks grey, becoming darker ventrally; iris light brown to red-brown; bill and legs relatively

pale orange-flesh. Sexes alike. Juvenile undescribed. VOICE. Song sounds thinner, more tinkling and less warbling than that of *Z. atrifrons*, and having first notes more constant in frequency and terminal section falling strongly. Contact calls described as thinner and higher-pitched than those of *Z. atrifrons*; also three high-pitched "swit...swit...swit" calls, c. 2 seconds in duration, similar to calls of some flowerpeckers (*Dicaeum*) but higher and sharper.

Habitat. Primary ridgetop (low-stature) forest and broadleaf-trophophyllous hill rainforest, with considerable density of *Pandanus*, at c. 750–920 m; absent from secondary habitats such as mixed plantations, and seems to be confined to submontane low-stature forest in S of island. Not found near lower limit of presently existing forest, where one would expect it had it ever occurred in low-elevation forest.

Food and Feeding. Insects. Forages in groups of three, in dense canopy and subcanopy; gleans leaves.

Breeding. Singing by three birds in Feb strongly suggests breeding or pre-breeding activity. No other information.

Movements. Presumed sedentary.

Status and Conservation. CRITICALLY ENDANGERED. Restricted-range species: present in Sangihe and Talaud EBA. Rare. Had been known only from a single specimen, collected in late 1886, but rediscovered during two-week survey on Mt Sahengbalira in Aug 1996, when three individuals were observed on two consecutive days. During a subsequent survey on the mountain for two weeks in Nov 1996, three birds seen only once, at same locality; during 60 days spent in same area between Aug 1998 and Feb 1999, a sight record of a single individual and aural records on three consecutive days. Numerous other observers in recent times failed to see the species. The very few records suggest that this species is now extremely rare, and may already have been so for a long time. It may be wide-ranging in search of fruits, and the small area of suitable habitat (800 ha) remaining within its present range, which is under pressure from small-scale agricultural encroachment by local farmers, may critically restrain the population. Conservation of remaining forest is critical for the survival of this species, which is the only white-eye on Sangihe I.

Bibliography. Anon. (2007n), Blasius (1888a, 1888b), Butchart & Stattersfield (2004), Collar *et al.* (2001), Finsch (1901), Mees (1961), Meyer & Wigglesworth (1898b), Rasmussen *et al.* (2000), Riley (1997, 2002), Stattersfield & Capper (2000), Stattersfield *et al.* (1998), Wardill & Hunowu (1998).

27. Seram White-eye

Zosterops stalker

French: Zostérops de Céram **German:** Sagobrillenvogel **Spanish:** Antojitos de Seram
Other common names: Black-fronted White-eye(!) (within *Z. atrifrons*–*Z. minor* species group)

Taxonomy. *Zosterops stalker* Ogilvie-Grant, 1910, Manusela, Seram.

Forms a superspecies with *Z. atriceps*, *Z. atrifrons*, *Z. somadikartai*, *Z. nehrkorni*, *Z. minor*, *Z. meeki* and *Z. hypoxanthus*. In past, often considered conspecific with *Z. atrifrons*, but differs from that species and from other members of superspecies in bill morphology, plumage and voice. Monotypic.

Distribution. Seram, in SE Moluccas.



Descriptive notes. c. 11 cm; 9–12 g. Has rather narrow white eyering interrupted at front by blackish spot; black on head extending over whole of crown and side of head (blackish ear-coverts), merging into nape; upperparts bronzy olive, with bronzy-yellow rump; flight-feathers and tail brownish-black, marginal upperwing-coverts black; chin and throat bronzy olive to pyrite-yellow, some blackish on chin, underparts whitish, with greyish-white side of breast, orange-yellow undertail-coverts; iris dark red-brown; bill black or bluish, lower mandible light grey-brown; legs pale blue-grey. Differs from other members of the superspecies

in having extensive black on crown, dull greenish plumage, bronzy overall coloration, black mar-

ginal wing-coverts, straighter and more peg-like bill; from sympatric *Z. kuehni* mainly by black (not olive-green) crown, and from *Z. montanus* also by whitish (not yellow) belly. Sexes alike. Juvenile undescribed. **VOICE.** Songs and calls include series of rapidly repeated, sweet tinkling notes terminating with a few ringing notes; also a fairly rapid series of slightly rolling short “swi” notes, quite different from anything found in other members of the superspecies.

Habitat. Secondary forest; occurs at 100–850 m, where most abundant in mid-mountain regions; overlaps with *Z. montanus* in narrow belt between 650 m and 850 m.

Food and Feeding. Small seeds found as stomach contents. Not very gregarious, sometimes in small flocks; often in mixed-species foraging flocks, frequently associating with *Tephrozosterops stalkerii*, Ashy Flowerpecker (*Dicaeum vulneratum*) and Streaky-breasted Fantail (*Rhipidura dedemi*), also other small birds. Forages in undergrowth.

Breeding. No information.

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species: present in Seram EBA. Little-known species; appears to be fairly common. Hitherto recorded only in W & C parts of Seram, but SE part of the island still ornithologically unexplored.

Bibliography. van Bemmelen (1948), Bowler & Taylor (1989a, 1993b), Mayr (1967), Mees (1961, 1969), Ogilvie-Grant (1910), Rasmussen *et al.* (2000), Stattersfield *et al.* (1998), Stresemann (1914a), White & Bruce (1986).

28. Black-fronted White-eye

Zosterops minor

French: Zostérops mineur **German:** Neuguineabrillenvogel **Spanish:** Antojitos Menor
Other common names: (Papuan/New Guinea) Black-fronted/(Papuan) Mountain(!) White-eye (*minor* and *gregarius*); Arfak/Arfak Black-fronted/Arfak Yellow-throated White-eye (*chrysolaemus*); Small (Black-fronted) White-eye (*delicatulus*)

Taxonomy. *Zosterops albiventer minor* A. B. Meyer, 1874, Yapen Island, New Guinea. Forms a superspecies with *Z. atriceps*, *Z. atrifrons*, *Z. somadikartai*, *Z. nehrkorni*, *Z. stalkerii*, *Z. meeki* and *Z. hypoxanthus*. Sometimes considered conspecific with *Z. atrifrons*, *Z. meeki* and *Z. hypoxanthus*. Distinctive nominate race possibly represents a separate species from other three races; review desirable. Proposed race *rothschildi* (described from Gebroeders Mts, in Weyland Range), attributed to birds from Weyland Mts in W part of species' range and Adelbert Mts in NE, better treated as hybrid or intergrade between nominate race and *chrysolaemus*; *tenuifrons* (from Wau, in Morobe District of E New Guinea) is synonymized with *chrysolaemus*; and *pallidogularis* (from Fergusson I, in D'Entrecasteaux Is) is considered indistinguishable from *delicatulus*. Four subspecies currently recognized.

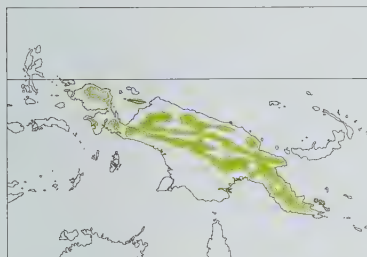
Subspecies and Distribution.

Z. m. minor A. B. Meyer, 1874 – Yapen I, and N watershed of mainland New Guinea (Cyclops Mts, Weyland Mts and Nassau Mts) E to Sepik Mts and Adelbert Mts.

Z. m. chrysolaemus Salvadori, 1876 – mountains of Vogelkop (Tamrau Mts, Arfak Mts, Farfak Mts), S watershed of New Guinea, and Herzog Mts E to Hydrographer Range.

Z. m. gregarius Mayr, 1933 – NE New Guinea (Huon Peninsula).

Z. m. delicatulus Sharpe, 1882 – S slopes of mountains of SE New Guinea (E to Milne Bay), and D'Entrecasteaux Is (Goodenough I, Fergusson I).



Descriptive notes. 11 cm; 10.3–11.6 g. Nominant race has forehead, crown and ear-coverts to upperparts bright yellowish-green, upper-tail-coverts slightly more yellow; very narrow white eyering (almost lacking); chin and throat to upper breast orange-yellow, remainder of underparts greyish-white, undertail-coverts yellow; iris chestnut-brown to grey-brown; bill blackish; legs bluish-grey. Differs from *Z. novaeguinae* in generally brighter coloration, much narrower white eyering. Sexes alike. Juvenile apparently undescribed. Races differ mainly in coloration of head and prominence of eyering, nominate being brightest and almost lacking eyering, other three having black forehead and broad eyering; *chrysolaemus* has greener upperparts than nominate, and very conspicuous greenish edges on tail feathers; *gregarius* is more yellow and duller on back, with narrower eyering than previous and slightly more orangeish-yellow on throat, thus approaching nominate; *delicatulus* has whole forehead, loreal line and area under eye black, very broad white eyering, greener back than *chrysolaemus*, distinctly less orange throat (closely resembles race *sulaensis* of *Z. atrifrons*). **VOICE.** Song diagnostic, frequently heard, sweet-sounding, consists of a series (2.5–4 seconds long) of 7–12 liquid notes almost immediately reaching its highest pitch in seesawing fashion and then descends scale, notes like the sounds produced by a squeaking wheel, although details of pattern may vary geographically; some regional variation in length and speed, but quality and overall patterns remain much same, e.g. “dyudyu dyodyo dee dyo dyu”. Calls include repeated inquiring, high upslurred “tswee”, “sweei” or “zweeit”; and often repeated high-pitched, wheezy, somewhat trilled downslurred “tseew”, “chee” or “weedit”.

Habitat. Hill forest and edges and second growth, locally town gardens (Wau); between 150 m and 1460 m, but mainly above 400 m. In mainland New Guinea occurs almost exclusively on the mountains; on Yapen I, where no forested hills above 1500 m, found in mid-montane area. In parts of E New Guinea overlaps broadly in altitudinal range with ecologically very similar though more montane *Z. novaeguinae*.

Food and Feeding. Insects and fruits; latter include berries and arillate fruits, of various figs (*Ficus*), *Schefflera*, *Polyscias ledermanni*, *Elmerrillia tsiampaca*, *Xylopiu papuana*; nectar taken from *Rhus taiensis*, and sometimes from flowering *Evodia* trees. In single-species flocks, also in mixed flocks with e.g. Old World warblers (Sylviidae); sometimes found in same flock as *Z. novaeguinae*. Frequents canopy, where it forages amid foliage and visits flowering and fruiting trees. Obtains food by gleanng.

Breeding. “Breeding individuals” in Oct and Nov, and laying females in E Huon Peninsula in late Dec and early Jan. No other information.

Movements. Little known. Possibly nomadic.

Status and Conservation. Not globally threatened. Fairly common to abundant throughout most of range. Occurs in several protected areas, e.g. Varirata National Park.

Bibliography. Beehler (1980b), Beehler & Finch (1985), Beehler *et al.* (1986), Brown & Hopkins (1995, 2002), Coates (1990), Coates & Peckover (2001), David & Gosse (2002b), Diamond (1972a), Finch (1981b), Gilliard & LeCroy (1967a, 1970), Mayr (1933a), Mayr & Meyer de Schauensee (1939b), Mayr & Rand (1937), Mees (1961, 1969), Rand (1942b), Rand & Gilliard (1967), Rothschild (1931), Strange (2001).

29. White-throated White-eye

Zosterops meeki

French: Zostérops à gorge blanche **German:** Tagulabrillenvogel **Spanish:** Antojitos Goliblanco
Other common names: Tagula (Black-fronted)/Louisiade Black-fronted White-eye

Taxonomy. *Zosterops meeki* E. J. O. Hartert, 1898, Tagula Island (Sudest Island), in Louisiade Archipelago.

Forms a superspecies with *Z. atriceps*, *Z. atrifrons*, *Z. somadikartai*, *Z. nehrkorni*, *Z. stalkerii*, *Z. minor* and *Z. hypoxanthus*. Sometimes treated as conspecific with *Z. minor*, of which it may be merely a race which has lost its yellow throat. Monotypic.

Distribution. Tagula I (in Louisiade Is), off SE New Guinea.



Descriptive notes. 10.5 cm. Has forehead to middle of crown, lores, region below eyering and ear-coverts blackish, shading into olive-green on rear crown and upperparts, which shade into olive-yellow on rump; broad white eyering interrupted at front by black spot; ill-defined yellow malar stripe; chin to abdomen white, faintly tinged buffy, vent and undertail-coverts yellow; iris dark brown; bill black, slaty blue at base; legs slate-blue or slate-brown. Sexes alike. Juvenile undescribed. **VOICE.** Not recorded.

Habitat. Lowland forest and forest edge at 300 m; probably most numerous in hills.

Food and Feeding. No information.

Breeding. No information.

Movements. Not known.

Status and Conservation. Data-deficient. Restricted-range species: present in Louisiade Archipelago EBA. Virtually unknown. No modern records from Tagula (700 km²); none seen during a ten-day trek from N coast S to Mt Riu in 1992. Large-scale logging could have a devastating effect on this and other species on Tagula, but no immediate plans for logging are known.

Bibliography. Anon. (2007n), Butchart & Stattersfield (2004), Collar *et al.* (1994), Finsch (1901), Hartert (1898a), Mayr (1933a, 1967), Mees (1961, 1969), Rand & Gilliard (1967), Sibley & Monroe (1990), Stattersfield & Capper (2000), Stresemann (1931a).

30. Black-headed White-eye

Zosterops hypoxanthus

French: Zostérops des Bismarck **Spanish:** Antojitos de las Bismarck
German: Schwarzkopf-Brillenvogel

Other common names: Bismarck Black-fronted/Bismarck (Yellow-bellied) White-eye

Taxonomy. *Zosterops hypoxanthus* Salvadori, 1881, New Britain. Forms a superspecies with *Z. atriceps*, *Z. atrifrons*, *Z. somadikartai*, *Z. nehrkorni*, *Z. stalkerii*, *Z. minor* and *Z. meeki*. Sometimes considered conspecific with *Z. minor*, and has been thought to be conspecific with *Z. fuscicapilla*. Three subspecies recognized.

Subspecies and Distribution.

Z. h. admiralitatis Rothschild & E. J. O. Hartert, 1914 – Manus I (Admiralty Is), in Bismarck Archipelago.

Z. h. ultimus Mayr, 1955 – islands of New Hanover and New Ireland (Bismarcks).

Z. h. hypoxanthus Salvadori, 1881 – Umboi I, New Britain, Watom I and Mioko I (Duke of York).



Descriptive notes. 10.5–11.5 cm; 7.6–13 g. Nominant race has top and side of head, including cheek, black, white eyering of moderate width; upperparts yellowish olive-green or yellowish-olive, except for blackish-brown wingtips and tail; chin, throat and underparts bright yellow, washed olive on flanks; iris light brown to reddish-brown, occasionally grey; bill blackish, light grey lower mandible; legs light grey to slaty blue. Sexes similar. Juvenile probably less black on head. Race *ultimus* is brighter above and below than nominate, has broader eyering, and black of crown not extending so far back on to nape; *admiralitatis*

has top and side of head brown, becoming blackish on face, and duller underparts, with chin to upper breast strongly (but variably) washed dusky brown, also narrower eyering. **VOICE.** Tinkling song reminiscent of that of a bushlark (*Mirafra*), given from top of bush. Calls “zching” and piercing sibilant “sip sip”, very different from usual white-eye calls.

Habitat. Forest, forest edge, secondary forest and partly cleared and regrowth areas, gardens, plantations. Mainly in hills and mountains, above 670 m on Umboi, and generally between c. 800 m and 1450 m, locally to 1680 m, and on New Ireland to 1760 m; occasionally down to sea-level locally, in particular New Britain and Watom, and probably elsewhere.

Food and Feeding. Small food items: various seeds, tiny fruits, and insects (e.g. caterpillars). Singly, in pairs or, especially in dry season, in small parties of 4–8 individuals. Visits flowering trees in company of *Myzomela* honeyeaters; associates also with other birds, such as Island Thrush (*Turdus poliocephalus*), Island Leaf-warbler (*Phylloscopus poliocephalus*), Golden Whistler (*Pachycephala pectoralis*) and Blue-faced Parrot-finch (*Erythrura trichroa*), usually in multi-species foraging flocks. On Umboi it remains in crown of trees in flocks of 3–5 individuals.

Breeding. Nominant race breeds in most months, but mainly during early wet season (Oct–Dec) and again in latter part (Apr–May); juveniles of race *ultimus* seen in Jan–Feb. Nest a thin-walled but strongly built basin-shaped structure 55–60 mm wide and 35–42 mm high, composed mainly of leaf-sheath fibres, with spider web and hair or cotton externally, and so finely constructed that contents may be seen through it, suspended in forked branch low down in bush or bamboo. Clutch 2 or 3 eggs, pale blue, 15.7–19 × 12–14 mm. No other information.

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species: present in Admiralty Islands EBA and in New Britain and New Ireland EBA. Nominant race on New Britain fairly common at 800–1450 m, uncommon above (to 1680 m), but scarce and of rather peripatetic occur-

rence in lowlands, this probably associated with paucity of food resources in mountains and the fruiting of certain (unidentified) shrubs and trees in foothills and lowland forest; on Umboi only above 670 m and to summits of all four mountains, where uncommon. Race *ultimus* is very scarce in lowlands but abundant in mountains (at 1500–1760 m) on New Ireland, where fairly common in forested areas and regrowth; regularly seen in secondary habitat on New Hanover. Race *admiralitatis* is fairly common to common in lowlands and hills on Manus.

Bibliography. Beehler (1978b), Bishop & Jones (2001), Coates (1990), David & Gosselin (2002b), Diamond (1976), Eastwood (1995a), Fletcher (2000a), Gregory (1995c), Hartert (1925), Leavesley & Leavesley (2000b), Mees (1961, 1969), Meyer (1930), Reichenow (1899).

31. Biak White-eye

Zosterops mysorensis

French: Zostérops de Biak **German:** Biakbrillenvogel **Spanish:** Antejitos de la Biak
Other common names: Soepiori/Black White-eye

Taxonomy. *Zosterops mysorensis* A. B. Meyer, 1874, Korido, on Supiori, north Geelvink Bay, New Guinea.

Relationships unclear, but possibly distantly related to *Z. atrifrons* and *Z. novaeguineae*. Monotypic.

Distribution. Supiori I and Biak I (N Geelvink Bay), in NW New Guinea.



Descriptive notes. 11.5 cm; male 15 g. Has top of head and entire upperparts olive, paler on rump; lores fuscous, white eyering greatly reduced, greyish-black loreal line continued as streak under eye; cheek and side of neck grey; flight-feathers and tail feathers brownish-black, edged olive; throat and underparts white, heavily washed grey on upper breast and flanks, undertail-coverts pale yellow; iris dull brownish; bill dark; legs pale. Sexes alike. Juvenile undescribed. **Voice.** Song is typical of the genus, based on a repeated five-note pattern. Call a medium-high, slightly downslurred “pii”, also “prtt”.

Habitat. Forest, forest edge, regrowth with tall trees, low secondary growth, also shrubs in open old wasteland along roads. From sea-level to 675 m.

Food and Feeding. Apparently mainly insectivorous, and not frugivorous. Forages in flocks of 3–12 individuals, often in small mixed-species flocks with gerygones (*Gerygone*), drongos (*Dicrurus*), fantails (*Rhipidura*) and flowerpeckers (*Dicaeum*). Observed while gleaning in dense foliage or hover-gleaning at base of palm fronds.

Breeding. No information.

Movements. Not known.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Geelvink Islands EBA. Only small numbers recorded during recent visits, and in some cases observers failed to find this species at all. On Biak forest is under heavy threat from logging and subsistence farming, but in interior of Supiori there are still large forest areas remaining. This white-eye appears to avoid heavily disturbed habitats and is more common in forested areas, but its occurrence in degraded forest and its presence within a relatively large (11,000 ha) protected area suggest that it is not yet at immediate risk.

Bibliography. Anon. (2007n), Beaufort (1909), Beehler *et al.* (1986), Bishop (1982), Butchart & Stattersfield (2004), Eastwood (1996a), Mayr & Meyer de Schauensee (1939a), Mees (1961, 1969), Rand & Gilliard (1967), Rothschild *et al.* (1932a), Stattersfield & Capper (2000), Stattersfield *et al.* (1998).

32. Capped White-eye

Zosterops fuscicapilla

French: Zostérops mitré **German:** Arfakbrillenvogel **Spanish:** Antejitos de las Arfak
Other common names: Yellow-bellied (Mountain)/Western Mountain White-eye; Crookshank's White-eye (*crookshanki*)

Taxonomy. *Zosterops fuscicapilla* Salvadori, 1876, Arfak Mountains, New Guinea.

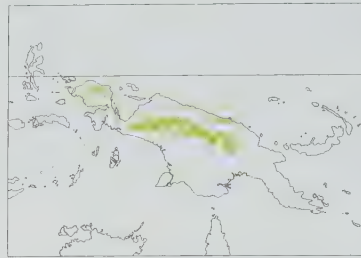
Sometimes treated as conspecific with *Z. hypoxanthus*; indeed, nominate race is strikingly similar to latter species, and may perhaps be an older offshoot of the “*Z. atrifrons* group”. Races sometimes treated as two separate species. Two subspecies recognized.

Subspecies and Distribution.

Z. f. fuscicapilla Salvadori, 1876 – mountains of W & C New Guinea (Tamrau, Arfak, Fakfak, Wandammen Mts, Foja Mts, W Central Ranges, Cyclops Mts and N Coastal Range).

Z. f. crookshanki Mayr & Rand, 1935 – Goodenough I (d'Entrecasteaux Is).

Descriptive notes. 9.5–11 cm; 10.8 g. Male nominate race has forehead, lores and a streak under eyering black, black extending over anterior part of crown and merging with green nape; eyering white, rather narrow, broken at front by black spot; upperparts dark yellowish olive-green, rump yellowish; wingtips and tail dusky brownish; throat and underparts yellowish olive green, becoming almost pure lemon-yellow on centre of belly and undertail-coverts; iris reddish-brown to dark brown; bill dark grey to blackish, basal half of lower mandible light grey; legs grey. Female is like



male, but on average duller, less yellowish. Juvenile has orange bill, lacks dark on face, has paler yellow flanks. Race *crookshanki* differs strikingly from nominate in having olive head like back, with black confined to a spot on lores, wider eyering, less yellow-toned underparts, and very greenish undertail-coverts. **Voice.** Flock call a wheezy, whistled “tyew” note, repeated, drier than calls of other mainland New Guinea white-eyes; also a rolling series of “chip” notes, suggestive of call of House Sparrow (*Passer domesticus*).

Habitat. Montane forest, second growth, isolated shrubs in mid-mountain grasslands (e.g.

in highly cultivated Baliem Valley), abandoned cultivation and bushes in native gardens. Mainly between 1200 m and 1850 m, but to at least 2500 m in W and 2600 m in E, and as low as 750 m in C parts of N Coastal Range. Marginal altitudinal overlap with ecological counterpart *Z. atrifrons*, which replaces present species at lower altitudes.

Food and Feeding. Fruit and insects. Gregarious. Moves about among twigs and branches in canopy and middle storey in relatively compact, quickly moving noisy flocks of up to several dozen individuals, or in mixed-species flocks with e.g. Mountain Gerygone (*Gerygone cinerea*) and Tit Berrypecker (*Oreocharis arfaki*). Sometimes in treetop flocks of considerable size. Occasionally in pairs.

Breeding. Dec. Nest a basin-shaped, slightly oval structure composed mainly of dried stems of plants, lightly woven, and partly covered externally with green moss together with pieces of soft greenish-gold down-like substance (arthropod silk), internal dimensions 30 × 40 × 50 mm; one nest was suspended from thin horizontal stems of bamboo leaves in clump of garden bamboo. Nest containing single nestling found. No other information.

Movements. Not known.

Status and Conservation. Not globally threatened. Common to scarce. Locally one of the most common bird species, together with Mountain Leaf-warbler (*Phylloscopus trivirgatus*), at c. 1500 m in Weyland Mts.

Bibliography. van Balen & Rombang (1998), Coates (1990), Coates & Peckover (2001), Coles (1995), David & Gosselin (2002a, 2002b), Diamond (1985), Hadden (1975), Mayr & Meyer de Schauensee (1939b), Mayr & Rand (1935), Mees (1961, 1969), Rand (1942b), Rand & Gilliard (1967), Stein (1936), Strange (2001), Weston (1976c).

33. Buru Yellow White-eye

Zosterops buruensis

French: Zostérops de Buru **German:** Burubrillenvogel **Spanish:** Antejitos de Buru
Other common names: Buru (Island) White-eye

Taxonomy. *Zosterops buruensis* Salvadori, 1878, Buru Island.

Relationships uncertain. Monotypic.

Distribution. Buru I, in S Moluccas.



Descriptive notes. 11.5–12 cm; 11–13 g. Has white eyering interrupted at front by black loreal line, latter continuing under eye-ring as narrow dusky line; top of head and upperparts generally dusky olive, slightly more yellowish on rump, and limited area of yellowish on forehead and over lores; remiges and rectrices blackish-brown, more or less narrowly edged greenish; throat and underparts entirely yellow, darker on sides; iris black or brown; bill black, sometimes light grey base; legs black or grey. Distinguished from sympatric *Z. montanus* by yellow belly, different mantle colour, and dark eyes. Sexes alike. Juvenile

undescribed. **Voice.** Quiet, quickly repeated “tsu-tsu-tsu-tsu” during foraging, and “chewit, chewit, chewit”; no other information.

Habitat. Primary forest, second growth, scrub, selectively logged forest, and farmland, from sea-level to 1750 m; well distributed in lower and middle montane zone to 1500 m. Replaced at higher elevations by *Z. montanus*.

Food and Feeding. No details of diet. Moves around in dense canopy and subcanopy in mixed flocks with Old World flycatchers (Muscicapidae).

Breeding. No information.

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species: present in Buru EBA. Moderately common to very common in primary and secondary forest, but less so in logged forest; probably at much lower density in non-forest area. Population estimated at 598,000–1,459,000 individuals in 1989.

Bibliography. van Bemmel (1948), Coates & Bishop (1997), Hartert (1900b), Inskipp *et al.* (1996), Jepson (1993a), Marsden *et al.* (1997), Mees (1961, 1969), Poulsen & Lambert (2000), Salvadori (1878), Stattersfield *et al.* (1998), Stresemann (1914b), White & Bruce (1986).



34

ssp crissalis

35

ssp novaeguineae

ssp metcalfei

36

ssp oreophilus

ssp floridanus

37

38

ssp griseotinctus

39

ssp pallidipes

40

41

42

43

ssp kulambangrae

ssp tetiparius

44

45

ssp rendovae

47

48

46

ssp hamlini

ssp oblitus

49

50

ssp flavifrons

51

ssp macgillivrayi

PLATE 33

inches

3

cm

8

34. Ambon Yellow White-eye

Zosterops kuehni

French: Zostérops d'Amboine **German:** Ambonbrillenvogel **Spanish:** Antojitos de Ambon
Other common names: Ambon/Amboina/Kühn's White-eye

Taxonomy. *Zosterops kuehni* E. J. O. Hartert, 1906, Ambon.

Relationships uncertain; has been thought to be closest to *Z. novaeguineae*, and dusky feather centres on forecrown and white-greyish abdomen may indicate relationship to *Z. atrifrons*. Has been suggested to be related to *Z. stalkerii*, although both species may occur on Seram. Monotypic.

Distribution. Ambon, and also recorded once on N Seram (Wahai), in S Moluccas.



Descriptive notes. 12 cm. Has top of head and upperparts olive-green, forecrown more dusky, lores and distinct streak under eye dull black; white eyering broken at front by blackish lore line; flight-feathers and tail feathers blackish-brown, broadly margined with olive-green; chin, throat and undertail-coverts yellow, remainder of underparts greyish-white; iris brown; bill black above, greyish below; legs grey. Sexes alike. Juvenile undescribed. Voice. Song a musical warble; calls include sibilant single "teeu" note.

Habitat. Lowland forest, remnant patches of secondary forest and woodland, and lightly

wooded cultivation, scrub, and gardens; sea-level to 500 m.

Food and Feeding. No details of diet. Usually in pairs and in small groups of three or four individuals. Fairly active, and movement rather deliberate. Forages mainly at inconspicuous flowers in crown of *Albizia* and acacia (*Acacia*) trees.

Breeding. No information.

Movements. Not known.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Seram EBA. Moderately common on Ambon. On Seram known only from a single specimen from Wahai, on N coast, in 1862; was not located on the island during searches in 1987 and 1990. Wooded habitats are diminishing on the densely populated and relatively small island of Ambon; this species could soon be at risk there.

Bibliography. Anon. (2007n), van Bemmel (1948), Bowler & Taylor (1993b), Butchart & Stattersfield (2004), Coates & Bishop (1997), Collar *et al.* (2001), Inskipp *et al.* (1996), Mees (1961, 1969), Stattersfield & Capper (2000), Stattersfield *et al.* (1998), Stresemann (1931a), White & Bruce (1986).

35. New Guinea White-eye

Zosterops novaeguineae

French: Zostérops de Nouvelle-Guinée **German:** Papuabrillenvogel **Spanish:** Antojitos Papú
Other common names: (New Guinea) Mountain White-eye

Taxonomy. *Zosterops novaeguineae* Salvadori, 1878, Arfak Mountains, New Guinea.

Possibly related to *Z. kuehni*; formerly suggested affinity to either *Z. montanus* or *Z. lateralis* not supported by morphological or ecological characters. Lowland races (*aruensis*, *wuroi* and *magnirostris*) smaller than montane ones (nominate, *wahgiensis*, *oreophilus*, *crissalis*), but the two groups have no phylogenetic significance. Birds of this species in Kumawa Mts are of uncertain racial identity, provisionally placed in nominate. Seven subspecies recognized.

Subspecies and Distribution.

Z. n. novaeguineae Salvadori, 1878 – Arfak Mts and (race dubious) Kumawa Mts, in NW New Guinea.

Z. n. aruensis Mees, 1953 – Aru Is.

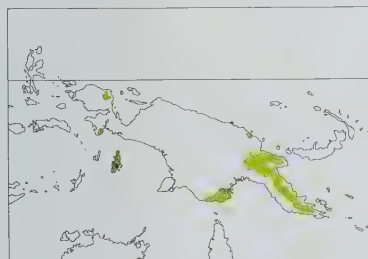
Z. n. wuroi Mayr & Rand, 1935 – Trans-Fly region from R Bensbach E to Fly R mouth, in lowland S New Guinea.

Z. n. magnirostris Mees, 1955 – Awar, opposite Manam I, perhaps also lower parts of Adelbert Range, in NE New Guinea.

Z. n. oreophilus Mayr, 1931 – Saruwaged Mts (Huon Peninsula), in NE New Guinea.

Z. n. wahgiensis Mayr & Gilliard, 1951 – Wahgi valley E to Okapa area, and surrounding mountains, Mt Wilhelm and Mt Orata (Eastern Highlands Province), in E New Guinea.

Z. n. crissalis Sharpe, 1884 – mountains of SE New Guinea.



Descriptive notes. 11 cm; 11–13.5 g. Nominate race has rather narrow white eyering, dark grey lores; top of head and upperparts dark yellowish olive-green; remiges and rectrices blackish-brown, broadly bordered with olive-green; chin, throat, upper breast and undertail-coverts not very bright sulphur-yellow, rest of underparts satin-white, more greyish on flanks and breast; iris blackish to grey-brown; bill black; legs grey, brown or blackish. Distinguished from *Z. minor* locally either by lack of black on forecrown, or by less bright throat. Sexes similar. Juvenile is similar to adult, but eyering smaller. Races differ mainly in size,

plumage tones and width of eyering: *aruensis* is small, with rather wide eyering, deeper dark yellow throat; *wuroi* is small, greener above than other races, lore line blackish-grey, wide eyering, rather pale yellow throat; *wahgiensis* is similar to nominate but larger, slightly greener above, throat rather bright yellow, sometimes has slight yellow longitudinal streak below; *oreophilus* is similar to previous, but some yellow on forehead and above lores, and has lower half of eyering white and upper half grey; *crissalis* is more yellowish, less dark green, on upperparts, with forehead and

supraloral region distinctly yellow; *magnirostris* is small, with large bill, rather pale yellow, more greenish throat, has yellowish median streak down to belly. Voice. Song in Arfak Mts (nominate race) of several notes varying in pitch, followed by high-pitched note and sweet trill on lower pitch; in Kumawa Mts (presumed also nominate race) loud, bright, fast and medium-high in pitch, consisting of up to c. 12 notes, the first 2–6 at several varying pitches, last 6 notes all on same lower pitch; in E of range a protracted series of sweet-sounding whistles and upslurs, not unlike that of Pied Bushchat (*Saxicola caprata*). Calls include sweet descending "tsyew", often by many members of a flock; also a short, dry upslurred trilled note and sharp hard "zeez".

Habitat. Rainforest, monsoon forest (Trans-Fly only) and edge, bushes of secondary growth, patches of secondary growth on grassland areas, disturbed areas, gardens, and groves of casuarinas (*Casuarina*). Mostly in hills and lower mountains, between 650 m and 2600 m (mainly 1250–2400 m); in S (*wuroi*) and N (*magnirostris*) locally at sea-level, and occurs at low elevations also on Aru Is (*aruensis*). At lower elevations locally replaced by *Z. atrifrons*, at higher elevations locally (W New Guinea) by *Z. fuscicapilla*.

Food and Feeding. Stomach contents included spiders (Araneae), insects, fruits and seeds. Occurs in small to large parties of up to 50 or more individuals; occasionally associates with flocks of *Z. atrifrons*. Forages in crown to middle levels, occasionally descends to understorey of forest, where seen to feed on fruits of small trees; gleans through foliage in search of small insects. Visits fig trees (*Ficus*) and flowering trees of *Rhus taitensis*.

Breeding. Recorded in Aug, Sept, Dec–Jan and Apr. Nest a basin-shaped cup, externally c. 7 cm wide and 3.7–4.5 cm high, internally c. 5 cm wide and 3–3.8 cm deep, composed of fine light brown fibres, thinly woven, with complete thin outer layer of green moss among which are a few small feathers and some spider webs, slung by rim from forked twig. Clutch 2 eggs, very pale blue, 16.3–17.3 × 11.4–13 mm. No other information.

Movements. Probably nomadic, and absent from some breeding areas during parts of year. Commonly in flocks in Dec–Feb.

Status and Conservation. Not globally threatened. Locally common to very common.

Bibliography. Beechler *et al.* (1986), Coates (1990), Coates & Peckover (2001), David & Gosse (2002b), Diamond (1972a, 1985), Finch (1981b), Gyldestolpe (1955a), Harrison & Frith (1970), Mack & Wright (1996), Mayr (1931c), Mayr & Gilliard (1954), Mayr & Rand (1935, 1937), Mees (1955, 1961, 1969), Pratt (1982), Strange (2001).

36. Yellow-throated White-eye

Zosterops metcalfei

French: Zostérops à gorge jaune **Spanish:** Antojitos Goliamarillo

German: Goldkehl-Brillenvogel

Other common names: Solomon Yellow-throated/Bukida/Metcalfe's White-eye

Taxonomy. *Zosterops metcalfei* Tristram, 1894, Santa Isabel, Solomon Islands.

Affinities unclear. Geographic variation is not very pronounced and mainly exists in presence or absence of eye-ringing. Three subspecies recognized.

Subspecies and Distribution.

Z. m. exiguus Murphy, 1929 – Buka, Bougainville, Shortland Is and Choiseul, in N Solomon Is.

Z. m. metcalfei Tristram, 1894 – Santa Isabel and San Jorge, in NC Solomons.

Z. m. floridanus Rothschild & E. J. O. Hartert, 1901 – Florida Is, in EC Solomons.



Descriptive notes. 11–11.5 cm; male 13.6 g, female 13.8 g. Nominate race has dusky lores, narrow white eyering broken before and behind eye (not easily seen in field, and may be absent altogether); top and side of head and upperparts, including upperwing-coverts, bright yellowish olive-green, remiges and rectrices blackish-brown, edged olive-green; throat and upper breast bright yellow, undertail-coverts paler yellow, lower breast and abdomen greyish-white; iris pale brown to medium red-brown; bill greyish-black or dark brown, paler horn-coloured base of mandible; legs grey. Sexes alike. Juvenile resembles adult.

Races differ minimally: *exiguus* is close to nominate, but has paler lower mandible, paler yellow throat and upper breast; *floridanus* has no white eyering but bare eyelid, and is slightly lighter and more yellowish above, especially on head. Voice. Song fairly strong and loud, a pleasant but nondescript mix of 6–9 variably pitched notes. Call fairly loud sibilant, high-pitched "tew tew" or "peep peep", uttered frequently by flock-members; also harsh trill of 4 or 5 notes and a "chirrup".

Habitat. Primary forest, forest edge, secondary growth, gardens and open areas with trees; often present in trees in Panguna town (Bougainville). From sea coast to hills, mainly to c. 900 m, occasionally to 1200 m. Replaced at higher elevations by *Z. rendovae*, but often mixes with that species where their ranges overlap.

Food and Feeding. Fruits (e.g. *Trema* spp.), grubs and insects. Usually in pairs and in parties of 3–5 birds, occasionally in flocks numbering 20–30 individuals; sometimes in company of flowerpeckers (*Dicaeum*). In river-edge vegetation and forest interior, is dominant member in most mixed-species foraging flocks, but not restricted to them. Moves quickly through canopy to middle levels of forest, but descends to c. 3 m above ground in secondary growth and at forest edge.

Breeding. Recorded Apr–Jun, also nestlings Nov–Jan and Apr and birds with enlarged gonads in Sept in N of range (race *exiguus*); eggs in Sept and Oct in C (nominate). Nest a neatly woven but thin bowl of grasses (looking almost white when made from very pale fibres), slung by rim from small twigs up to 10 m above ground in thin leafy tree or similar. Clutch 2 eggs, pale blue (*exiguus*). No other information.

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species: present in Solomon Group EBA. Common to abundant through most of small range.

Bibliography. Coates (1990), David & Gosse (2002b), Diamond (1975a), Doughty *et al.* (1999), Filewood (1970), Hadden (1981, 2004), Kratter, Steadman, Smith & Filardi (2001), Kratter, Steadman, Smith, Filardi & Webb (2001), Mayr (1945b), Mayr & Diamond (2001), Mees (1961, 1969), Murphy (1929), Schodde (1977), Tristram (1894), Virtue (1947), Webb (1997).

On following pages: 37. Christmas White-eye (*Zosterops natalis*); 38. Australian Yellow White-eye (*Zosterops luteus*); 39. Louisiade White-eye (*Zosterops griseotinctus*); 40. Rennell White-eye (*Zosterops rennellianus*); 41. Banded White-eye (*Zosterops vellavalavella*); 42. Ranongga White-eye (*Zosterops splendidus*); 43. Splendid White-eye (*Zosterops luteirostris*); 44. Solomon White-eye (*Zosterops kulambangrae*); 45. Kolombangara Mountain White-eye (*Zosterops murphyi*); 46. Grey-throated White-eye (*Zosterops rendovae*); 47. Malaita White-eye (*Zosterops stresemanni*); 48. Santa Cruz White-eye (*Zosterops sanctaecrucis*); 49. Samoan White-eye (*Zosterops samoensis*); 50. Fiji White-eye (*Zosterops explorator*); 51. Yellow-fronted White-eye (*Zosterops flavifrons*).

37. Christmas White-eye

Zosterops natalis

French: Zostérops de Christmas

German: Weißstirn-Brillenvogel

Spanish: Antejitos de la Christmas

Other common names: Christmas Island White-eye

Taxonomy. *Zosterops natalis* Lister, 1889, Christmas Island.Distinct species with no known close relatives; in appearance most resembles *Z. griseovirescens* of Gulf of Guinea (W Africa), Monotypic.**Distribution.** Christmas I (Indian Ocean); introduced on Horsburgh I, in S Cocos Is.**Descriptive notes.** 11.7–13.5 cm; male 10.8 g, female 11.5 g. Has forehead and supraloral stripe whitish to yellowish, wide black on lores continuing to half-way under white eyering, latter of average width. ear-coverts pure grey; crown and upperparts dull greenish; flight-feathers and tail feathers dull brownish with dull greenish outer edges; greyish-white below, rarely a trace of pale yellow on throat and belly, flanks with pale buff tinge, undertail-coverts pale yellow; iris deep chestnut-brown; bill black or dark brown, base of lower mandible pale blue; legs greenish-grey to blue-grey. Sexes alike. Juvenile apparently very like adult, but has grey eyes.**VOICE.** Series of loud notes believed to be song, described as “yerr yerr weet yerr yerr weet...”. Variety of calls, include twittering and chirping reminiscent of sparrow (*Passer*); high thin, but not drawn-out “ts-ee- seet...tsee-eet...” (function not known), “tsirr...tsirr...” as alarm and agitation call, and high “cheeuw...cheeuw...cheeuw...” for scolding at Australasian Goshawk (*Accipiter fasciatus*).**Habitat.** Found in all tree and shrub habitat types on the island; perhaps most often in open country and near forest edge.**Food and Feeding.** Fruits, seeds and nectar, some insects. Fruits include ripe bananas (*Musa*), mangoes (*Mangifera*), sour-sops (*Annona muricata*), custard-apples (*Annona squamosa*) and particularly papayas (*Carica papaya*), also wild *Passiflora* species and berries of *Callicarpa albidia*; nectar from *Stachytarpheta* taken. Boiled rice also accepted. Gregarious, in small flocks. Forages from canopy down to lower levels, on branches and among foliage; sometimes descends to ground. Clings to tree trunks. Gleans items from substrate; sallies after aerial insects.**Breeding.** Breeds in almost all months, peak from beginning Sept to end Jan or slightly later. Nest a neat and compact cup 5–5 cm wide and 2–2.5 cm deep, outer portion woven from dried grass and other fibres, rarely *Arenga*, sometimes few feathers or even dried leaves, carefully lined with fine fibres of sago palm (*Arenga listeri*), usually firmly attached in fork of very thin branch 1.5–4.5 m up in medium-sized bush, occasionally higher in tree. Clutch 2 eggs, less frequently 3 and once 4, pale watery blue, 17.8 × 12.4 mm; incubation period 15–16 days; fledging period 17 days at least; young fed by parents for at least a week after leaving nest.**Movements.** Sedentary.**Status and Conservation.** VULNERABLE. Restricted-range species; present in Christmas Island EBA. Formerly considered Near-threatened, or even not threatened, but conservation category recently upgraded because of loss of a third of forested habitat through mining activities (these ended in 1987, but could be resumed), threat of further forest clearance for satellite launch pads and for refugee transit stations, and species' tiny global range of just 135 km². Ecology of Christmas I also under modification by activities of introduced yellow crazy ant (*Anoplolepis gracilipes*), which formed massive “supercolonies” during 1990s and spread rapidly to cover c. 25% of island (since 2000 spread of ants under permanent human control); ants had direct impact on mortality of nestlings, as well as indirect impact through their farming of scale insects (Coccoidea), a practice which damages the native trees. This white-eye is nevertheless still abundant, and the commonest bird species on Christmas I; seems to tolerate some habitat modification, although only few are found around settlements. In 1961 population estimated at several thousands to tens of thousands of individuals; most recent (2005) estimate for Christmas I is 20,000 individuals. Christmas Island National Park was established in 1980; the setting-up of a captive population has been proposed. Introduced between 1885 and 1900 on Horsburgh I, in Cocos (Keeling) Is, where it still survives. Very common on Horsburgh in 1941, when 400 individuals present, but has not spread to any of the other islands in the Cocos group; it remained abundant on Horsburgh only in remnants of the original forest vegetation along shoreline of lagoon.**Bibliography.** Andrews (1900), Anon. (2007n), Butchart & Stattersfield (2004), Carter (1994), Chasen (1933), Collar *et al.* (1994), Garnett & Crowley (2000), Gibson-Hill (1947, 1950b), Higgins *et al.* (2006b), Lansley (1997), Lever (1987), Mees (1957, 1969), Schodde & Mason (1999), Stattersfield & Capper (2000), Stokes *et al.* (1984).

38. Australian Yellow White-eye

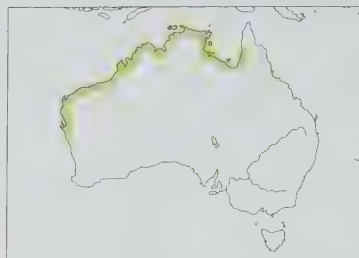
Zosterops luteus

French: Zostérops à ventre jaune

German: Mangrovebrillenvogel

Spanish: Antejitos Australiano

Other common names: Mangrove/Yellow/Golden White-eye, (Yellow) Silvereye(1)

Taxonomy. *Zosterops luteus* Gould, 1843, Greenhill Island, Van Diemen Gulf, Northern Territory, Australia.Formerly considered conspecific with *Z. flavus*, *Z. chloris* and *Z. citrinella*. Geographical variation in plumage and size clinal across entire range, this further complicated by local variation in colour; races intergrade considerably and their validity perhaps doubtful, but genetic data suggest a split between W & E populations. Two subspecies recognized.**Subspecies and Distribution.***Z. l. balstoni* Ogilvie-Grant, 1909 – coastal NW Australia from Shark Bay (including Dirk Hartog I) E to Wotjulum (King Sound) and N Kimberley District.*Z. l. luteus* Gould, 1843 – coastal N Australia from N Kimberley District E, including coastal islands of Melville, Bickerton, Groote Eylandt and Sir Edward Pellew Group, to W Cape York Peninsula (Edward R); isolated population in E Queensland (region of Ayr–mouth of Burdekin R).**Descriptive notes.** 9.5–11 cm; 8.4–11.3 g. Nominate race has forehead and supraloral region yellow, white eyering interrupted at front by blackish lore stripe, latter continuing to half-way under eyering; crown and upperparts yellow-olive; remiges and rectrices blackish-brown, edged yellowish-olive; all bright yellow below, brightest on throat, paler elsewhere, and with greenish-grey wash on flanks; iris brown to chestnut-brown; bill grey or black to dark brown, blue-grey base of lower mandible; legs(Eucalyptus), paperbark (*Melaleuca*) woodland, monsoon thickets, vegetation on coastal rivers; also trees and gardens in coastal towns. On mangroveless islands off NE Arnhem Land (Northern Territory) common in heaths and open woodland. Extends some distance inland along rivers.**Food and Feeding.** Insects including larvae, most importantly Diptera (mosquitoes and midges), small beetles (Coleoptera), bugs (Hemiptera), Lepidoptera, also wasps (Hymenoptera), ants (Formicidae), Orthoptera; also molluscs, spiders (Araneae) and once a pseudoscorpion (Pseudoscorpiones); prey items mostly 2–12 mm long. Also seen to eat seeds and pulp from *Passiflora foetida* growing in mangrove edge; presumed to take nectar as seen to probe flowers of most mangrove species, as well as *Melaleuca cajuputi*. Probably mainly insectivorous, as fruits rare in mangroves and nectar seasonal. Moves about in parties of 7–8 individuals, sometimes up to 40 birds, in mangroves and thickets; occasionally in mixed flocks with *Z. lateralis*, but otherwise separated by habitat. Searches for insects in foliage of mangrove trees; gleans arthropods from leaves and twigs, and probes flowers.**Breeding.** Mainly Oct–Mar; no obvious seasonality and throughout year (except Nov) in Darwin region, with possible peak in late dry season (Sept–Oct). Nest a deep cup of soft grass, lined with fine rootlets, with cobweb and pieces of bark on outside, suspended from horizontal fork usually in top third of mangrove tree overhanging water, mostly below 3–8 m, rarely up to 6 m in acacia. Clutch 2–3 eggs, sometimes 4, pale bluish-green or white, 14.7 × 10.3 mm; incubation period 9–12 days; nestling period 10–11 days.**Movements.** Seemingly nomadic locally outside breeding season, when wanders inland (never farther than several km from coast) and mobile flocks of considerable size spread over scrubby coast and sandhill areas. Daily routine movements between roosts (in mangroves) and daytime foraging sites (in acacia scrub) described.**Status and Conservation.** Not globally threatened. Common locally; dependent on mangroves. One of the four most abundant species in mangroves of Darwin area (Northern Territory), with densities of 5 birds/ha.**Bibliography.** Barrett *et al.* (2003), Blakers *et al.* (1984), Carter (1910), Crawford (1972), David & Gosselin (2002b), Franklin & Noske (2000a), Garnett *et al.* (2004), Harrison (1968a), Higgins *et al.* (2006b), Hill (1911), Johnstone (1990), Lane (1986), Lavery & Grimes (1974), Le Souëf (1903), Macgillivray (1914), Mathews (1914), McCarthy (2006), Mees (1961, 1969), Noske (1996, 1999), Pizzey & Knight (1997), Schodde & Mason (1999), Serventy & Whittell (1962), Thomson (1935).

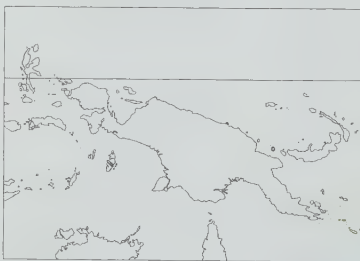
39. Louisiade White-eye

Zosterops griseotinctus

French: Zostérops des Louisiade

Spanish: Antejitos de las Luisiade

German: Louisiadenbrillenvogel

Other common names: Louisiade/Dull-colored White-eye; Nissan White-eye (*eichhorni*); Islet/Island White-eye (with *rennellianus*)**Taxonomy.** *Zosterops griseotincta* G. R. Gray, 1858, Duchateau Island, Louisiade Archipelago. Forms a superspecies with *Z. rennellianus*, *Z. vellaivelva*, *Z. splendidus*, *Z. luteostrictis* and *Z. kulambangrae*, possibly with *Z. murphyi* a member of same group. Sometimes considered conspecific with *Z. rennellianus*. Proposed race *ottomeyeri* (described from Nauna I, in Admiralty Is) is merged with *eichhorni*, and *aignani* (Misima, in Louisiade Archipelago) is synonymized with nominate. Four subspecies recognized.**Subspecies and Distribution.***Z. g. eichhorni* E. J. O. Hartert, 1926 – Nauna (E Admiralty Is); Nissan (Green Is), E of Bismarcks; and islands of Vitiaz Strait (Crown, Long, Tolokiwa), between New Britain and New Guinea.*Z. g. longirostris* E. P. Ramsay, 1879 – Rogaia I (Heath I), in Milne Bay (off extreme SE tip of New Guinea); Bonvouloir Group (East I and Hastings I), in W Louisiade Archipelago; and Alcester I (between Woodlark I and Louisiades).*Z. g. griseotinctus* G. R. Gray, 1858 – WC & C Louisiade Archipelago in Conflict Group (Panasesa Is), Kimuta, Deboyne Group (Panepompong Is), Renard Is and Misima.*Z. g. pallidipes* De Vis, 1890 – Rossel, in E Louisiade Archipelago.**Descriptive notes.** 11–12.5 cm; 14 g. Nominant race has well-developed white eyering interrupted at front by darker spot, dusky lore line continuing as streak to half-way under eye; top of head and upperparts yellowish olive-green; remiges and rectrices blackish-brown, margined olive-green; greenish-yellow below, throat and middle of abdomen purer yellow, more olive on flanks; iris light grey; bill proportionately large and heavy, light brown; legs greenish-slate. Sexes similar. Juvenile undescribed. Race *longirostris* is similar to nominate race, with slightly longer bill; *pallidipes* is fairly distinctive, with dirty yellow to yellowish-horn or greyish legs, and has somewhat longer bill, darker lores and more greyish underparts than nominate; *eichhorni* is slightly brighter above, plumage harder and stronger and slightly more yellow below, with bill dull straw-yellow, feet yellowish-brown or yellowish-slate. **VOICE.** Following details refer to race *eichhorni*. Song a somewhat monotonous, fairly rapid series of quite high-pitched loud notes, variable and reminiscent of Pied Bushchat (*Saxicola caprata*), with typical flourish at end of each phrase, continuing with few pauses especially during dawn chorus. Call “chew”, typical of genus; loud musical “chip-chip-chip...” in flight.**Habitat.** Forest edge, secondary growth and probably forest.**Food and Feeding.** Mainly fruits, especially figs (*Ficus*), ripe papaya (*Carica*) and berries; also insects, nectar and some seeds. Gleans insects from foliage.

Breeding. Recorded in Aug in N of range (race *eichhorni*). Cup-shaped nest loosely made from rootlets, fibres, fine grasses, sometimes moss or wool (plant down), lined with even finer grasses, sparsely covered on outside with small pieces of wood, bark or insect cocoons, suspended by rim usually in fork of twig, c. 3 m above ground. Clutch 2 eggs, very pale blue, unmarked, size 17.3–19.6 × 13–14 mm (nominat race), 18–20 × 14–14.6 mm (*eichhorni*). No other information.

Movements. Resident; at least some races, such as *eichhorni*, are highly vagile.

Status and Conservation. Not globally threatened. Restricted-range species: present in New Britain and New Ireland EBA and in Louisiade Archipelago EBA. Very abundant on Nissan I, where probably most common bird species; abundant in all habitats in 1999 on Long I. Apparently common on Rossel I at end of nineteenth century, and possibly still common.

Bibliography. Beehler *et al.* (1986), Coates (1990), David & Gosselin (2002b), Diamond (1975b, 1998), Doughty *et al.* (1999), Hadden (2004), Harding (1982), Hartert (1899a, 1899b), LeCroy & Peckover (1998), Mayr (1945b), Mayr & Diamond (2001), Mees (1961, 1969), Rand & Gilliard (1967), Schipper *et al.* (2001).

40. Rennell White-eye

Zosterops rennellianus

French: Zostérops de Rennell **German:** Rennellbrillenvogel **Spanish:** Antojitos de la Renell

Taxonomy. *Zosterops rennelliana* Murphy, 1929, Rennell, Solomon Islands.

Forms a superspecies with *Z. griseotinctus*, *Z. vellaavella*, *Z. splendidus*, *Z. luteirostris* and *Z. kulambangrae*, possibly with *Z. murphyi* also a member of same group. Sometimes considered conspecific with *Z. griseotinctus*. Monotypic.

Distribution. Rennell, in SE Solomon Is.



Descriptive notes. c. 12 cm; 12–17 g. Plumage is olive-green above, with little or no yellow on forehead and above lores; lores greenish dusky, eyering no more than a narrow area of bluish or grey bare skin; yellowish-green below, brightest on throat; iris reddish-brown or brown; bill bright orange; legs pale orange. Sexes alike. Juvenile undescribed. **VOICE.** Song and call different from those of congeners, approaching voice of *Woodfordia superciliosa*. Song unusually fast for this genus, a quiet, rather strong high-pitched tinkling warble of 7–11 seconds, within pitch span of a few notes, reminiscent of that of Blackcap (*Sylvia atricapilla*), repeated at intervals of 4–30 seconds, interspersed with occasional characteristic “tjnk-tjnk-tjnk”. Chattering series of weak contact notes “chu, chu, chu...”; springy “zhe-hee-hee”.

Habitat. Forest, especially forest edge; less common in regrowth and scrub.

Food and Feeding. Insects, e.g. locusts (Orthoptera), also spiders (Araneae), small seeds, and variety of fruits smaller than 0.8 cm (including *Pipturus argenteus* and *Macaranga tanarius*). Arthropods may form larger part of the diet than does fruit. Usually forages quietly in pairs and small flocks, often on edge of mixed-species flocks. Forages mainly in lower and middle storeys. Often creeps along trunks and branches, and hops up vines. Techniques include hover-gleaning, hanging upside-down and gleaning at dead leaves and twigs; much feeding from bark, climbing trunks in manner of nuthatch (*Sitta*).

Breeding. Few data. Cup-shaped nest 2.5–5 cm in diameter, built from dead leaves and moss woven together, much live green moss on outside, lined with fine grass or dry fibres (similar to that of *Woodfordia* but only two-third the size), suspended 1 m above ground from horizontal fork. Clutch 2 eggs. No other information.

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species: present in Rennell and Bellona EBA. Common and widespread within range. The only white-eye on Rennell, where it is one of the less common passerines; absent from islets in L Tegano.

Bibliography. Bradley & Wolff (1958), David & Gosselin (2002b), Diamond (1991), Doughty *et al.* (1999), Gibbs (1996a), Mayr (1967), Mayr & Diamond (2001), Mees (1961, 1969), Murphy (1929), Sibley & Monroe (1990), Wolff (1976).

41. Banded White-eye

Zosterops vellaavella

French: Zostérops de Vella Lavella **Spanish:** Antojitos de la Vella Lavella
German: Bänderbrillenvogel

Other common names: Vellaavella White-eye

Taxonomy. *Zosterops vellaavella* E. J. O. Hartert, 1908, Vella Lavella, Solomon Islands.

Forms a superspecies with *Z. griseotinctus*, *Z. rennellianus*, *Z. splendidus*, *Z. luteirostris* and *Z. kulambangrae*, possibly with *Z. murphyi* also a member of same group. Monotypic.

Distribution. New Georgia Is (Vella Lavella and Mbava), in C Solomon Is.



Descriptive notes. 11.5 cm. Plumage is yellowish-olive above, white eyering broken at front by dusky spot, dusky loreal line continuing under eye; remiges and rectrices blackish-brown, broadly edged yellowish-olive; almost light orange-yellow chin and throat separated from greyish-white lower breast and belly by olive breastband; undertail-coverts yellow; iris reddish-brown; bill bright yellow; legs yellow. Sexes alike. Juvenile has horn-brownish bill and grey legs. **VOICE.** Song, given strongly in early morning, slow series of c. 10 downslurred notes with irregular silent breaks. Strong “tse” contact call; also a springy “tse-tse-se-se” call.

Habitat. Primary forest, secondary growth, scrub, and forest edge, including coconut plantations with some undergrowth and scattered old trees.

Food and Feeding. No information.

Breeding. Nestling in Nov, and laying presumably in Oct. No other information.

Movements. Not known.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Solomon Group EBA. The only white-eye on the two islands

of its range, where presently common. Likely to be at risk because of the extensive logging on Vella Lavella; majority of this island has already been or is scheduled to be logged, and this may lead to a major decline in numbers of this species. No information from Mbava.

Bibliography. Anon. (2007n), Butchart & Stattersfield (2004), David & Gosselin (2002b), Doughty *et al.* (1999), Dutson (2007b), Gibbs (1996b), Hartert (1908), Mayr (1945b, 1967), Mayr & Diamond (2001), Mees (1961, 1969), Murphy (1929), Sibley & Monroe (1990), Stattersfield & Capper (2000), Stresemann (1931a).

42. Ranongga White-eye

Zosterops splendidus

French: Zostérops de Ganongga **Spanish:** Antojitos Espléndido
German: Ranonggabrillevogel

Other common names: Ganongga White-eye

Taxonomy. *Zosterops splendida* E. J. O. Hartert, 1929, Ranonga, Solomon Islands.

Forms a superspecies with *Z. griseotinctus*, *Z. rennellianus*, *Z. vellaavella*, *Z. luteirostris* and *Z. kulambangrae*, possibly with *Z. murphyi* also a member of same group. Most closely related to *Z. luteirostris*; sometimes treated as conspecific, but differs in plumage and morphology. Monotypic.

Distribution. Ranongga, in WC Solomon Is.



Descriptive notes. 11.5–12 cm. Has fairly wide white eyering interrupted at front by big blackish spot; forehead, forecrown, lores and area under eyering black, merging posteriorly into yellowish-olive of rear crown and upperparts; flight-feathers and tail feathers blackish-brown, margined yellowish-olive; golden-yellow below; merging on side of breast into olive of upperparts; iris reddish-brown; bill black; legs yellow. Differs from *Z. luteirostris* in having relatively longer tail, black (instead of yellow) bill, more black on crown and brighter coloration. Sexes alike. Juvenile undescribed. **VOICE.** Sings often, especially at dawn, a short simple but unpredictable series of c. 9 staccato down- and/or upslurred notes. Contact call “cheu”, slightly louder and more disyllabic than that of other white-eyes.

Habitat. Primary forest, scrub, gardens, secondary forest.

Food and Feeding. No information.

Breeding. No information.

Movements. Not known.

Status and Conservation. **VULNERABLE.** Restricted-range species: present in Solomon Group EBA. Small and declining population confined to a single island, where it is the only white-eye present. True population size perhaps underestimated; this species considered common by some ornithologists, and may be better reclassified as Near-threatened. On the other hand, if it is found to have a severely fragmented range, and if current local demand for timber persists, its conservation status may have to be upgraded in future to that of Endangered.

Bibliography. Anon. (2007n), Butchart & Stattersfield (2004), David & Gosselin (2002b), Diamond (1998), Doughty *et al.* (1999), Dutson (2007b), Gibbs (1996a, 1996b), Mayr (1945b, 1967), Mayr & Diamond (2001), Mees (1961, 1969), Murphy (1929), Stattersfield & Capper (2000), Stresemann (1931a).

43. Splendid White-eye

Zosterops luteirostris

French: Zostérops de Gizo **German:** Gizobrillenvogel **Spanish:** Antojitos de la Gizo

Other common names: Gizo/Hartert's White-eye

Taxonomy. *Zosterops luteirostris* E. J. O. Hartert, 1904, Gizo, Solomon Islands.

Forms a superspecies with *Z. griseotinctus*, *Z. rennellianus*, *Z. vellaavella*, *Z. splendidus* and *Z. kulambangrae*, possibly with *Z. murphyi* also a member of same group. Close to *Z. splendidus* and sometimes considered conspecific, but differs in plumage and morphology; approaches *Z. vellaavella* in some characters (colours of mantle and bill). Monotypic.

Distribution. Gizo (Ghizo), in WC Solomon Is.



Descriptive notes. 11.5–12 cm. Has white eyering interrupted at front by black spot; forehead, supraloral region, lores and a streak half-way under eye black, merging into yellowish-olive of upperparts on forecrown (about one-third along head from base of bill); remiges and rectrices blackish-brown, edged yellowish-olive; entirely yellow below, flanks and side of breast washed greenish; iris reddish-brown; bill bright yellow; legs yellow. Sexes alike. Juvenile undescribed. **VOICE.** Series of loud upslurred notes, slow, unusual in its unvaryingly sweet and piercing notes (without hoarse or sharp ones), with some inserted sections reminiscent

of an *Acrocephalus* warbler, in so-called “telegraph” song; calls upslurs and downslurs, the first similar to those of Collared Kingfisher (*Todiramphus chloris*). Contact call a soft “pee-u”.

Habitat. Forest in gulleys, and other secondary growth.

Food and Feeding. No information.

Breeding. No information.

Movements. Not known.

Status and Conservation. **ENDANGERED.** Restricted-range species: present in Solomon Group EBA. Confined to the densely populated, virtually deforested, small (37 km²) island of Gizo, where fairly common. Its habitat is limited by demand for agricultural land. Remaining tall or old-growth forest on the island is very fragmented and now covers less than 1 km² in total extent. This species appears to have adapted well to scrub and secondary growth, and is found in reasonable numbers near Gizo town, but these surviving forest patches are also threatened by local cutting for timber use and by clearance for gardens.

Bibliography. Anon. (2007n), Buckingham *et al.* (1995), Butchart & Stattersfield (2004), Collar *et al.* (1994), Diamond (1998), Doughty *et al.* (1999), Dutson (2007b), Gibbs (1996b), Mayr (1945b, 1967), Mayr & Diamond (2001), Mees (1961, 1969), Stattersfield & Capper (2000).

44. Solomon White-eye

Zosterops kulambangrae

French: Zostérops des Salomon

German: Kulambangrabrillenvogel

Spanish: Antejitos de las Salomón

Other common names: Central Solomons/Rendova White-eye

Taxonomy. *Zosterops kulambangrae* Rothschild and E. J. O. Hartert, 1901, Kolombangra, Solomon Islands. Forms a superspecies with *Z. griseotinctus*, *Z. rennellianus*, *Z. vellalavella*, *Z. splendidus* and *Z. luteirostris*, and possibly *Z. murphyi*. Species has been listed as *Z. rendovae*, but original description now seen clearly to be based on specimens from San Cristobal, not Rendova, and thus applicable to a different species. Geographical variation rather well marked, including vocal differentiation; races possibly better treated as separate species. Three subspecies currently recognized.

Subspecies and Distribution.

Z. k. kulambangrae Rothschild & E. J. O. Hartert, 1901 – New Georgia Group (Kolombangra, Vonavona, Kolinggo, New Georgia, Vangunu and Ngatokae), in WC Solomon Is.

Z. k. paradoxus Mees, 1955 – Rendova, in S New Georgia Group.

Z. k. tetiparius Murphy, 1929 – Tetepare, in S New Georgia Group.

Descriptive notes. 11–12 cm. Nominate race has fairly narrow white eyering interrupted at front by black spot; feathers behind nostrils, broad loreal area and stripe under and continuing behind eye blackish; forehead slightly tinged fuscous, crown and upperparts yellowish-tinged greenish-olive; remiges and rectrices brownish-black, edged yellowish-olive; olive-yellow below, centre of belly and undertail-coverts yellow, flanks greenish; iris reddish-brown; bill black; legs straw-yellow. Sexes alike. Juvenile is paler on throat and belly and greener on breast and flanks than adult. Races differ mainly in extent of yellow and presence or absence of eyering, nominate being slightly greener, less yellow, above than others; *paradoxus* lacks white eyering but has bare skin instead, also narrower blackish loreal patch, yellowish-olive forehead, throat and breast, bright canary-yellow abdomen and undertail-coverts; *tetiparius* is very close to preceding race, but has whitish flanks and belly sharply contrasting against greenish breast, and sometimes traces of eyering present. Voice. Typical “telegraph” song of genus, various loud notes in slow fairly more or less uniform series; *tetiparius* has hoarse “chewy” notes, fast with narrow pitch span, thus almost identical to flight song of a distant Singing Parrot (*Geoffroyus heteroclitus*); song pitch of *paradoxus* higher, with various piercing and hoarse notes, whereas nominate has various sweet, piercing, chirping notes, both these songs reminiscent of Common Blackbird (*Turdus merula*). Calls include series of light “tsit” notes during foraging, loud “chirp” like that of a sparrow (*Passer*), and short musical “cheep-cheep”.



Habitat. Found in all habitats, and equally abundant in virgin jungle and (taller) secondary growth, from sea-level to 1350 m. Overlaps commonly with *Z. murphyi* at 950–1350 m.

Food and Feeding. No details of diet. Occurs in flocks, often associated in loosely organized parties of Solomon Flycatchers (*Myiagra ferrocyanæa*), monarchs (*Monarcha*), Cockerell’s Fantail (*Rhipidura cockerelli*) and Rufous Fantail (*Rhipidura rufifrons*). Forages at all heights.

Breeding. No information.

Movements. Sedentary.

Status and Conservation. Not globally threatened. Restricted-range species: present in Solomon Group EBA. Locally common to abundant. Very common in area of Munda, on New Georgia I. **Bibliography.** David & Gosselin (2002b), Diamond (1998, 2002), Doughty *et al.* (1999), Dutson (2007b), Hadden (1981), Mayr (1945b, 1967), Mayr & Diamond (2001), Mees (1957, 1961, 1969), Sibley (1951), Sibley & Monroe (1990).

45. Kolombangra Mountain White-eye

Zosterops murphyi

French: Zostérops de Murphy

German: Murphybrillenvogel

Spanish: Antejitos de Murphy

Other common names: Hermit/Murphy’s/Kulambangra White-eye

Taxonomy. *Zosterops murphyi* E. J. O. Hartert, 1929, Kolombangra, Solomon Islands.

Very large white-eye, morphologically extremely similar to and possibly very closely related to *Z. griseotinctus*; may belong to the superspecies formed by latter and *Z. rennellianus*, *Z. vellalavella*, *Z. splendidus*, *Z. luteirostris* and *Z. kulambangrae*. Monotypic.

Distribution. Kolombangra (New Georgia Group), in WC Solomon Is.



Descriptive notes. 13–14 cm. Has very broad white eyering interrupted at front by darker loreal line, lores pale greyish-yellow, faint dusky streak under eyering; rest of head and upperparts olive-green; remiges and rectrices brownish-black, edged olive-green; underside as upperparts but paler, more yellowish on middle of throat, middle of breast, abdomen and undertail-coverts; iris brown; bill black, yellowish base of lower mandible; legs grey. Sexes alike. Juvenile undescribed. Voice. Song a very long (up to 5 seconds) high-pitched warble, not broken into distinct syllables, of very sweet quality, sometimes penetrating; many notes sharp, reminiscent of sound made by dropping coin on to hard surface. Call a repeated sharp peeping note, or a descending whinny; single plaintive note from flock-members during foraging.

Habitat. Mossy cloudforest from 950 m (sometimes down to 660 m, even 350 m) to at least 1620 m; overlaps commonly with *Z. kulambangrae* at 950–1350 m.

Food and Feeding. Insects, small fruits. In large flocks of 100 and more individuals, often in company of lorikeets (Psittacidae) and myzomelas (*Myzomela*). Forages in canopy in tall forest, mainly above 5 m, but descending to 1 m in lower vegetation at summit of Kolombangra. Picks in fruits of 3 mm diameter; probes at flowers (*Eugenia*).

Breeding. One nest with two naked chicks in Oct, and birds with enlarged gonads in Oct–Nov. Nest a cup 5 cm deep and 5 cm across, woven from tiny dry twigs, placed 1.5 m up in bush 1.8 m tall, site at elevation of 1620 m.

Movements. Resident. Daily movements downslope in morning and back uphill in mid-afternoon.

Status and Conservation. Not globally threatened. Restricted-range species: present in Solomon Group EBA. Common. The most abundant bird species in mountains of Kolombangra.

Bibliography. Diamond (2002), Gibbs (1996a), Mayr (1945b, 1967), Mayr & Diamond (2001), Mees (1961, 1969), Murphy (1929), Snouckaert van Schauburg (1931), Stresemann (1931a).

46. Grey-throated White-eye

Zosterops rendovae

French: Zostérops à gorge grise

German: Graukehl-Brillenvogel

Spanish: Antejitos Gorgjigris

Other common names: Variable White-eye, Solomon Grey-throated White-eye

Taxonomy. *Zosterops rendovae* Tristram, 1882, Rendova; error = San Cristobal, Solomon Islands. Affinities unclear; probably an old endemic species of Solomon Is. Previously listed as *Z. ugiensis*, as present name was erroneously applied to *Z. kulambangrae*. Three subspecies recognized.

Subspecies and Distribution.

Z. r. hamlini Murphy, 1929 – Bougainville I, in NW Solomon Sea.

Z. r. oblitus E. J. O. Hartert, 1929 – Guadalcanal, in EC Solomon Is.

Z. r. rendovae Tristram, 1882 – San Cristobal, in SE Solomon Is.



Descriptive notes. 12.5 cm; male 15 g and female 15.8 g (*oblitus*), unsexed 19.1 g (nominate). Nominate race is dark olive or brownish-olive above, face and forehead washed with dark brown, primaries and rectrices blackish-brown with dark olive outer margins; throat and breast dirty white, more greyish at sides; abdomen and undertail-coverts almost pure satin-white, sometimes a trace of yellow on undertail-coverts; iris pale to dark orange-brown; bill blackish, whitish base of lower mandible; legs pale leaden grey. Sexes alike. Juvenile undescribed. Races differ mainly in presence or absence of eyering and in colour of

forehead, throat and undertail-coverts: *oblitus* has face and forehead olive-green as back, throat and breast more greyish than nominate, pale yellow undertail-coverts; *hamlini* has narrow white eyering (broken before and behind eye), forehead and face sooty brown, upper throat greenish-olive, lower throat, breast and flanks dark grey, middle of belly white, yellow undertail-coverts. Voice. Song a loud rambling musical warble of mellow whistles (these almost run together), varying in pitch. Call a loud downslurred mellow “peeu” (mellowness of which unique among Pacific members of genus); monotonous “peep...peep...peep...” heard from foraging parties, and once a whispered, almost growling “churewuwurwui” heard from a foraging group; sharp “tk tk tk tk...” when chasing one another.

Habitat. Forest, especially forest edge and secondary forest, but rarely in low bushes; in hills and mountains, less commonly in stunted upper montane forest, and rare or nomadic in lowlands. On Bougainville occurs in mountains at 900–1950 m, largely replacing *Z. metcalfei* at these elevations; rarely, as low as 500 m on Guadalcanal and San Cristobal. Locally associated with kandaka, a small second-growth tree.

Food and Feeding. Soft seedy fruit, mostly small seeds, and probably occasionally insects. Reported as being fond of the seeds of kandaka trees. Usually in flocks of 6–12 individuals; readily associates with *Z. metcalfei* where ranges overlap at lower elevations. Frequents middle level to canopy. Sometimes hover-gleans.

Breeding. Juvenile not long out of nest in Apr; birds with small to large gonads in Nov (nominate race), and all birds with enlarged gonads in Jul and Aug (*oblitus*). No other information.

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species: present in Solomon Group EBA. Common to abundant, especially in mistforest. The most abundant bird species of the Bougainville mountains at 1200–1950 m.

Bibliography. Bishop (1987), Cain & Galbraith (1956), Coates (1990), David & Gosselin (2002b), Diamond (1975a), Doughty *et al.* (1999), Dutson (2007b), Galbraith (1957), Hadden (1981, 2004), Mayr (1945b), Mayr & Diamond (2001), Mees (1961, 1969), Murphy (1929), Schodde (1977).

47. Malaita White-eye

Zosterops stresemanni

French: Zostérops de Malaita

German: Malaitabrillenvogel

Spanish: Antejitos de la Malaita

Taxonomy. *Zosterops stresemanni* Mayr, 1931, Malaita, Solomon Islands.

Affinities unclear. Monotypic.

Distribution. Malaita I, in E Solomon Is.



Descriptive notes. 13.5 cm; male 22.2 g, female 21.7 g. Has top and side of head and upperparts olive-green, very slight fuscous wash on crown; lores ash-grey, area around eye bare (but no eyering); flight-feathers and tail feathers blackish-brown, broadly margined pyrite-yellow; pale olive-green faintly barred yellow on throat, breast and flanks, becoming yellow on belly and undertail-coverts; iris light brown; upper mandible greyish, lower mandible dull orange with grey tip; legs greenish-grey. Sexes alike. Juvenile undescribed. Voice. Song very melodious, like that of a Thrush (*Turdidae*); single-note call, typical of genus.

Habitat. Gardens, scrub, primary forest, secondary growth; sea-level to 1100 m.

Food and Feeding. No information.

Breeding. No information.

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species: present in Solomon Group EBA. Rare on coastal plain and uncommon to fairly common inland around Auki in 1990s–2004. In mid-1940s was apparently common to abundant from sea-coast to mountains. The only white-eye on Malaita.

Bibliography. Cain (1954), Doughty *et al.* (1999), Mayr (1945b), Mayr & Diamond (2001), Mees (1961, 1969), Sibley & Monroe (1990), Snouckaert van Schauburg (1931).

48. Santa Cruz White-eye

Zosterops sanctaecrucis

French: Zostérops de Santa Cruz

German: Einfarb-Brillenvogel

Spanish: Antejitos de las Santa Cruz

Other common names: Nendo White-eye

Taxonomy. *Zosterops sanctaecrucis* Tristram, 1894, Santa Cruz Island.

Affinities unclear; suggested relationship to *Z. samoensis* seems unlikely due to morphological and ecological differences. A taxon resembling this species, but with slightly more slender bill and entirely yellowish-orange legs, was found in 1994 on nearby Vanikoro I; shortly to be described. Monotypic.

Distribution. Ndeni, in Santa Cruz Is (N of Vanuatu).



Descriptive notes. 12.5 cm. Plumage is generally dull olive above, with broad dusky area on lores and narrowly around eye; flight-feathers and tail feathers blackish-brown, broadly edged with rather bright olive; greenish-yellow below, yellowish towards centre of belly and vent; iris brown; bill black, yellow base; legs blue-grey. Differs from *Z. samoensis* in having e.g. dark iris, longer tarsus, much larger size, no white eyering. Sexes alike. Juvenile undescribed. **VOICE.** Song a rich melodic warble; subsong a stuttering series of short notes, e.g. "zhay-zhay-zhe..."; call a low-pitched nasal trill.

Habitat. Scrub, gardens, primary forest, forest edge, secondary growth.

Food and Feeding. No information.

Breeding. No relevant information.

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species: present in Vanuatu and Temotu EBA. Fairly common to common in 1994–2005.

Bibliography. Doughty *et al.* (1999), Dutton (2007b), Finsch (1901), Gibbs (1996a, 1996b), Mayr (1945b, 1967), Mees (1961, 1969), Murphy & Mathews (1929), Stresemann (1931a), Tristram (1894).

49. Samoan White-eye

Zosterops samoensis

French: Zostérops des Samoa

German: Samoabrillenvogel

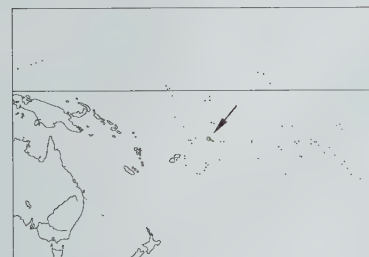
Spanish: Antejitos de Samoa

Other common names: Savaii/Savau White-eye

Taxonomy. *Zosterops samoensis* Murphy and Mathews, 1929, Savai'i, Samoa.

Suggested relationship to *Z. sanctaecrucis* seems unlikely on grounds of morphological and ecological differences. Monotypic.

Distribution. Island of Savai'i, in W Samoa.



Descriptive notes. 10–11 cm. Has narrow white eyering more or less broken at front, lores yellowish-green; including forehead, crown and upperparts dull citrine; flight-feathers and tail brownish-black, former broadly edged greenish; rectrices rather narrowly edged greenish; throat and undertail-coverts light yellow, breast and flanks pale yellowish-green, trace of buffish on flanks, centre of belly very pale yellowish (rather weak demarcation between upperside and underside); iris yellowish-white; bill brown above, yellow below; legs greyish or greenish. Differs from *Z. sanctaecrucis* in e.g. white eyering, pale iris, shorter

tarsus, much smaller size. Sexes alike. Juvenile undescribed. **VOICE.** No information.

Habitat. Upland forest above 900 m, occasionally down to 780 m; was recorded also in open scrub-like habitat after a cyclone in 1991.

Food and Feeding. No details of diet. Feeds in canopy of forest; sometimes in low bushes in more open scrub. Highly gregarious; travels in flocks of 10–20 individuals, occasionally more (up to 40).

Breeding. No information.

Movements. Not known.

Status and Conservation. **VULNERABLE.** Restricted-range species: present in Samoan Islands EBA. Uncommon. Total population fewer than 2500 individuals within global range of 520 km². Flocks of 15–20 birds seen in highlands in 1987, and again in 1991. Remaining areas of upland forest on Savai'i threatened by slash-and-burn cultivation, as forestry roads from heavily logged lowland forests provide access to formerly inaccessible land. Early introduction of predators may have had adverse effects on the species. The possible introduction of or colonization by *Z. japonicus* and *Z. lateralis* considered by some a potential threat, as these species have become established in rainforest on Hawaii and other Pacific islands. Occurs in Mount Silisili Park, an area of montane cloudforest in C part of the island.

Bibliography. Anon. (2007n), Baker (1951), Beichle & Baumann (2003), Bellingham & Davis (1988), Butchart & Stattersfield (2004), Collar *et al.* (1994), Evans *et al.* (1992), Mayr (1945b, 1967), Mees (1969), Murphy & Mathews (1929), duPont (1976), Pratt *et al.* (1987), Snouckaert van Schauburg (1931), Stattersfield & Capper (2000).

50. Fiji White-eye

Zosterops explorator

French: Zostérops des Fidji

German: Layardbrillenvogel

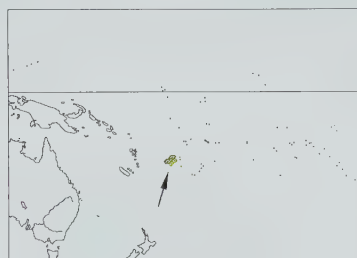
Spanish: Antejitos de Fiji

Other common names: Layard's White-eye

Taxonomy. *Zosterops explorator* E. L. Layard, 1875, Kandavu Island, Fiji. Affinities unclear; may form a superspecies with *Z. flavifrons*, *Z. minutus* and *Z. xanthochroa*. Monotypic.

Distribution. Fiji Is: Vanua Levu, Taveuni, Viti Levu, Ovalau and Kadavu.

Descriptive notes. 10–11 cm; 10.5 g. Has well-developed entire white eyering, blackish stripe from under lores continuing back under eyering; top of head and entire upperparts yellowish-olive, more



yellow on forehead and lores; remiges and rectrices brownish-black, edged yellowish-olive; chin, throat and breast lemon-yellow, undertail-coverts paler yellow, sides tawny-buff, remainder of underparts greyish-white, yellowish wash along middle; iris brown; bill black or brown above, horn-coloured below; legs grey. Sexes alike. Juvenile undescribed, but plumage of nestling only slightly paler than that of adult.

VOICE. Song a rambling series of unvarying notes. Call a high-pitched reedy "seeu-seeu" or "pleu", and squeaky "see"; also short "zick".

Habitat. Occurs in many habitats, especially forest (including hill forest) and plantations; has preference for inland habitats. Overlaps broadly with *Z. lateralis*, but there is little intermingling of the two species; latter is typical of open habitats and forest edge, whereas present species tends to be more common in heavily forested areas.

Food and Feeding. Insects recorded. Moves about in small parties of ten or more individuals; sometimes found in mixed flocks with *Z. lateralis*. Gleans foliage of small trees and shrubs. Visits cotton (*Gossypium*) fields to devour the minute insects that infest the cotton buds.

Breeding. Nestling in Nov. Nest reported typical of genus. Clutch 2 eggs, bluish-white. No other data.

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species: present in Fiji EBA. Common to fairly common.

Bibliography. Dunning (1993), Langham (1987), Layard (1876a, 1876b, 1876c), Mayr (1945b), Mees (1969), Mercer (1966), Murphy & Mathews (1929), Nehrkorn (1879), duPont (1976), Pratt *et al.* (1987), Watling (2001).

51. Yellow-fronted White-eye

Zosterops flavifrons

French: Zostérops à front jaune

German: Gelbstirn-Brillenvogel

Spanish: Antejitos Frentigualdo

Other common names: Vanuatu/Yellow White-eye

Taxonomy. *Muscicapa flavifrons* J. F. Gmelin, 1789, Tanna Island, Vanuatu.

Affinities obscure; may form a superspecies with *Z. explorator*, *Z. minutus* and *Z. xanthochroa*. Race *perplexus* sometimes synonymized with *macgillivrayi*, and *efatensis* with *gauensis*; further study needed. Seven subspecies currently recognized.

Subspecies and Distribution.

Z. f. perplexus Murphy & Mathews, 1929 – extreme N & NE Vanuatu from Banks Is (Vanua Lava, Mere Lava) S to Maéwo, Aoba, Pentecost, Ambrym, Paama, Lopévi, Épi, Tongoa and Émaé.

Z. f. gauensis Murphy & Mathews, 1929 – Santa Maria I (Gaua), in N Vanuatu.

Z. f. brevicauda Murphy & Mathews, 1929 – Espiritu Santo and Malo, in NW Vanuatu.

Z. f. macgillivrayi Sharpe, 1900 – Malakula, in NC Vanuatu.

Z. f. efatensis Mayr, 1937 – Nguna, Éfaté and Erromango, in SC Vanuatu.

Z. f. flavifrons (J. F. Gmelin, 1789) – Tanna, Aniwa and Futuna (Erronan), in S Vanuatu.

Z. f. majusculus Murphy & Mathews, 1929 – Anatom (Aneityum), in extreme S Vanuatu.



Descriptive notes. 11.5–12.5 cm; 10.9–11.9 g.

Nominate has yellowish forehead and supraloral region, broad white eyering interrupted at front by small dusky to blackish spot, blackish continuing onto lores and under eyering; crown and upperparts yellowish-olive, flight-feathers and tail blackish-brown, edged yellow-olive; chin, throat and underparts rich yellow, tinged olive on flanks; iris brown; upper mandible brown, lower mandible pinkish-brown; legs greyish. Sexes alike. Juvenile undescribed. Races vary little, mainly in brightness of plumage, amount of yellow on forehead, size, and relative tail length, nominate slightly larger and stronger-

billeted than others: *perplexus* has more greenish-tinged yellow underparts and darker upperparts than nominate, with virtually no yellow on forehead; *brevicauda* is like previous but with some yellow on forehead, and tail shorter than all others; *macgillivrayi* is distinctive, with no yellow on forehead, has yellow-olive throat and breast, much larger eyering, and on average slightly smaller than *perplexus*; *gauensis* is like nominate but smaller, with distinctly shorter and more brownish bill; *efatensis* doubtfully distinct from last, but perhaps with blackish bill; *majusculus* has little yellow on forehead, is a little duller green than others, otherwise mainly like *perplexus* but with slightly longer bill. **VOICE.** Pleasant, often repeated warbling song. Contact call a short, high-pitched "chip-chip" or "tzeep-tzeep".

Habitat. Primary forest, secondary forest, plantations, scrub, scattered bushes, trees, second growth and native gardens; apparently breeds in cotton fields locally (race *efatensis*). From sea-level upwards; may be more common in hill country than in lowlands. Co-occurs with *Z. lateralis* throughout its range; possibly favours less open country than that preferred by latter.

Food and Feeding. Arthropods, fruits, nectar, fruit seeds, probably also small buds. Insects include beetles (Coleoptera), also eggs and larvae, e.g. caterpillars; spiders (Araneae). Fruits especially of introduced *Lantana*, chilli (*Capsicum*) and soft, sweet wild figs (*Ficus*); ripe but uncollected papayas (*Carica*) are hollowed out. Moves about in sizeable groups; outside breeding season, gathers and wanders in often fairly large noisy flocks, sometimes with whistlers (*Pachycephala*), fantails (*Rhipidura*) and honeyeaters (Meliphagidae). Seen to feed on the ground in tall forest with scant undergrowth.

Breeding. Season Sept–Jan, sometimes to Mar; young just out of nest in Dec in NW (race *brevicauda*), and birds with enlarged gonads in Nov on Santa Maria I (*gauensis*) and in Mar and Jun in SC part of range (*efatensis*). Nest a neat cup 6 × 5.5 cm externally, made from fine grass, thin bark, shreds and spider webs, occasionally lined with few feathers and fine vegetable fibres, attached at rim to thin horizontal fork or two leaf stems 2.5 m or more above ground. Clutch 3 eggs, pale blue, 17.8 × 13.8 mm (race *perplexus*); incubation period 12–13 days; no information on nestling period.

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species: present in Vanuatu and Temotu EBA. Common and widespread; perhaps the most numerous bird species in Vanuatu. Occurs on almost all major islands, but not yet recorded on Uréparapara and Mota Lava (both in N Banks Is).

Bibliography. Bregulla (1992), David & Gosselin (2002b), Kleefisch (1971), Layard & Layard (1878), Mayr (1945b), Mayr & Diamond (2001), McCarthy (2006), Mees (1969), Murphy & Mathews (1929), Parker (1967), Scott (1946), Sibley & Monroe (1996), Stresemann (1931a), Tristram (1876).

53

ssp lateralis

52

ssp chloronotus

54

ssp vatensis

55

ssp nigrescens

56

57

ssp abyssinicus

58

ssp cinereus

60

ssp arabs

59

ssp ponapensis

ssp flavilateralis

ssp pallidus

61

ssp capensis

ssp senegalensis

ssp stenocricotus

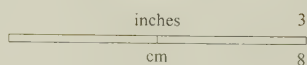
62

ssp jacksoni

ssp virens

63

PLATE 34

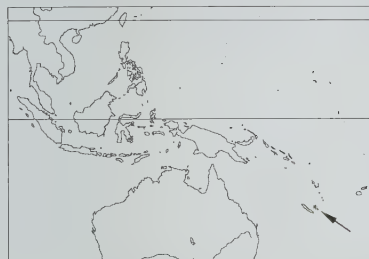


52. Small Lifou White-eye

*Zosterops minutus***French:** Zostérops minute **German:** Ameisenbrillenvogel **Spanish:** Antejitos Menudo

Taxonomy. *Zosterops minuta* E. L. Layard, 1878, Lifou, Loyalty Islands. Affinities unclear; may form a superspecies with *Z. explorator*, *Z. flavifrons* and *Z. xanthochroa*. Looks exactly like an intermediate between last two species. Monotypic.

Distribution. Lifou I, in C Loyalty Is.



Descriptive notes. 10–11 cm; male 8.9 g, female 7.6 g. Has forehead and supraloral region yellowish, lores and narrow streak below eye blackish-grey, broad white eyering narrowly interrupted at front by loreal streak; crown and upperparts bright olive-green, remiges and rectrices blackish, broadly margined with olive-green; throat, breast, middle of abdomen and undertail-coverts yellow, flanks pale buffish (in the field white side patches very conspicuous, giving impression of a white, instead of black, wing edge); iris drab; bill pale brown; legs grey-brown. Sexes alike. Juvenile undescribed. Voice. Call a mournful “tee-oo”, typical of genus.

Habitat. Forest edge, low shrubs, native villages and gardens.

Food and Feeding. Insects, in particular ants (Formicidae), also caterpillars, grubs, beetles (Coleoptera) etc.; also seeds, fruits. Fruits eaten said to be restricted to papaya (*Carica papaya*) and banyan (*Ficus*). Generally in small to larger flocks, numbering 4–25 and more individuals, occasionally mixed with others of genus. Forages at all levels, but mainly above 3 m.

Breeding. Breeds throughout greater part of year, but rarely from Feb to late May; probably several broods. Nest said to be typical of genus, but no details available; clutch 2–4 eggs. No other information.

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species: present in New Caledonia EBA. Very common on Lifou, where the most abundant of the three white-eye species present. Rather shy, as it suffers persecution by native people to some extent. Reportedly very destructive to fruits of all kinds, especially when moving in large flocks, although damage may be limited (as fruit-eating said also to be restricted to very few plant species).

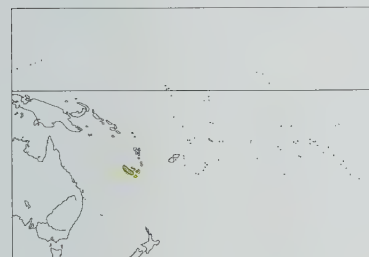
Bibliography. Bruce (1975), David & Gosselin (2002b), Doughty *et al.* (1999), Layard & Layard (1880), Mayr (1945b, 1967), Mees (1969), Sarasin (1913), Sibley & Monroe (1990), Stresemann (1931a), Tristram (1879), Warner (1947).

53. Green-backed White-eye

*Zosterops xanthochroa***French:** Zostérops à dos vert **German:** Waldbrillenvogel **Spanish:** Antejitos Dorsiverde
Other common names: New Caledonian White-eye

Taxonomy. *Zosterops xanthochroa* G. R. Gray, 1859, Nu, New Caledonia. Affinities unclear; may form a superspecies with *Z. explorator*, *Z. flavifrons* and *Z. minutus*. Monotypic.

Distribution. New Caledonia, including I of Pines (off SE coast), and S Loyalty Is (Maré).



Descriptive notes. 11.5–12.5 cm; 8.5–12 g. Has lores and streak under eye blackish-grey, fairly broad white eyering broken at front by loreal line; top and side of head and upperparts dark olive-green, remiges and rectrices blackish-brown, margined olive-green; throat and breast yellow, undertail-coverts and faint streak down centre of abdomen paler yellow, rest of underparts dirty white; iris light brown; bill dark slate, white base of lower mandible; legs pale greyish-slate. Sexes alike. Juvenile undescribed. Voice. Song a rapid jumbled warble of short warbles and whistles. Call a thin repeated “see”.

Habitat. Mainly primary forest, also native gardens and open glades; from lowlands into mountains, but less common above 1000 m. More or less replaced by *Z. lateralis* in brush and semi-open woodland.

Food and Feeding. Insects; fruits e.g. papaya (*Carica papaya*), and berries, especially those of introduced *Lantana*. Towards end of breeding season (Jan) begins to form flocks, these increasing in size in succeeding months. When fruits and berries ripen, flocks venture outside forest and associate with *Z. lateralis*, Fan-tailed Gerygone (*Gerygone flavolateralis*) and Red-throated Parrot-finches (*Erythrura psittacea*).

Breeding. Aug–Oct, perhaps to Jan or later; possibly double-brooded. Nest a beautiful structure of soft rootlets, hair, feathers, cobweb and similar, placed in branch fork in tree or shrub. Clutch 2–4 eggs, pure turquoise-blue, 16.5 × 13 mm. No other information.

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species: present in New Caledonia EBA. Common and widespread in New Caledonia, perhaps especially S part; common also on Maré I. Although consuming fruit, this species is believed not to cause much damage in native gardens.

Bibliography. David & Gosselin (2002a), Doughty *et al.* (1999), Layard & Layard (1882), Mayr (1945b, 1967), Mees (1969), Nehrkorn (1910), Ogilvie-Grant (1912), Sarasin (1913), Sibley & Monroe (1990), Warner (1947).

54. Silvereye

*Zosterops lateralis***French:** Zostérops à dos gris **German:** Graumantel-Brillenvogel **Spanish:** Antejitos Dorsigris

Other common names: Grey-backed/Grey-breasted/Western White-eye; Western Silvereye (*chloronotus*); Grey-backed Silvereye (“*halmaturinus*”); Grey-breasted Silvereye (*lateralis*); Capricorn Silvereye (*chlorocephalus*); Lord Howe (Island) White-eye (*tephroleptus*)

Taxonomy. *Sylvia lateralis* Latham, 1801, Port Jackson, New South Wales, Australia.

Member of a species group which includes also *Z. tenuirostris*, *Z. albogularis* and *Z. inornatus*. Australian races sometimes grouped into three separate species, differing in plumage characters, size and vocalizations; all mainland forms, however, intergrade through broad zones, and DNA–DNA analysis indicates that neighbouring races are each other’s closest relatives. Lord Howe race *tephroleptus* sometimes treated as a further separate species. In Australia, birds in W of range previously known as race *gouldi*, but *chloronotus* has priority and not preoccupied by “*chloronotus*”. Recent taxonomic review has led to several changes to the previously accepted arrangement: in E Australia, population in N Queensland (S to Mackay region) formerly known by name *ramsayi* (but type description based on intergrade specimens) and those from Mackay region S to E Victoria as *familiaris* (which appears to consist of two intergrading races), hence N populations of *ramsayi* now known as race *vegetus* and S populations along with most of *familiaris* replaced by name *cornwalli*; S populations of former *familiaris* now known as *westernensis*; S populations (CS South Australia E to SW New South Wales and W Victoria) formerly treated as race *halmaturinus*, but that name invalid (type material seems to represent intergrades between *chloronotus* and dull birds from SE South Australia), hence birds in E of that range described as new race *pinarochrous*; in addition, birds on King I (in Bass Strait), formerly included in nominate, considered to differ sufficiently to warrant racial separation, and thus described as new race *ochrochrous*; further research, including genetic analyses, required as a priority to enable better understanding of racial limits. Otherwise, proposed race *macmillani* (from Tanna, in S Vanuatu) is considered synonymous with *vatensis*. Sixteen subspecies currently recognized.

Subspecies and Distribution.

Z. l. chloronotus Gould, 1841 – SW & S Western Australia (S from Point Cloates and Shark Bay, and from Wongan Hills) E (S of Nullarbor Plain) to S South Australia.

Z. l. vegetus E. J. O. Hartert, 1899 – NE Queensland (E Cape York Peninsula) in NE Australia.

Z. l. cornwalli Mathews, 1912 – EC & SE Queensland and NE New South Wales.

Z. l. chlorocephalus A. J. Campbell & S. A. White, 1910 – Capricorn Group (notably Heron I) and Bunker Group, in S Great Barrier Reef, off SE Queensland.

Z. l. westernensis (Quoy & Gaimard, 1830) – SE New South Wales (from upper Lachlan R) S to E Victoria.

Z. l. pinarochrous Schodde & Mason, 1999 – SE South Australia, SW New South Wales and W Victoria.

Z. l. tephroleptus Gould, 1855 – Lord Howe I, off E Australia.

Z. l. ochrochrous Schodde & Mason, 1999 – King I (W Bass Strait).

Z. l. lateralis (Latham, 1801) – Flinders I (Furneaux Group, in E Bass Strait), Tasmania, Norfolk I, New Zealand (both main islands, all smaller adjacent islands) and Chatham Is; non-breeding also SE Australia.

Z. l. valuensis Murphy & Mathews, 1929 – Mota Lava, in E Banks Is (in extreme NE Vanuatu).

Z. l. tropicus Mees, 1969 – Torres Is, Banks Is (except Mota Lava) and NW Vanuatu (Malé, Espiritu Santo).

Z. l. vatensis Tristram, 1879 – C & S Vanuatu (Malakula, Ambrym, Paama, Lopévi, Épi, Émaé, Tongariki, Tongoa, Makura, Éfaté, Erromanga, Tanna, Aniwa).

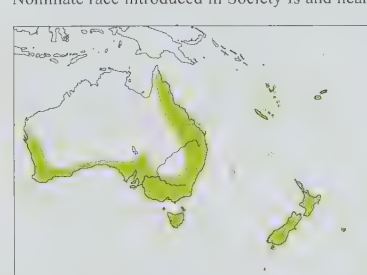
Z. l. griseonota G. R. Gray, 1859 – New Caledonia.

Z. l. nigrescens F. Sarasin, 1913 – Beaufort Bay, Ouvéa and Maré, in Loyalty Is.

Z. l. melanops G. R. Gray, 1860 – Lifou, in C Loyalty Is.

Z. l. flaviceps Peale, 1848 – Fiji Is (main islands and all adjacent smaller islands from Vanua Levu and Taveuni S to Viti Levu and Kadavu; also Koro, Gau and Moala).

Nominate race introduced in Society Is and nearby Tubuai Is, and on Lord Howe I.



Descriptive notes. 12 cm; 9.2–16.9 g. Male nominate race has broad white eyering broken at front by black loreal line, this continuing below eyering; top and side of head bright yellowish-green; upper back and scapulars grey, tinged yellowish-green, upperwing-coverts, lower back, rump and upperpart-coverts yellowish-green; remiges and rectrices brown, with yellowish-green on outer webs; pale greyish-white below, throat and undertail-coverts often tinged yellow, entire underside sometimes darkened (to distinct grey), sides and flanks chestnut-brown; underwing-coverts white; iris brown; bill yellowish-horn, blackish tip; legs

pale brown. Female is like male, but with colour of sides and flanks less intense, more pale cinnamon-brown. Immature resembles adult, but lacks white eyering. Races differ mainly in colour of back, throat and flanks, in wing formula (with migratory races having longest primary P2) and in size (larger on smaller islands): *chloronotus* is smallest, distinctive, has upperparts uniformly olive-green, throat olive-yellow, breast grey, flanks washed buff; *vegetus* is smaller than nominate, with throat and undertail-coverts citrine-yellow, tail relatively shorter than in other races; *cornwalli* has general appearance close to nominate, but with throat yellow, undertail-coverts lemon, flanks grey or buffish; *chlorocephalus* is similar to previous but very much larger, with throat duller, flanks greyer; *westernensis* is intermediate between *cornwalli* and *pinarochrous*; *pinarochrous* differs from last in somewhat duller head, paler and browner upperparts, greyish throat and undertail-coverts, grey breast, pale rufous flanks; *tephroleptus* closely resembles *cornwalli*, but differs in having more robust build, slightly heavier and longer bill, larger feet and claws, slightly paler yellow chin and throat, slightly richer yellow undertail-coverts; *ochrochrous* is shorter-billed than nominate, also on average paler below; *tropicus* is extremely similar to *tephroleptus*, but paler yellow on undertail-coverts, more slender bill; *valuensis* is similar to *tropicus*, but has whole upper back green (sometimes some admixed grey); *vatensis* is large, with much grey on back, much black below eye, and a tendency towards blackening of forehead and crown in S population; *griseonota* has rather greyish breast, inconspicuous brownish wash on flanks; *nigrescens* is intermediate between previous race and following one; *melanops* has rather grey back, most of breast distinctly grey, rather dark olive colours, differs from all others in having blackish on forehead and whole of forecrown; *flaviceps* is very similar to *griseonota* and *tropicus*. Voice. Song, surprisingly loud and

On following pages: 55. Slender-billed White-eye (*Zosterops tenuirostris*); 56. White-chested White-eye (*Zosterops albogularis*); 57. Large Lifou White-eye (*Zosterops inornatus*); 58. Dusky White-eye (*Zosterops finschii*); 59. Grey-brown White-eye (*Zosterops cinereus*); 60. Abyssinian White-eye (*Zosterops abyssinicus*); 61. Cape White-eye (*Zosterops pallidus*); 62. African Yellow White-eye (*Zosterops senegalensis*); 63. Pemba White-eye (*Zosterops vaughani*).

melodious, a rapid, loosely organized succession of high-pitched notes, trills, warbles and slurs; autumn subsong includes mimicry. Flocking call in flight a chirping “cli-cli-cli...”; other calls include rather plaintive “cree” or thin peevish “psee”, dry “rick”, and various alarm and other calls; in W Australia (race *chloronotus*) calls harsher, and flight note a staccato “chip chip”.

Habitat. Found in coastal/subcoastal Australia in most vegetation types so long as at least moderate vegetation cover present, thus from shrubland and heathland to rainforest and mangroves; although penetrates several hundred kilometres inland, not found in arid interior of Australia. In all types of settled habitat with tree cover; also in coastal shrubland and in native forest and subalpine scrub in New Zealand; in urban New Zealand becomes more abundant in areas with higher percentage of native plants. Native gardens and other open country and only rarely in true forest on New Caledonia and Loyalty Is. From sea-level to uplands. Commonly found from sea coast to mountains in Society Is (where introduced).

Food and Feeding. Insects, earthworms (Oligochaeta), spiders (Araneae); fruits and softer berries; nectar, and sepals of *Feijoa*. Also takes household foods provided at feeders. In forest, fruits of a number of trees and shrubs taken (e.g. *Rhagodia parabolica*, *Hymenanthera dentata*), mostly red and black in colour, but also ripe green fruits of *Persoonia*, *Brachyloma ericoides* and *Oxal benthamiana* in Australia (preferred any red fruit during experiments in captivity, but green fruits preferred if sugar concentration was increased); in New Zealand fruits of introduced strawberry tree (*Arbutus unedo*) and of strawberry dogwood (*Dendrobenthamia capitata*) and, in subalpine scrub, fruits of *Cupressoma*, *Hymenanthera* and others; favourite fruits in Vanuatu are the introduced *Lantana camara*, also chilli (*Capsicum*), soft sweet figs (*Ficus*) and papaya fruits (*Carica*). Many introduced plants provide nectar (e.g. *Rondeletia*) and other food items (e.g. the weed *Asparagus asparagoides*). Arthropods taken by race *chlorocephalus* on Heron I (S Great Barrier Reef) were mainly ants (Formicidae) and other small hymenopterans, small flies (Diptera), bugs (Hemiptera, including homopterans), larval lepidopterans, and spiders; almost all smaller than 5 mm. Young are fed with grubs, caterpillars, fruits (ripe figs), occasionally with adult insects and spiders. Forages in small groups of 2–8 individuals. Also in mixed flocks with whistlers (*Pachycephala*), thornbills (Acanthizidae), fantails (*Rhipidura*) and others, and seen in five of 105 mixed-species flocks studied in SE Australia, where 40% of the white-eyes seen were in these flocks; in a New Zealand study, present species was not found in 66% of 76 mixed flocks, but sometimes was the nuclear species leading flock direction; at times in small flocks with whistlers, monarch-flycatchers (Monarchidae) and other white-eye species in Vanuatu. In winter months, on Heron I, forages in flocks among low vegetation of *Messerschmidia*, *Scaevola*, *Wedelia*, in tall casuarinas (*Casuarina*), and in canopy of *Pisonia grandis*, the locally dominant tree; also visits fruiting trees, e.g. *Ficus* and *Pipturus*. When food scarce, eats fruit in orchards and vineyards. Also frequents birdtables, and takes items such as fat, fruit, sugar, honey, syrup, jam, bread. In New Zealand prevented from attending feeding stations by New Zealand Bellbirds (*Anthornis melanura*), and in many localities nectar-feeding from flowers may be limited by various honeyeaters (Meliphagidae). Prey taken mostly by gleaning and probing.

Breeding. Sept–Jan in Australia and Aug–Feb in New Zealand and Vanuatu; two or three broods, locally even up to five broods in a season. Pair-bond long term, mated partners remain together in winter flock; flock disintegration brought about as pairs leave to establish individual territories; first-year individuals form pairs while in flock. Nest a small cup 6.5 × 6 cm, strongly woven from fine grasses, fibres, fragments of moss, etc. and spider webs, attached at rim to twigs or foliage in hammock-like fashion, generally in outermost foliage at height of 1–9 m (occasionally to 14 m), usually in shrub, but other sites recorded include bracken-fern (*Pteridium*) and a clump of bamboo (nest 2 m above ground between two slender stems). Clutch 2–4 eggs, usually 3, delicate pale blue, average 17 × 13 mm; incubation by both parents, beginning with second egg, period 10–11 days; nestlings fed by both sexes, fledging period 9–13 days; first flocks, probably resulting from fusion of family parties and young of early broods, noted in mid-Feb in New Zealand (Auckland). Nests parasitized by Shining Bronze-cuckoo (*Chrysococcyx lucidus*).

Movements. Races on tropical islands more or less sedentary. Otherwise, some races nomadic and/or migratory, but details poorly understood; movements involve only parts of populations, also individuals migrate in some years and not in others. Some populations of nominate race leave Tasmania after breeding, dispersing N through coastal SE Australia N to SE Queensland; return to Tasmania in Aug–Oct. Ringing studies showed distances covered more than 300 km along E coast and between Tasmania and Australia, and as far N as near Murwillumbah (extreme NE New South Wales), 1600 km from Tasmania; breeders at Wollomombi (NE New South Wales) disappear in winter, and are replaced by Tasmanian birds. In SW Australia (e.g. Perth), movements of up to 100–300 km recorded, and small numbers have been observed while moving S along coast in summer; migratory individuals move through area N of Perth in Jun–Jul when nectar production high. On migration flocks gather in trees, and dash into air on next stage of journey. In Jun 1856, large flocks that appeared on Wellington coast in New Zealand may have represented beginning of the spread of this species throughout New Zealand (scattered records before that time, earliest in 1832); movements of thousands of individuals are now recorded in autumn–winter in New Zealand, mostly on South I and moving N, possibly into North I.

Status and Conservation. Not globally threatened. Common to abundant throughout most of range. Common and often very abundant in Australia; the only dominant native bird species (5.9–10.3 %) in Canberra suburbs, where 3.4–8.7 territories/10 ha recorded. Densities in Australian eucalypt (*Eucalyptus*) woodland 0.03–1.8 birds/ha, in heath 3–5 birds/ha; densities up to four times greater after breeding season. Common in Vanuatu, New Caledonia and Loyalty Is. Common generally throughout New Zealand, and locally one of the most abundant bird species, but curiously scarce as a breeder on many offshore islands. Great Barrier Reef race *chlorocephalus* has its largest population on Heron I (of only 16.8 ha in extent), where between 1967 and 1993 numbers fluctuated between 225 and 445 individuals; breeding densities of 6.4–11 pairs/ha recorded on the island. Race *rephroleptus* inhabits the small (17 km²) island of Lord Howe, where it is widespread; was earlier thought to be extinct, as there had been no reliable reports since 1914, but found again in 1963. Although this race has adapted to presence of introduced rats (*Rattus*), genetic swamping by nominate race would be a potential threat should the latter colonize the island (as it has Norfolk I); nevertheless, individuals of nominate race from Norfolk I and of race *westernensis* from New South Wales were released on Lord Howe in 1924–1936, but no traces of either are left. In 1930s, nominate race introduced from New Zealand to Society Is, including Tahiti (where it is now firmly established), and more recently to nearby Tubuai Is. In SW Australia, this species is beneficial to man as it is the most important avian predator of potato moth (*Phthorimaea operculella*) larvae; on the other hand, it is unfortunately also the most important disperser of the introduced *Asparagus asparagoides*, as it consumes the berries of this environmentally unwelcome plant and voids the seeds.

Bibliography. Barnett & Briskie (2007), Barrett *et al.* (2003), Bell (1980b), Berger (1972), Blakers *et al.* (1984), Brook & Kikkawa (1998), Bruce, M.D. (1975), Bruce, P.J. (1989), Bruce, P.J. & Kikkawa (1988), Catterall (1989), Catterall, Elgar & Kikkawa (1992), Catterall, Wyatt & Henderson (1982), Chan (1994a, 1994b, 1994c, 1995a, 1995b), Chan & Kikkawa (1997), Chan & Sutton (1993), Child (1984), Christidis & Boles (1994), Clegg, Degnan, Kikkawa *et al.* (2002), Clegg, Degnan, Moritz *et al.* (2002), Cleland (1911), Collar *et al.* (1994), David & Gosse (2002b), Day (1995), Dean (1990), Degnan (1993a, 1993b, 1999), Degnan & Moritz (1992), Degnan *et al.* (1999), Doughty *et al.* (1999), Falla *et al.* (1981), Fleming (1943), Ford (1987b), Forde (1986), Freeman (1999), French

(1996), Funnell & Munro (2007), Gibb (2000b), Giles & Lill (1999), Gray (1988), Harrison (1968a), Haywood & Green (2003), Henderson (1977), Higgins *et al.* (2006b), Hindwood (1940), Hutton (1991), Kikkawa (1962, 1963, 1968, 1970, 1973, 1976, 1977, 1980a, 1980b, 1987, 1997a, 1997b), Kikkawa & Catterall (1991), Kikkawa & Wilson (1983, 2002), Langham (1987), Layard & Layard (1878, 1882), Lenz (1990), Lever (1987), Marples (1944a, 1945), Mathews (1928), Matthiessen & Springett (1973), Mayr (1945b), McCarthy (2006), McFarland (1994b), McKean & Hindwood (1965), Mees (1969), Moon (1967), Munro, Funnell & Thomson (2006), Munro, Munro, Phillips & Wiltchko (1997), Munro, Munro, Phillips, Wiltchko & Wiltchko (1997), Murphy & Mathews (1929), Pizzey & Knight (1997), duPont (1976), Pratt *et al.* (1987), Puckey *et al.* (1996), Pyke & Recher (1988), Robertson & Kikkawa (1994), Rooke (1984), Rooke, Bradshaw & Langworthy (1983), Rooke, Bradshaw & Langworthy & Tom (1986), Schodde & Mason (1999), Scott, J.M. *et al.* (1986), Scott, W.E. (1946), Sharland (1929), Sibson (1993), Slater (1991, 1993), Stanley & Lill (2001a, 2001b), Stansbury (2001), Tarburton (1992), Taylor (1934), Watling (2001), Wilson & Kikkawa (1988), Wiltchko, R. *et al.* (1999), Wiltchko, W. & Wiltchko (2000), Wiltchko, W., Ford *et al.* (2007), Wiltchko, W., Munro *et al.* (1998, 2003), Wiltchko, W., Wiltchko & Munro (2000), Wiltchko, W., Wiltchko, Munro & Ford (1998).

55. Slender-billed White-eye

Zosterops tenuirostris

French: Zostérops à bec fin **German:** Dünnschnabel-Brillenvogel **Spanish:** Antojitos Picofino
Other common names: Norfolk (Island) White-eye

Taxonomy. *Zosterops tenuirostris* Gould, 1837, Murrumbidgee River; error = Norfolk Island. Member of a species group which includes also *Z. lateralis*, *Z. albogularis* and *Z. inornatus*. Closely related to first of those; extinct *Z. strenuus* (formerly occurring on Lord Howe I) sometimes treated as conspecific with present species. Monotypic.

Distribution. Norfolk I, E of Australia.



Descriptive notes. 13–15 cm; 16–18 g. Has black lores continuing under and behind medium-sized white eyering, latter interrupted at front by the black of lores; forehead, crown, neck and side of head olive-green; upperparts greyish-olive to buffy olive (not sharply demarcated against greenish neck and head), uppertail-coverts more greenish; flight-feathers and tail feathers brownish-black with greenish outer margins; throat and upper breast yellow, paler yellow lower breast and citron-yellow undertail-coverts, greyish-buff belly and flanks; iris bright to yellowish-brown; bill grey; legs light grey-blue or dirty flesh-

coloured. Sexes alike. Juvenile undescribed. **VOICE.** Song said to be similar to that of *Z. lateralis* but lower in pitch and more musical in quality. Contact call a short whistle, searching call a slowly repeated “kyeeeh” and alarm “ti-hi-hi-hi”; all calls similar to those of *Z. lateralis*, but generally lower, louder and somewhat less melodious.

Habitat. Forest, forest remnants and tall secondary growth.

Food and Feeding. Invertebrates; also vegetable matter, such as fruits of lemons (*Citrus limon*), loquat (*Eriobotrya japonica*) and guavas (*Psidium*), and nectar. Wanders in small groups of 3–20 individuals through lower stages of forest. Items obtained mostly by probing, less often by gleaning.

Breeding. Sept–Dec. Nest a cup-shaped structure composed of mosses, fibrous roots and grasses, lined with hair, suspended by rim from thin twigs up to 8 m (usually lower) above ground in low tree or scrub. Clutch 2–4 eggs, occasionally up to 6, reportedly pale blue, 19.5–21.5 × 13.5–16.3 mm. No other information.

Movements. Sedentary.

Status and Conservation. **ENDANGERED.** Restricted-range species: present in Norfolk Island EBA. Confined to small island of Norfolk, less than 35 km² in extent, where moderately abundant in its habitat, which is centred today on Norfolk Island National Park. Although certainly a forest-dwelling species, is able to survive in secondary growth, and can be found throughout the island except in denuded C & S parts. Interbreeding with *Z. lateralis* ceased ten years after latter’s arrival on the island at beginning of 20th century, and the two now maintain their own discrete populations. Current threats include forest clearance, and introduced black rats (*Rattus rattus*) and probably cats. **Bibliography.** Anon. (2007n), Burchart & Stattersfield (2004), Collar *et al.* (1994), Gill, F.B. (1970b), Hermes (1985), Higgins *et al.* (2006b), Hull (1910), Mathews (1928), McCarthy (2006), Mees (1969, 1970a), Ogilvie-Grant (1912), Schodde & Mason (1999), Schodde *et al.* (1983), Stattersfield & Capper (2000), Stresemann (1931a).

56. White-chested White-eye

Zosterops albogularis

French: Zostérops à poitrine blanche **German:** Norfolkbrillenvogel **Spanish:** Antojitos Pechiblanco
Other common names: Norfolk (Island)/White-throated White-eye

Taxonomy. *Zosterops albogularis* Gould, 1837, Murrumbidgee River; error = Norfolk Island. Member of a species group which includes also *Z. lateralis*, *Z. tenuirostris* and *Z. inornatus*. Closely related to first of those. Monotypic.

Distribution. Norfolk I, E of Australia.



Descriptive notes. 13–14 cm. Has lores and area below and behind white eyering blackish, eyering interrupted at front by the black of lores; cheek greenish or greyish, forehead, crown, side of head and uppertail-coverts olive-green, merging into greenish-tinged brownish-bronze remainder of upperparts; flight-feathers and tail feathers blackish-brown, edged olive-green; throat, upper breast and middle of belly white, flanks brown, undertail-coverts citron-yellow; iris brown; bill black above, grey below; legs greyish. Sexes alike. Juvenile undescribed. **VOICE.** Little known. Song said to be more musical than

those of congeners on island (*Z. lateralis*, *Z. tenuirostris*); one individual once heard to give (in apparent subsong) perfect imitations of two introduced and locally common *Turdus* thrushes.

Habitat. Forest; found in remnants of tall rainforest, usually undisturbed, occasionally in disturbed areas.

Food and Feeding. Small caterpillars or grubs; also fruit. Fruits include e.g. wild olive (*Olea africana*), these roundish and 6 mm in diameter, and swallowed whole. Forages by moving quietly in middle and upper levels of forest; down to 4–5 m above ground in smaller trees and shrubs. Gleans insect larvae from leaves and branches; probes in foliage and branches. Occurs together with *Z. lateralis* and *Z. tenuirostris*, and sometimes forages with them in same tree.

Breeding. Oct–Dec. Cup-shaped nest made from moss, grass and fibrous roots, lined with hair, suspended in fork of twig. Clutch 2 eggs, pale blue, 21–23.5 × 15–16.6 mm. No other information.

Movements. Sedentary.

Status and Conservation. CRITICALLY ENDANGERED. Restricted-range species: present in Norfolk Island EBA. CITES I. Confined to remoter forest of Norfolk Island National Park, in NW of the island, where last confirmed sighting dates from 1980. Is believed never to have been common. Current total population “officially” fewer than 50 individuals, and almost certainly fewer than 20, within global range of just 5 km². Although formal searches have failed to find any individuals of this species for almost three decades, there have been reported sightings scattered throughout this period, including four in 1978, one in 1979, one in 1981, one in 1987, two in 1991, four in 1994 and one in March 2000; last an unconfirmed report in 2005. Causes of decline are predation by introduced rats (*Rattus*) and cats, and possibly clearing of natural vegetation, invasion of exotic weeds and competition from *Z. lateralis*, which colonized the island at beginning of 20th century. Control of predators essential for this species to have any chance of survival, if it is not already extinct.

Bibliography. Anon. (1978d, 2007n), Butchart & Stattersfield (2004), Collar *et al.* (1994), Higgins *et al.* (2006b), Hinkelmann (1988), Mathews (1928), Mees (1969, 1970a), Rooke (1985), Schodde & Mason (1999), Sibley & Monroe (1990), Stattersfield & Capper (2000), Stresemann (1931a).

57. Large Lifou White-eye

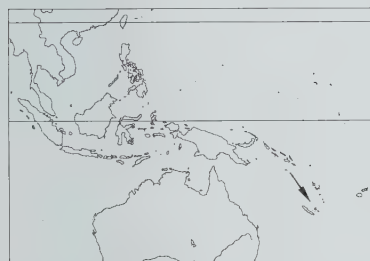
Zosterops inornatus

French: Zostérops de Lifou **German:** Lifubrillenvogel **Spanish:** Antejitos Sencillo

Taxonomy. *Zosterops inornata* E. L. Layard, 1878, Lifou, Loyalty Islands.

Member of a species group which includes also *Z. lateralis*, *Z. tenuirostris* and *Z. albogularis*. Related to and a derivative of first of those, possibly closest to its New Caledonian population (*griseonota*). Monotypic.

Distribution. Lifou I, in C Loyalty Is.



Descriptive notes. 15 cm; male 22.9–25.8 g, female 20–23.8 g. A large, plump, rather shy white-eye with slow, deliberate movements. Has eyering consisting of extremely small white feathers (invisible in field), pale grey lores and region below eye; olive-green above, mixed with grey on lower rump and uppertail-coverts, and dark olive-grey on back; remiges and rectrices brownish-black, edged olive-green; throat and breast lime-green, lower breast pale greyish, flanks buffish, centre of belly whitish or very pale yellow, undertail-coverts light yellow; iris dull or dark crimson; upper mandible black, lower mandible reddish-horn colour; legs yellowish-flesh. Differs from *Z. lateralis* mainly in reduced eyering, extent of greenish-yellow on breast, and bill and leg colours. Sexes alike. Juvenile undescribed. Voice. A low chatter, a chirp like that of a lost chick, and a less frequent low chuckling sound like that of a parrot (Psittacidae) are described as call notes; another call, or possibly song, described as a loud whistle resembling that of a whistler (*Pachycephala*).

Habitat. Primary forest and forest edge, where it prefers tall trees. May be found in low scrub at considerable distance from forest, and thus in almost any habitat on the island.

Food and Feeding. Stomachs contained a variety of fruits and berries, including figs (*Ficus*), pineapple (*Ananas comosus*), papaya (*Carica*), the blue berries of a vine, the hard seeds of a cane species, palm seeds; occasionally insects, molluscs. Forages in high trees, generally in pairs or flocks, sometimes associating with *Z. lateralis* and Striated Starling (*Aplonis striata*).

Breeding. Nov–Jan. Nest said to be like that of *Z. lateralis* but larger and thicker; clutch 2 eggs. No other information.

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species: present in New Caledonia EBA. Fairly numerous within its very small range.

Bibliography. Barré *et al.* (2006), Bruce (1975), David & Gosse (2002b), Doughty *et al.* (1999), Gadow (1884), Layard & Layard (1880), Mayr (1945b, 1967), Mees (1969), Sibley & Monroe (1990), Stresemann (1931a).

58. Dusky White-eye

Zosterops finschii

French: Zostérops de Finsch **German:** Palaubrillenvogel **Spanish:** Antejitos de Finsch
Other common names: Finsch's White-eye; Caroline/Grey White-eye (when treated as conspecific with *Z. cinereus*)

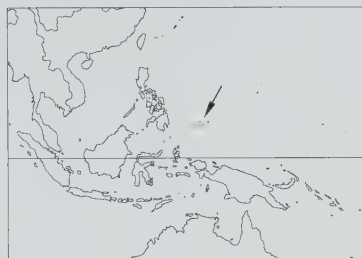
Taxonomy. *Tephros finschii* Hartlaub, 1868, Palau Islands.

Forms a superspecies with *Z. cinereus*; previously treated as conspecific, but differs in voice and behaviour. Monotypic.

Distribution. Palau Is on Babeldaob, Koror, Ngabad, Ngergoi (Garakayo) and Peleliu.

Descriptive notes. 10 cm. Plumage is almost pure sepia above, with head blacker, wing and tail browner, rump and uppertail-coverts somewhat paler and browner; lores dark, side of head and neck brownish (no white eyering); mostly brownish-grey below, chin and throat smoky grey, breast and abdomen more brown and less grey, side and flanks and undertail-coverts tawny-brown; iris reddish-brown; bill blackish-horn; legs grey. Sexes alike. Juvenile undescribed. Voice. Very noisy when in flocks; call notes “chee”, like that of *Z. semperi*, which co-occurs in Palau Is but louder and lower, and not so sweet; in flight and perched gives rollicking “chéé-che-che-ché”, resembling call of American Goldfinch (*Carduelis tristis*).

Habitat. Secondary bush, grassland, low bush of small islands; all kinds of vegetation, in addition to woodland. More in deep woodland compared with *Z. conspiciatus* of nearby Northern Mariana Is. Forages out along margins of woodlands, along roadsides, and in low trees near summits of hills.



species on all main islands (except Angaur). Very common in deep woodland, and outnumbering *Z. semperi*; less common on the smaller islands.

Bibliography. Baker (1948, 1951), Hartlaub & Finsch (1868, 1872), Marshall (1949), Mayr (1945b, 1967), Mees (1969), Owen (1977), Pratt, Bruner & Berrett (1987), Pratt, Engbring *et al.* (1980), Sibley & Monroe (1990).

59. Grey-brown White-eye

Zosterops cinereus

French: Zostérops cendré **German:** Kittlitzbrillenvogel **Spanish:** Antejitos Cenizo
Other common names: Kosrae White-eye (*cinereus*); Pohnpei White-eye (*ponapensis*); Caroline/Grey White-eye (when treated as conspecific with *Z. finschii*)

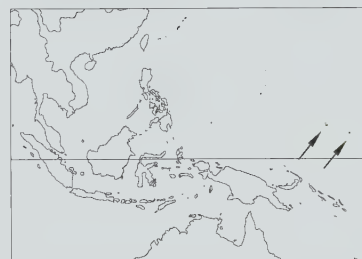
Taxonomy. *Drepanis cinerea* Kittlitz, 1832, Kosrae, Caroline Islands.

Forms a superspecies with *Z. finschii*; previously treated as conspecific, but differs in voice and behaviour. The two races are distinctive, and may well merit treatment as separate species. Two subspecies recognized.

Subspecies and Distribution.

Z. c. ponapensis Finsch, 1876 – Pohnpei, in EC Caroline Is.

Z. c. cinereus (Kittlitz, 1832) – Kosrae, in E Caroline Is.



Descriptive notes. 10–11 cm; one male 11.2 g (*ponapensis*). Nominat race is deep greyish-olive above, approaching mouse-grey on crown and upperwing-coverts; very narrow white eyering (often lacking); dirty pale or sepia below, flanks and side of breast somewhat darker than remainder, approaching colour of upperparts; iris reddish-brown; bill leaden, tip blackish; legs light brown to lead-coloured. Sexes alike. Juvenile has conspicuously yellow bill with dark tip of upper mandible, and darker plumage. Race *ponapensis* has upperparts more sepia, less grey, and forehead and underparts pale ash-grey, flanks brownish-buff. Voice.

Calls like those of a sparrow (*Passer*) and calls reminiscent of those of tits (*Paridae*) reported.

Habitat. Most vegetated habitats. On Pohnpei occurs at low altitudes in and around native gardens.

Food and Feeding. Small, large-seeded berries, seeds, also insects. Takes food items from twigs and leaves in bushes and small trees. Moves about often in noisy and quarrelsome flocks, sometimes in tops of tall trees; often solitary too, and small family groups sometimes accompany flocks of *Z. semperi*.

Breeding. Fledglings being fed by parents in Feb on Kosrae (nominat); eggs in Aug, fledgling just out of nest in Mar, on Pohnpei. Two nests found on Pohnpei, with outer layer of fine roots, fibres, leaves and petals, interwoven with cotton wool, inner layer of fibres of fine roots only, built on branch, not suspended. Clutch 1 egg, pale greenish-blue, 18.5 × 13.5 mm (Pohnpei).

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species: present in East Caroline Islands EBA. Common on both Pohnpei and Kosrae. May have declined on Pohnpei: encounter rates (individuals per hour) in Pohnpei forest above 200 m was 37.6 in 1983 and 7.2 in 1994 (81% decrease), while below 200 m was 60.9 in 1983 and 10.4 in 1994 (83% decrease).

Bibliography. Baker (1951), Buden (2000), David & Gosse (2002b), Finsch (1880), Kittlitz (1832), Kuroda (1933b), Marshall (1949), Mayr (1945b, 1967), Mees (1969), Owen (1977), Yamashina (1932).

60. Abyssinian White-eye

Zosterops abyssinicus

French: Zostérops à flancs jaunes **German:** Somalibrillenvogel **Spanish:** Antejitos Abisinio
Other common names: White-breasted/Yellow White-eye, Abyssinian (Yellow) White-eye; Kenya (Yellow) White-eye (*flavilaterialis*, *omoensis*)

Taxonomy. *Zosterops abyssinicus* Guérin-Méneville, 1843, Ethiopia.

Sometimes included in a superspecies with *Z. pallidus*, *Z. senegalensis* and *Z. poliogastrus*. Races believed by some authors to represent two separate species, nominate, *arabs*, *socotranus* and *jubaensis* forming one species and *omoensis* and *flavilaterialis* another. Six subspecies recognized.

Subspecies and Distribution.

Z. a. abyssinicus Guérin-Méneville, 1843 – NE Sudan (region of Erkowit), Eritrea and N & C Ethiopia.

Z. a. arabs Lorenz von Lübnau & Hellmayr 1901 – SW Saudi Arabia, Yemen and S Oman.

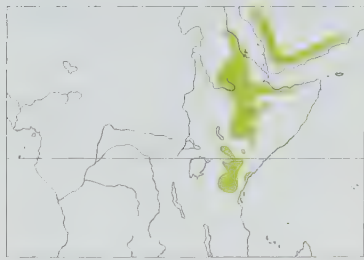
Z. a. socotranus Neumann, 1908 – N Somalia and Socotra I.

Z. a. omoensis Neumann, 1904 – W Ethiopia.

Z. a. jubaensis Erlanger, 1901 – S Ethiopia, N Kenya (S to Kulal) and S Somalia.

Z. a. flavilaterialis Reichenow, 1892 – E, C & S Kenya S to NE & E Tanzania.

Descriptive notes. 10.2 cm; 7.2–12 g. Nominat race has yellow supraloral stripe extending to yellow area above bill, narrow blackish-brown line from lores to below narrow white eyering; cheek flecked yellow; forehead to upperparts pale greyish-green, yellower on uppertail-coverts; flight-feathers and primary coverts dark brown, edged green to yellowish-green; tail dark brown, feathers narrowly edged yellowish-green; chin to throat and centre of upper breast pale yellow, lower breast and sides pale grey, belly and thighs greyish-white, undertail-coverts pale yellow; underwing and inner borders of flight-feathers whitish; iris light red-brown to brown; bill horn-



brown above, pinkish-brown below; legs brown or flesh-coloured. Sexes alike. Juvenile resembles adult; young fledgling has lax plumage, duller upperparts and underparts, darker (black) eyes and flight-feathers, pinkish bill, thick pale yellow gape. Race *arabs* is like nominate, but with fairly dark greyish-green upperparts; *socotranus* resembles nominate, but blackish bill, brighter yellow throat, darker grey sides and underparts; *omoensis* also is like nominate, but with pale yellowish-green upperparts, brighter yellow throat, and grey underparts tinged buff; *flavilateralis* has upperparts yellowish-green, is wholly pale

powdery canary-yellow below, washed greenish on sides and flanks, bill black, eyes grey-brown, legs blue-grey to blackish; *jubaensis* is like previous, but has greyish tinge on upperparts, duller underparts. **VOICE.** Sweet and lilting song of burry quality, like that of Afrotropical congeners. Buzzing and twittering call notes by foraging groups, also plaintive calls described as "teeyu", "tew" and "tyew-tip", and sharper sibilant "pseeyp"; race *arabs* occasionally gives fine purring call reminiscent of that of Snow Bunting (*Plectrophenax nivalis*), and short, deep low "waouw".

Habitat. Broadleaf woodland and thorn-woodland (e.g. *Adenium*, *Ziziphus* on Socotra), wooded mountain slopes and wadis, bushland, savanna, forest edge, copses and thickets; common in parks and gardens; in Somalia associated with olive trees (*Olea*), acacias (*Acacia*), euphorbias (*Euphorbia*), fruiting figs (*Ficus*) and junipers (*Juniperus*). Mainly from sea-level to 1800 m; between 300 m and 3100 m, usually at middle to higher altitudes, in Arabian Peninsula.

Food and Feeding. Aphids (Aphidoidea) and other small insects, including caterpillars 10–38 mm long; fruits. Nestling diet exclusively insects, mainly small moth larvae (Lepidoptera), on first and second day, but exclusively fruits after day 6. Forages at flowers, e.g. *Acanthus arboreus*, whereby forehead often dusted with pollen. Forages in flocks of 12–20 individuals, working through canopy of tall bushes.

Breeding. Mainly Feb–Jul, but towards end of year on Socotra I. Nest built by both sexes, a small open cup or hammock of fine bark strips, cemented with spider web and often decorated externally with spider cocoons, slung in twig fork or between parallel petioles 1–3 m up in bush or tree. Clutch 2–4 eggs, pale blue, 14 × 10 mm; incubation of eggs and feeding of chicks by both parents; incubation period 11 days, nestling period 14 days; fledglings dependent on parents for several days. Nests parasitized by Eastern Green-backed Honeyguide (*Prodotiscus zambeziac*). Breeding success low; many eggs and young taken by predators.

Movements. Mainly sedentary; in most of N Tanzania (race *flavilateralis*) moves out of forest-edge habitats in Oct–Nov, but present all year in and around Arusha.

Status and Conservation. Not globally threatened. Common throughout most of its range. Occurs in several protected areas, including Serengeti National Park, in Tanzania.

Bibliography. Archer & Godman (1961), Britton (1980), David & Gosselin (2002b), Erlanger (1901), Fry *et al.* (2000), Harvey (1993), Hailom *et al.* (1988), Jennings (1981), Kirwan (2007), Lewis & Pomeroy (1989), Meinertzhagen (1954), Neumann (1904), Pearson (1983), Reichenow (1892), Short *et al.* (1990), van Someren (1956).

61. Cape White-eye

Zosterops pallidus

French: Zostérops du Cap **German:** Kapbrillenvogel **Spanish:** Antojitos de El Cabo

Other common names: (African) Pale/Pallid/Cape-and-Green White-eye; Green White-eye (*virens*, *capensis*, *atmorii*); Orange River White-eye (*pallidus*, *sundevalli*); Pale White-eye (*pallidus*, *sundevalli*, *caniviridis*)

Taxonomy. *Zosterops pallida* Swainson, 1838, east of Prieska, Northern Cape, South Africa. Sometimes included in a superspecies with *Z. abyssinicus*, *Z. senegalensis*, *Z. vaughani* and *Z. polioastrus*. Races *capensis*, *virens* and *atmorii* formerly treated as representing a separate species, nominate and *sundevalli* (often united with *caniviridis*) together constituting another species. Races *atmorii* and *virens* interbreed in Eastern Cape Province. Six subspecies recognized.

Subspecies and Distribution.

Z. p. pallidus Swainson, 1838 – Namibia and W South Africa (W Northern Cape).

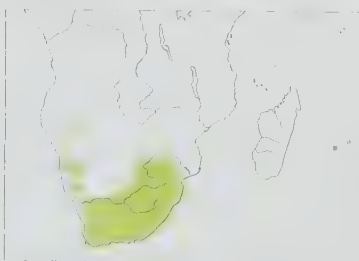
Z. p. capensis Sundevall, 1850 – SW South Africa (E to W Eastern Cape).

Z. p. caniviridis Clancey, 1962 – E & SE Botswana and adjacent N South Africa.

Z. p. sundevalli Hartlaub, 1865 – C South Africa (North West Province, E Northern Cape Province, Free State).

Z. p. virens Sundevall, 1850 – extreme SW Mozambique, E South Africa (S to Eastern Cape) and Swaziland.

Z. p. atmorii Sharpe, 1877 – Lesotho and adjacent South Africa (mainly W KwaZulu-Natal).



Descriptive notes. 10–13 cm; 8–20 g. Nominant race has yellow supraloral stripe extending over base of upper mandible (narrow yellow forehead band), narrow (1 mm) white eyering, blackish loreal line broadening around lower front margin of eyering; top of head and upperparts pale dull olive-green, upperwing-coverts edged pale yellow-green; flight-feathers, primary coverts and tail blackish-brown with narrow green edges; chin, throat and undertail-coverts pale yellow, narrow olive-grey band across upper breast, tawny-buff side of breast and flanks, white or buffish-white centre of breast to belly; underwing-coverts whitish; iris

dark brown or grey-brown; bill blackish-brown, greyer base of lower mandible; legs brownish-grey or blue-grey. Sexes similar. Immature is duller than adult, eyering develops at c. 5 weeks of age. Race *virens* is larger than nominate, with darker, brighter upperparts, darker, less yellow edges of wing feathers than nominate, yellow supraloral stripe continuous with yellow forehead, brighter yellow below, with olive-green breast, flanks and belly; *caniviridis* is like previous, but with lighter upperparts, yellower underparts, olive-green more restricted to breast side and flanks; *atmorii* also resembles *virens*, but yellow below restricted to chin, throat and undertail-coverts, with buffish-grey upper breast, sides and flanks, and whitish lower breast and belly; *capensis* is like preceding race, but darker and more olive above and darker grey on underparts, usually lacks yellow on forehead and supraloral line; *sundevalli* is slightly larger than nominate, with rather greener

upperparts. **VOICE.** Daytime song composed of short subdued twittering followed by louder subsong, including mimicry, which breaks into typical song (often given alone) of slightly burry warbles and whistles; dawn song shorter, lacks first part; song described also as longish jerky phrases of sweet reedy notes, varying in pitch, volume and tempo, usually starting with "tee tee" or "pirrup pirrup" notes before becoming jumble of "tee tippee twee yip yip twee...", often incorporating brief imitations of other birds' calls. Calls include sweet piping notes or slightly trilled "pee, prree" or "pirree" for contact in flocks, and "chip-chirrrr" and "chrrree" as alarm. Some geographical variation reported: nominate race and *sundevalli* have more muted, subdued songs, a little deeper in tone, less ringing and variable, more staccato, and lower-pitched contact calls.

Habitat. Wide variety of habitats in open hilly and coastal country with scattered stands of trees, acacia (*Acacia*) thickets, savanna, dune scrub, also riverine scrub and bush, parks, wooded gardens, tree-lined streets, exotic plantations e.g. eucalypts (*Eucalyptus*), pines (*Pinus*), oaks (*Quercus*), poplars (*Populus*), wattles (*Acacia*); also tall coastal to montane evergreen forest; favours native and alien willows (*Salix*), flower gardens with hedges, ornamental and fruit trees. Sea-level to 2770 m.

Food and Feeding. Nectar, fruits and other plant parts; arthropods (mainly insects). Nectar taken from aloes (*Aloe*), *Reyena*, *Scutia*, *Watsonia*, *Tecomaria*, *Poinsettia*, *Erythrina*, *Callistemon*, grevilleas; fruit pulp of e.g. oranges taken; small soft and hard fruits eaten entire, include figs (*Ficus*), *Kiggelaria*, olives (*Olea*), *Cotoneaster*, *Pyraecantha*, *Lantana*, *Schinus*, *Rhus*, apricots, peaches, mulberries, grapes, plums, pears, blackberries; fleshy flower petals consumed. Insects include aphids (Aphidoidea), scale insects (Coccoidea), flying termites (Isoptera), moths and caterpillars (Lepidoptera), katydids (Tettigoniidae), mantises (Mantodea), stick-insects (Phasmida) up to 5 cm long, beetles (Coleoptera); also honeydew; spiders (Araneae) and their eggs taken. Visits garden birdtables, taking sugar and jam. Aphids consumed in large quantities by systematic gleaning of infested bushes, trees etc.; flying insects taken in short hawking flights, other insects seized opportunistically. In pairs and small parties throughout year; also in large flocks of up to 100 individuals outside breeding season. Although mainly arboreal, sometimes comes to within 2 m of ground in low bushwood; sometimes even down to ground to pick up insects, and dropped items, to take juice or flesh from fallen fruits, or to ingest gastroliths (e.g. sand).

Breeding. Season generally Aug–Apr in SW of range, gradually shifting to Jun–Feb in NE. Often sings from same place throughout breeding season, starting at dawn; no fixed songposts recorded during dawn song, but singers typically perched 100–300 m apart in tall trees. Nest built in 5–10 days, a small, delicate but durable cup 3.7–4.5 cm in diameter and 4.1–5.1 cm deep, made from fine plant materials, lined with some feathers and plant down, and bound together and to twigs with spider cocoons, sometimes artificial materials (e.g. string, threads and doormat coir) used as materials; usually 1–6 m above ground and concealed in dense foliage in small shrub (*Erica*, *Metastasia*, *Salvia*, *Randia*) or tree, typical site at end of horizontal branch of leafy thin-branched sapling in shade of larger trees. Clutch usually 2–3 eggs, sometimes up to 4, white (*capensis* and *virens*) or pale blue to greenish-blue (other races), 16.8 × 12.3 mm; incubation by both sexes, period c. 10.5–12 days; chicks brooded and fed by both parents, nestling period 12–13 days; young often leave nest prematurely, able to fly at 10–12 days. Success moderate to fairly good, 50–57% of nestlings survive to fledging; main nest predators are Common Fiscal (*Lanius collaris*), Southern Boubou (*Laniarius ferrugineus*) and snakes of genus *Dispholidus*. Recorded longevity in ringing studies 7 years 11 months; estimated average annual mortality of adults 35%.

Movements. Usually sedentary. There may be some movement into arid interiors of Karoo and Namaqualand (W South Africa) during austral winter and some emigration in spring; ringing records show movements of up to 164 km.

Status and Conservation. Not globally threatened. Locally very common to scarce. Locally common in S Namibia, but scarce and irregular in much of N part of range. Very common in much of South Africa. In Botswana, very common locally (Gaborone) and common in Lobatse and Kanye. Locally common in S Mozambique.

Bibliography. Bannerman (1948), Broekhuysen & Winterbottom (1968), Brown, C.R. *et al.* (2001), Brown, K.J. & Downs (2003), Bunting (1985), Clancey (1966, 1967b, 1980b), Clancey & Winterbottom (1961), Cohen & Winter (1992), Colahan (1981), Craig & Hullely (1996), David & Gosselin (2002b), Dowsett (1985), Franke *et al.* (1998), Fry *et al.* (2000), Harrison *et al.* (1997), Hullely *et al.* (2004), Kopij (2004b), Lawson (1966), Lunt *et al.* (2004), Maclean (1993), McCarthy (2006), Moreau (1957b), Noll (1992), Porter (1975), Prys-Jones (1985), Rajimakers (1999), Schmidt (1955), Sinclair *et al.* (1993), Skead (1967), Skead & Ranger (1958), Symes, Downs & Brown (2001), Symes, Nicolson & McKechnie (2008), Tree (2002), Vincent (1949), Whitelaw (1985), Winterbottom (1955).

62. African Yellow White-eye

Zosterops senegalensis

French: Zostérops jaune **German:** Senegalbrillenvogel **Spanish:** Antojitos Senegalés

Other common names: Yellow White-eye; Jackson's White-eye (*jacksoni*)

Taxonomy. *Zosterops senegalensis* Bonaparte, 1850, Senegal.

Forms a superspecies and sometimes regarded as conspecific with *Z. vaughani*; both sometimes suggested as being part of a larger superspecies that includes also *Z. abyssinicus*, *Z. pallidus* and *Z. polioastrus*, or, more unlikely, a close relationship to race *kirkii* of *Z. maderaspatanus* proposed. Races *gerhardi* and *jacksoni* have in the past been included in *Z. polioastrus*; *jacksoni* sometimes considered a separate species. Race *stenocricotus* differs vocally from others and may merit full species status. Races intergrade widely, e.g. nominate intergrades with *demeryi*, *stenocricotus* and *stuhlmanni*, and *quanzue* with *kasaicus*, *heinrichi* and *andersoni*, etc. Described races *phylliscus* from W Cameroon (Tatum, in Bamenda Highlands) and *poensis* from Bioko I (in Gulf of Guinea) synonymized with *stenocricotus*. Fourteen subspecies recognized.

Subspecies and Distribution.

Z. s. senegalensis Bonaparte, 1850 – S Mauritania, Senegal and Guinea E to S Chad, Central African Republic (except SW), S Sudan, NW Ethiopia and N Eritrea.

Z. s. demeryi Büttikofer, 1890 – Sierra Leone, Liberia and Ivory Coast.

Z. s. stenocricotus Reichenow, 1892 – SE Nigeria, highlands of Cameroon and SW Central African Republic S to N Gabon; Bioko I (Fernando Póo).

Z. s. gerhardi van den Elzen & König, 1983 – S Sudan and NE Uganda.

Z. s. toroensis Reichenow, 1904 – NE DR Congo and W Uganda.

Z. s. reichenowi A. J. C. Dubois, 1911 – E DR Congo (highland forests W of L Kivu and NW of L Tanganyika).

Z. s. stuhlmanni Reichenow, 1892 – SC Uganda S to NW Tanzania.

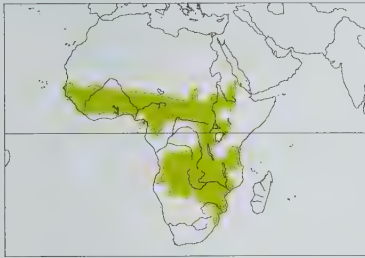
Z. s. jacksoni Neumann, 1899 – highlands of Kenya and N Tanzania (Loliondo).

Z. s. stierlingi Reichenow, 1899 – highlands of E Zambia, S & E Tanzania, Malawi and N & NW Mozambique.

Z. s. kasaicus Chapin, 1932 – C DR Congo S to NE Angola.

Z. s. heinrichi Meise, 1958 – NW Angola.

Z. s. quanzae Meyer de Schauensee, 1932 – C Angola.
Z. s. anderssoni Shelley, 1892 – savannas of SE Zaire, SW Tanzania, W Malawi and W Mozambique S to S & E Angola, N Namibia, N & NE Botswana, Zimbabwe plateau and N South Africa (E Limpopo lowveld).
Z. s. tongensis Roberts, 1931 – lowlands of SE Zimbabwe, S Mozambique and NE South Africa (NE KwaZulu-Natal).



Descriptive notes. 11·5 cm; 6·8–14·1 g. Nominate race has broad area of yellow on forehead and above eye, rather narrow white eyering, black on loreal area extending back under eyering; crown and upperparts greenish-yellow, yellow on rump and uppertail-coverts; flight-feathers and primary coverts dark brown, edged greenish to yellow-green; tail brown, narrowly fringed yellowish; check, throat and underparts bright yellow, more greenish on sides, flanks and often in diffuse band across breast (at times contrasting noticeably with yellow throat and belly); underwing-coverts creamy white; iris brown; bill dark horn to

blackish above, paler below; legs grey or blue-grey. Sexes alike. Immature is like adult, but paler below. Races differ mainly in plumage tone and pattern: *demeryi* is greener above than nominate, with narrower yellow forehead band and supraloral stripe, slightly paler below, breast side and flanks greenish; *stenocricotus* is more richly coloured than previous, has broader yellow forehead and supraloral stripe, darker green above and on body side below, contrasting with otherwise yellow underparts; *stuhmanni* is like *demeryi* but slightly larger, with slight brownish or cinnamon tinge on upperparts, has forehead and supraloral area yellower, breast side and flanks olive-green (contrasting less with yellow ventral parts than in preceding race); *gerhardi* is similar to last but lacks brownish tinge on upperparts; *toroensis* is smaller and paler than previous; *reichenowi* is large, dark green above with little yellow on forehead, mainly greenish below, with yellow confined to chin, throat and centre of belly; *jacksoni* is like *stenocricotus*, but eyering larger and better defined; *stierlingi* is similar to previous but smaller, with paler upperparts, less yellow on forehead, narrower supraloral stripe, and yellower below, with slightly less green on side; *kasaicus* is small, dull green above, with no yellow on forehead, olive-green flanks, narrow eyering; *heinrichi* is larger and slightly brighter than last, with yellow forehead; *quanzae* is rather large, with entirely green upperparts and side of head, olive-green breast and flanks, yellowish chin, throat and belly also tinged green; *anderssoni* is similar to nominate but larger, and with yellowish-green upperparts and side of head, and breast side tinged green; *tongensis* is like last, but slightly duller and greener above and duller yellow below, tinged more olive on side. **VOICE.** Song from top of tall forest tree, at and shortly after dawn (seldom continues for long after sunrise), a rising-and-falling series of 12–30 burred notes, often introduced by 4 or 5 clear slurred notes, “tree-turri weecu-teu, dzree-dzri-dzee chiri-tseeu-tseu zhee-zhee chew-chew-chew dzi-chew dzi-chew tze-zizi-chew”; described also as a melodious whistled warble like that of Willow Warbler (*Phylloscopus trochilus*), “tsee-tseer-tsi-tsi-tseer-tsee”, followed by pause before next phrase; other songs described are faster, almost a trill or chatter. Song in Cameroon highlands (race *stenocricotus*) very different, lacks burry quality of songs of other races. Song repeated frequently, sometimes in turn by two or more birds 100–150 m apart. Contact calls a soft piping and twittering, rather tinny; other calls include repeated rolling rasp, “sreep”, and a faster “sreep-sreep-sreep”.

Habitat. Wide variety of habitats, from woodland (*Isoberlinia*, *Brachystegia*, *Baikiaea*, *Uapaca*), open primary forest (not in interior), forest clearings, riverine bushes and wooded swamps, to thorn bushes, forest-grassland mosaic, acacia (*Acacia*) and savanna woodland, cultivated land, smallholdings, rural and urban gardens, parks, boulevards in towns, and plantations e.g. of flowering eucalypts (*Eucalyptus*). Generally avoids high forest and secondary forest. Mainly in highlands, above 1100 m; it extends to 3400 m in giant-heath (*Erica*) and moorland zones (except where *Z. polioastrus* present); in Ethiopia and in S of range found in lowlands.

Food and Feeding. Mainly small arthropods, e.g. aphids (Aphidoidea), small moths and many caterpillars (Lepidoptera), flies (Diptera) and termites (Isoptera); also nectar (of *Eucalyptus*, *Grevillea robusta*), juices, wild and cultivated fruits (e.g. *Ficus burtdavyi*, *Cussonia*, *Tetrorchidium*, grapes); occasionally small seeds. Forages in small loose parties of 4–10 individuals in forest, sometimes up to 50 individuals in farmland and towns; also a nuclear species in mixed flocks, e.g. where 17–20 % of flocks of race *anderssoni* in Zambia mixed with sunbirds (Nectariniidae), Brubrus (*Nilaus afer*) and sylviid warblers e.g. Green-capped Eremomela (*Eremomela scotops*). Keeps in dense foliage in upper half of trees.

Breeding. Probably mainly Sept–Oct in W, C & S parts of range, and Sept–Mar (occasionally to Jul) in E, but in many places breeding recorded throughout year and apparently dependent on local climatic patterns. Nest built by both sexes, taking c. 7 days, a small, compact but thinly constructed

cup made from fine plant material (grass strips, bark, chaffed grass, twiglets, etc.) bound with some spider web, and attached to supporting twiglets and live leaves with spider cocoons, or placed in vertical or horizontal fork of twig, well concealed 1–3·5 m from ground at tip of branch, near top and centre of dense shrub. Clutch 1–4 eggs, usually 2–3, immaculate white to bluish or bluish-green, average dimensions 15·3 × 11·7 mm; incubation by both sexes, period 11 days; chicks fed by both parents, nestling period 14 days. Nests parasitized by Klaas’s Cuckoo (*Chrysococcyx klaas*) and Eastern Green-backed Honeyguide (*Prodotiscus zambeziae*). Recorded longevity 5–7 years; average annual survival rate 34%.

Movements. Resident; may move locally during non-breeding period, e.g. reportedly more common in winter (especially Jul) in Zimbabwe.

Status and Conservation. Not globally threatened. Frequent to locally common, and generally widespread throughout range. Rather unevenly distributed in W Africa, where uncommon in some areas.

Bibliography. Bannerman (1948), Borrow & Demey (2001), Britton (1980), Chapin (1954), David & Gosselin (2002b), Dowsett (1985), Dowsett *et al.* (2008), Eisentraut (1973), Elgood (1982), Fry *et al.* (2000), Gatter (1997), Gore (1990), Grimes (1987), Harrison *et al.* (1997), Irwin (1981b), Kalinganire *et al.* (2001), Kunkel (1975), Louette (1981), Mackworth-Præd & Grant (1945a), Maclean (1993), McGregor *et al.* (2007), Neumann (1902), Reichenow (1892), Serle *et al.* (1977), Vernon (1985), Vincent (1949), White (1963), Williams & Arlott (1980), Winterbottom (1943), Wolff-Metternich & Stresemann (1956), Zimmerman *et al.* (1996).

63. Pemba White-eye

Zosterops vaughani

French: Zostérops de Pemba **German:** Pembabrillenvogel **Spanish:** Anteojitos de Pemba

Taxonomy. *Zosterops vaughani* Bannerman, 1924, Pemba Island.

Forms a superspecies with *Z. senegalensis* and sometimes regarded as conspecific, but differs in appearance and voice; both sometimes suggested as being part of a larger superspecies that includes also *Z. abyssinicus*, *Z. pallidus* and *Z. polioastrus*. Monotypic.

Distribution. Pemba I and adjacent coral islets, off NE Tanzania.



Descriptive notes. 10–10·5 cm. Has prominent black loreal spot and very narrow (c. 1 mm) and inconspicuous white eyering; broad yellow on forehead, extending to above lores and eye, merging into greenish on crown; upperparts yellowish-green; flight-feathers blackish-brown, narrowly edged yellowish, tertials brown with greenish-yellow edges; alula blackish-brown, inner webs tinged green, primary coverts brown, tinged green; tail blackish-brown, outer webs narrowly edged greenish towards base, central pair of feathers yellowish-green; yellow below, washed greenish-olive on sides and flanks, pale yellow axillaries,

yellow-tinged whitish underwing-coverts; iris dark brown to blackish; bill black, blue-grey base of lower mandible; legs blackish or slate-grey. Sexes alike. Immature is like adult. **VOICE.** Song high-pitched and sweet, “seweet-sureteet-trwerila-eeta-eet” or “weet, su-weet-see-sur-seeiwee-see”, first note distinct, others often run together, the whole lasting 5–8 seconds; shorter but fuller than that of *Z. senegalensis*. Low liquid twittering trill 0·5 seconds long also given.

Habitat. Woody vegetation: mangrove forest, bushland, thickets on coral rag (rubbly limestone of ancient coral reef material), copses and hedges in grassland, clove (*Syzygium aromaticum*) plantations, gardens. Highest frequencies in coral-rag scrub.

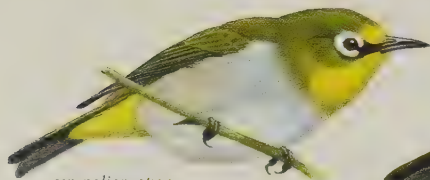
Food and Feeding. Mainly fruits and berries of *Margaritaria discoidea*, *Antidesma venosum*; particularly fond of fruits of wild mulberry (*Morus nigra*), flowerbuds of chillies (*Capsicum*), seeds of *Tacca leontopetaloides*, and soft seeds. Also insects. Forages in pairs and in groups of up to 20 or more individuals. Searches in foliage.

Breeding. Aug–Mar, mainly Oct–Dec. Nest a small open cup of fine grass or palm fibres, placed 1–3 m above ground in branches of shrub or small tree, often in young clove tree. Clutch 2 eggs, pale blue. No other information.

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species: present in Pemba EBA. Abundant; one of the commonest bird species throughout its tiny range, including on coral islets.

Bibliography. Catry *et al.* (2000), Collar *et al.* (1994), Fry *et al.* (2000), Mackworth-Præd & Grant (1945a), Pakenham (1979), Sibley & Monroe (1990), Vaughan (1930), Zimmerman *et al.* (1996).

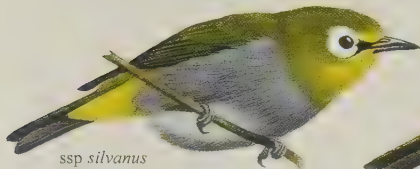
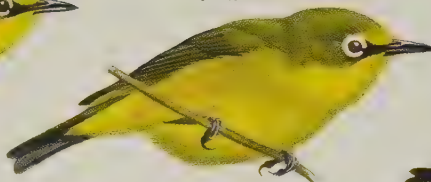


ssp poliogastrus



ssp winifredae

ssp kaffensis



ssp silvanus



ssp kulalensis

brown-backed morph



brown morph

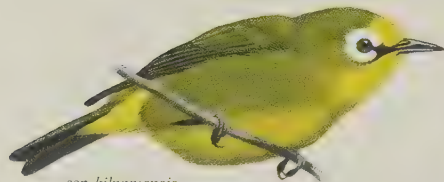


ssp borbonicus

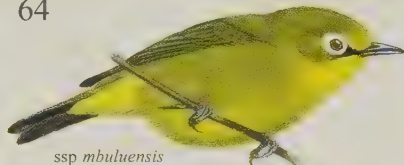
grey morph



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ssp kikuyuensis



ssp mbuluensis

65

ssp euryricotus

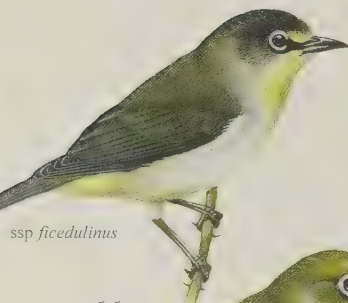


ssp mauritianus

ssp maderaspatanus



ssp anjuanensis



ssp ficedulinus

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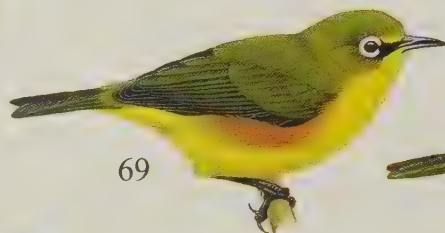
ssp feae

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ssp aldabrensis

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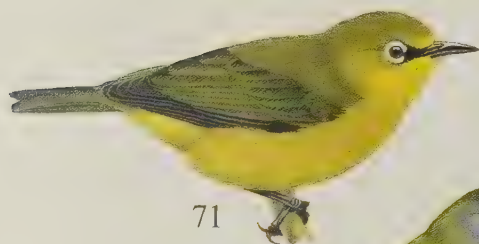
ssp kirki



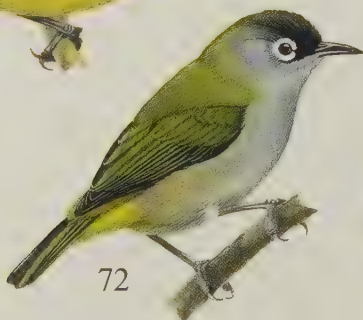
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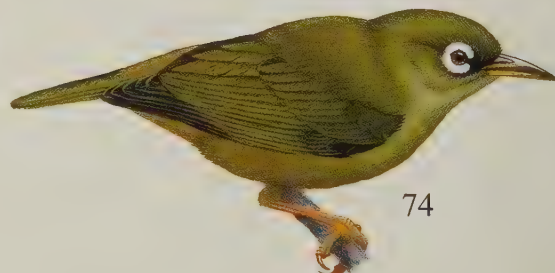
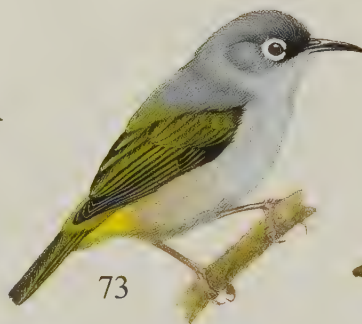
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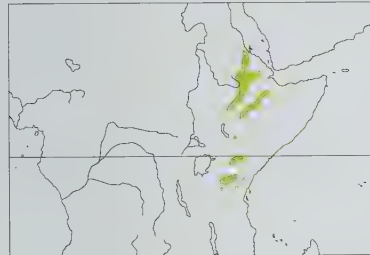
64. African Montane White-eye
Zosterops poliogastrus

French: Zostérops alticole **German:** Heuglinbrillenvogel **Spanish:** Antejitos Serrano
Other common names: Broad-ringed White-eye, Heuglin's/Highland/(African) Mountain White-eye; Kikuyu White-eye (*kikuyuensis*); Kula White-eye (*kulalensis*); Mbulu White-eye (*mbuluensis*); South Pare White-eye (*winifredae*); Taïta/Teita White-eye (*silvanus*)

Taxonomy. *Zosterops poliogastra* Heuglin, 1861, highlands of Ethiopia. Sometimes thought to form a superspecies with *Z. abyssinicus*, *Z. pallidus*, *Z. senegalensis* and *Z. vaughani*. Races *gerhardi* and *jacksoni* of *Z. senegalensis* have at times been included in present species, but seem closer to former species. Geographical variation quite well marked; each of the races *silvanus*, *kikuyuensis*, *eurycritotus*, *kulalensis*, *winifredae* and *mbuluensis* has been considered to be a full species. Eight subspecies recognized.

Subspecies and Distribution.

Z. p. poliogastrus Heuglin, 1861 – Eritrea, and Ethiopian Highlands (except W, SW) S to Addis Ababa (also Yavello) and E to Harar; and locally in mountains of SE Sudan (Imatong, Dongotona, Didinga).
Z. p. kaffensis Neumann, 1902 – W & SW Ethiopia.
Z. p. kulalensis J. G. Williams, 1948 – Mt Kulal, in N Kenya.
Z. p. kikuyuensis Sharpe, 1891 – C Kenyan Highlands from Meru district, Mt Kenya and Aberdare Mts S to Nairobi.
Z. p. eurycritotus G. A. Fischer & Reichenow, 1884 – N Tanzania (Mt Kilimanjaro region, Arusha, Mt Meru, Essimingo, Lössogono, Lolikissale).
Z. p. mbuluensis W. L. Sclater & Moreau, 1935 – S Kenya (Namanga Hill and Chyulu Hills) and N Tanzania (from Mt Hanang, Mbulu and Crater Highlands, Mt Ketumbeine and Longido E to N Pare Mts).
Z. p. silvanus J. L. Peters & Loveridge, 1935 – Mt Kasigau and Teita Hills, in SE Kenya.
Z. p. winifredae W. L. Sclater, 1934 – S Pare Mts, in NE Tanzania.



Descriptive notes. 11.5–12 cm, 11–11.3 cm (*silvanus*); 9–14 g. Nominate race has distinct yellow forehead and forehead extending to between eyes, white eyering 1–2 mm wide, narrow black line through lores and lower front edge of eyering; crown and upperparts green; flight-feathers and primary coverts blackish-brown, edged green to yellowish-green, tail dark brown with narrow green outer edges; chin and throat yellow, breast side and band across upper breast pale grey, flanks greyish-buff, centre of breast and belly white, sometimes tinged yellow, thighs and undertail-coverts yellow; axillaries pale yellow, underwing-coverts white

with yellow tinge; iris brown or hazel; bill black; legs slate to pale grey. Differs from *Z. abyssinicus* mainly in larger size, darker plumage, more yellow on forehead. Sexes alike. Immature resembles adult. Race *kikuyuensis* is rich green above, with very broad (3 mm) eyering, very broad and well-defined golden-yellow forehead band (to above lores and eyes), has centre of breast to undertail yellow, breast side and flanks dark green; *kaffensis* is like previous but with forehead as nominate, much narrower eyering (1–2 mm); *kulalensis* has relatively narrow eyering margined with black below and on lores, distinct yellow forehead, dark grey sides and flanks contrast with limited greenish-yellow of throat and upper breast, pale yellowish-white mid-ventral streak from breast to yellow vent, female only faintly yellowish-white on belly and paler grey on sides and flanks than male; *mbuluensis* has yellow forehead narrower and not sharply defined, merging with yellow-green of crown, eyering somewhat narrow (2 mm), golden-yellow below, paler green on sides; *eurycritotus* has very broad eyering, no yellow on forehead, mostly dark greenish below, some yellow on throat, yellow undertail-coverts; *winifredae* is smaller than preceding races, grey-bellied and similar to *kulalensis*, but darker above, forehead less yellow, darker and more blue-grey sides, mid-ventral stripe greyish-white, yellow undertail-coverts tinged green; *silvanus* is rather small, with very broad (4 mm) eyering but yellow restricted to supraloral band, belly grey. **Voice.** Song in C Kenya (race *kikuyuensis*) described as “three zhee zhee zhee zhee zhee zhee zhee”, in SE Kenya (*silvanus*) as a slow warbling “see tee tee tee, tee see tee see-chew...”. Typical buzzing and twittering calls from moving flock. Distinctive foraging calls include clear, slightly querulous but not buzzing “kweer-a-ree-ree” or “tree-tree, ter-ree-tee” or “kwerakwee-kwee-kwee”; foraging call in C Kenya (*kikuyuensis*) “whii-tu-tu-her-tu” or “whii-tew”.

Habitat. Highland forest, forest edge, bamboo and wooded gardens, *Euphorbia* and olive trees (*Olea*), eucalypt (*Eucalyptus*) and conifer woods; in NE Tanzania, race *winifredae* is found in the heath (*Erica*) vegetation at forest edge and in interior light gaps, but also in low (1 m) *Erica*. Found at 1380–3400 m, mostly above 1500 m. In dry season Mt Kulal race (*kulalensis*) found only in montane forest, where more abundant in glades than in closed-canopy forest; in wet season in forest and drier bush at lower altitudes, preferring young tree formations with thicker vegetation, and thus less restricted to mature forest than was previously thought.

Food and Feeding. Small berries, pieces of figs (*Ficus*), papaw (*Carica*) pulp; also invertebrates, especially aphids (Aphidoidea); also nectar (of exotic *Grevillea robusta*). Race *kulalensis* mainly frugivorous in dry season, insectivorous in wet season. Nestling diet small spiders (Araneae) and tiny caterpillars. In flocks of up to 30 individuals; *kulalensis* in larger flocks (up to 50 birds) in dry season, but in wet season flocks larger in morning and late afternoon.

Breeding. Nov–Apr in Sudan, Apr–Dec (mainly Apr) in Ethiopia, and Feb–Jun (mainly Apr–May) in E Africa; double-brooded in long season. No apparent territoriality; two nests may be close together. Nest built by both sexes, taking 7–10 days, a small cup 4.5 cm in diameter and 3.5 cm deep, neat inside, made of beard lichen (*Usnea*), moss, fine fibres and spider web, sometimes decorated externally with green moss and spider cocoons, slung between two stems, arms of a fork etc. in bush or tree, protected from rain and sun by overhanging foliage. Clutch 2–3 eggs, blue or white, 17–18 × 12 mm; incubation by both sexes, no information on duration; nestling period 15 days.

Movements. Mainly sedentary. In N Kenya, race *kulalensis* descends in dry season from montane habitat (1675 ha) on top of Mt Kulal to forest and drier shrub (7100 ha) at lower altitudes.

Status and Conservation. Not globally threatened. Locally common to rare. Race *silvanus* (sometimes treated as full species) previously considered Critically Endangered, subsequently downgraded to Endangered; a restricted-range taxon, present in Kenyan Mountains EBA. Following a study of this race in 1998–1999, population estimated at 7100 individuals; occurs in and adjacent to tiny areas (less than 3 km²) of forest remaining on Teita Hills and similarly small area on nearby Mt Kasigau, its main stronghold (very high density of 26 birds/ha, 80% of total population), but no interchange found between the hills and Mt Kasigau; despite abundance and capability of foraging far from forested areas, at risk because of further degradation of the core area. Race *kulalensis* (sometimes treated as full species) is Vulnerable; a restricted-range taxon, present in Mount Kulal Secondary Area; on Mt Kulal was abundant by 1980 in the 40 km² of forest, heavily penetrated and degraded by herds of cattle; population estimated at 10,000 individuals in Nov 1997. Race *winifredae* (sometimes treated as full species) is Vulnerable; a restricted-range taxon, present in Tanzania-Malawi Mountains EBA; in Oct–Nov 1992 was fairly common, with total of several thousands of individuals in four reserves, namely the Chombe Catchment Forest Reserve (143 km²), Mwala Forest Reserve (14 km²), and Kwizu and Chambogo Catchment Forest Reserves (combined 80 km²); these forests are under human pressure. Otherwise, race *kikuyuensis* is very common in the forests around Nairobi, on the Aberdares, and on Mt Kenya, and elsewhere local.

Bibliography. Barnes & Brooks (1997), Borghesio & Laiolo (2004), Borghesio & Ndag'ang'a (1999), Britton (1980), Butchart & Stattersfield (2004), Collar & Stuart (1985, 1988), Collar *et al.* (1994), David & Gosselin (2002a, 2002b), Diamond & Keith (1980), Fry *et al.* (2000), Heuglin (1861), Kalinganire *et al.* (2001), Lewis & Pomeroy (1989), Mackworth-Præd & Grant (1945a, 1945b, 1946), Mulwa *et al.* (2007), Nikolaus (1987), Pearson (1983), van Someren (1956), Stattersfield & Capper (2000), Williams & Arlott (1980), Zimmerman *et al.* (1996).

65. Mascarene White-eye
Zosterops borbonicus

French: Zostérops des Mascareignes **Spanish:** Antejitos de las Mascareñas
German: Maskarenenbrillenvogel
Other common names: Bourbon White-eye, (Réunion/Mascarene) Grey White-eye; Mauritius Grey White-eye (*mauritanus*)

Taxonomy. *Motacilla borbonica* J. F. Gmelin, 1789, Bourbon and Madagascar; error = Île Bourbon (Réunion).

Race *mauritanus* sometimes considered to represent a separate species. Very variable in overall colour, and nominate race polymorphic and with partly clinal variation. Two additional races described from Réunion, *alopekion* (Cilaos) and *xerophilus* (Étang Salé les Bains), appear to be colour morphs of nominate. Two subspecies recognized.

Subspecies and Distribution.

Z. b. borbonicus (J. F. Gmelin, 1789) – Réunion.
Z. b. mauritanus (J. F. Gmelin, 1789) – Mauritius.



Descriptive notes. 10.7–11.4 cm; male 8.2 g, female 7.9 g. Distinctive white-eye with white rump, no eyering; the only white-eye that characteristically cocks the tail. Nominate race has crown, back and upperwing-coverts slaty grey or brownish, rump and uppertail-coverts white; lores dusky, variable narrow whitish line above, ear-coverts lighter ashy than back; flight-feathers blackish, narrowly edged slaty, a little more hoary on primaries, tail feathers blackish, edged grey on outer webs, edged whitish on inner webs; cheek and chin hoary white, throat to breast ashy grey, abdomen whitish with slight ashy tinge, body sides and

flanks ashy grey, thighs and vent white with slight ashy tinge, underwing-coverts and axillaries white; obvious pale stripe running down sides of puffed-out breast and flanks (gives unusual “epaulette” effect); iris bright hazel to chestnut or dull brown; bill dull lead-colour, base of lower mandible paler; legs dull lead. Nominate race polymorphic: brown-backed with grey head in N & E, grey-headed with brown nape in S, and brown-headed and brown-backed in W & C parts of island; and others, with grey back and grey head, which rarely occur below 700 m but increase to 65–100% of population above 1300 m in N & E, and rarely below 1200 m in W; within and between each morph a complete range of colours, but with low proportion of intermediates; apart from plumage differences, morphs differ slightly also in weight and bill length (often related to sex and altitude), and grey morphs slightly larger than brown morphs, also other biometric differences recorded. Distinguished from sympatric *Z. olivaceus* and *Z. chloronothos* mainly by paler appearance, much greyer (not olive-green) plumage, and white rump. Sexes identical. Juvenile is like adult, but young fledgling has yellow gape. Race *mauritanus* has delicate bluish-grey upperparts, white cheeks, throat and underparts, slightly tinged with grey on forehead and breast, and washed rusty on side of body and flanks. **Voice.** Song on Réunion (nominate race) an elaborate loud warble; also an assemblage of sweet warbled phrases, “chip” notes, sputters and squeaks reminiscent of a catbird (*Dumetella*). Song on Mauritius (*mauritanus*) a whistled warbling. Calls include “plee plee plee” as contact; also varied “chee chee chee”, plaintive “eeee” or double “eeee-eee” (on Réunion), and soft inflected, slightly warbled “p-tree” or “p-tee” (on Mauritius).

Habitat. Scrub-forest, highland heath, evergreen forest, pine (*Pinus*) and casuarina (*Casuarina*) forest, gardens, natural forest at higher altitudes; also seasonally in exotic vegetation at lower elevations. Has adapted to man-made forest-like habitats, such as orchards, timbered gardens and plantations, also secondary forest, but absent from sparsely vegetated natural habitats, and cane fields, geranium fields, sparse dry thorn-scrub etc. On Mauritius visits tea plantations (for nectar), market gardens, wasteland, scrubby secondary growth with odd trees and town gardens for feeding.

Food and Feeding. Primarily insectivorous; also fruits and nectar. Insects include especially Hemiptera (*Flatopsis nivea* often taken), grasshoppers and crickets (Orthoptera), caterpillars and small butterflies (Lepidoptera). Fruits e.g. *Aphloia theiformis* at high altitudes, also exotic *Lantana camara*, *Schinus terebinthifolius*. Nectar (taken by probing and sometimes puncturing corolla base) mainly from the introduced species *Lantana camara*, tea (*Camellia*) and *Syzygium jambos*, but also native species e.g. *Eugenia mauritiana*, *Bertiera zaluziana*, *Sideroxylon*, *Gaetnera*; sweet sap oozing

On following pages: 66. Principe White-eye (*Zosterops ficedulinus*); 67. Annobon White-eye (*Zosterops griseovirescens*); 68. Malagasy White-eye (*Zosterops maderaspatanus*); 69. Chestnut-sided White-eye (*Zosterops mayottensis*); 70. Seychelles Grey White-eye (*Zosterops modestus*); 71. Mount Karthala White-eye (*Zosterops mouroiensis*); 72. Réunion Olive White-eye (*Zosterops olivaceus*); 73. Mauritius Olive White-eye (*Zosterops chloronothos*); 74. Yap Olive White-eye (*Zosterops oleagineus*).

from trees also taken. On Réunion more fruits eaten in winter (Jun–Jul), whereas fruits rarely eaten at high altitudes in summer; above 2000 m buds of *Philippia nontana* eaten where fruit-bearing plants absent, and when insects scarce (in winter). On Mauritius fruits less regularly eaten. Forages throughout year in noisy parties of 4–10 individuals, sometimes up to 20 (on Réunion), and 35 or more and once 81 (on Mauritius); on Mauritius these flocks sometimes joined by other species, such as *Z. chloronothos*, Mauritius Fody (*Foudia rubra*), cuckoo-shrikes (*Coracina*), monarchid flycatchers, and also introduced Red-whiskered Bulbul (*Pycnonotus jocosus*). Insects obtained by gleaning from foliage, by foraging among flowers, along twigs, on bark, probing in rotten wood, on the ground; aerial flycatching reported.

Breeding. Sept–Dec, occasionally to Feb, and adults feeding young observed in Aug on Réunion; Jul–Mar on Mauritius. Helpers feeding young reported for both races; nests sometimes in loose semi-colonial groups, no territoriality or nest defence, but breeding units reported as holding very small (c. 1 ha) territory. Striking white axillaries and rump important in courtship display. Nest on Réunion a small delicate cup of fine stems, covered in green moss when in foliage (e.g. casuarina branchlets), or with grey-white material (possibly lichen), and sometimes with dead leaves in more exposed areas, attached to twigs at 1–5 m in tree; on Mauritius a thin though robust structure made of moss, lichen, leaves or rootlets and (locally) dry grass, held together with spider web, lined with loosely coiled fine hairs, attached to supporting twigs in foliage towards end of a branch. Clutch 2–3 (occasionally 4) eggs on Réunion, 2 eggs on Mauritius, pale blue; no information on incubation period; fledging period 10 days. Longevity of ringed individual on Mauritius 4 years 11 months.

Movements. Resident. On Réunion, reports of some movement up and down 1000-m hills to visit flowering *Sophora* plants.

Status and Conservation. Not globally threatened. Restricted-range species: present in Réunion EBA and in Mauritius EBA. Common on Réunion, where population estimated at 556,000 individuals in 1967; although white-eyes have not suffered from habitat modification by humans, the balance of polymorphism on the island undoubtedly has been affected. Most common and conspicuous white-eye on Mauritius, locally reaching densities of 150 “pairs”/km²; reported numbers in native habitat substantially higher than those of all other native bird species combined. Main predator on Réunion is Madagascar Marsh-harrier (*Circus maillardi*); on Mauritius, a known predator is Mauritius Kestrel (*Falco punctatus*), but Red-whiskered Bulbul also considered responsible for nest losses. Avian malaria may limit the distribution of white-eyes outside undisturbed forest.

Bibliography. Buffon (1778), Cheke (1987b), David & Gosselin (2002b), Diamond (1987), Gadow (1884), Gill (1971a, 1973), Hansen *et al.* (2002), Horne (1987), Sinclair & Langrand (1998), Temple (1981), Warren *et al.* (2006).

66. Principe White-eye

Zosterops ficedulinus

French: Zostérops beeffigue **German:** Fahlbrillenvogel **Spanish:** Antojitos de Principe
Other common names: Sao Tome White-eye (*feae*)

Taxonomy. *Zosterops ficedulina* Hartlaub, 1866, hilly parts of Principe.

Closely related to and possibly forming a superspecies with *Z. griseovirescens*. Two subspecies recognized.

Subspecies and Distribution.

Z. f. ficedulinus Hartlaub, 1866 – Principe I, in Gulf of Guinea.

Z. f. feae Salvadori, 1901 – São Tomé I, in Gulf of Guinea.



legs brownish-grey. Sexes alike. Juvenile undescribed. Race *feae* is slightly darker and uniformly greenish above, including top of head, greyer below on throat, breast and flanks, with patches of tawny-rufous on posterior flanks. **Voice.** Powerful dawn song a monotonous and insistent, rapid series of 3–6 burry “ptirr” notes, last note more stressed; more complex song of burry, tinny and musical notes given during the day. Contact calls “prrip, prrip...”; flight calls high pitched weak “pink-pink-pink...”, and during foraging chipping notes with thin buzzes and dry tuneless “tyup” or “tyew” described.

Habitat. On São Tomé dense primary and degraded rainforest from sea-level to 1000 m, mainly above 400 m; also patches of dry woodland and isolated large trees in savanna. On Principe in forest and canopy of tallest trees in plantations in hilly interior.

Food and Feeding. Insects and berries. In pairs, family parties, and flocks of up to 20 individuals; often in mixed flocks with speirops (*Speirops lugubris* and *Speirops leucophoebus*), Sao Tome Prinia (*Prinia melleri*), Sao Tome Paradise-flycatcher (*Terpsiphone atrochalybeia*) and Newton’s Sunbird (*Anabathmis newtonii*). Forages in middle levels and in canopy. Gleans insects from twigs, leaves and other vegetation.

Breeding. Laying from Sept onwards, and fledglings seen in Feb. Nest a neat open cup slung under forked twig; clutch 3–5 eggs. No other information.

Movements. Resident; possibly some local movement on São Tomé.

Status and Conservation. **VULNERABLE.** Restricted-range species: present in São Tomé EBA and in Principe EBA. Rare to locally uncommon. Has declined seriously on Principe, where habitat destruction has been extensive, but was for unknown reasons rare in past century, with 2–3 specimens collected in 1920s, and none seen in 1970s; survives in the C massif, where it is mainly confined to primary forest, and more recently a flock was observed on R Papagaio; may still be present in SW of the island. Similarly, has declined worryingly on São Tomé, where it was common in 1920s, uncommon in 1970s, and generally rare and only locally quite common in 1990; seems to fluctuate in numbers, and is at risk from clearance of high-altitude rainforest for cocoa plantations.

Bibliography. Anon. (2007n), Atkinson *et al.* (1991), Bannerman (1914, 1948), Borrow & Demey (2001), Butchart & Stattersfield (2004), Christy & Clarke (1998), Collar & Stuart (1985), Collar *et al.* (1994), David & Gosselin

(2002b), Eccles (1988), Fry *et al.* (2000), Günther & Feiler (1985), Jones & Tye (1988, 2006), Keulemans (1866), Nadler (1993), de Naurois (1983), Stattersfield & Capper (2000).

67. Annobon White-eye

Zosterops griseovirescens

French: Zostérops d’Annobon **German:** Annobonbrillenvogel **Spanish:** Antojitos de Annobón

Taxonomy. *Zosterops griseovirescens* Bocage, 1893, Annobón.

Closely related to and possibly forming a superspecies with *Z. ficedulinus*. Monotypic.

Distribution. Annobón I (Pagalu), in Gulf of Guinea.



Descriptive notes. 12 cm; two birds 11 g. Top of head and upperparts are greyish-olive, with paler side of crown, sometimes a narrow creamy pale green to lemon-yellow supraloral line; conspicuous white eyering broader above than below and broken at front (and sometimes behind eye), black lores and dusky line below and behind eye; ear-coverts streaked greyish; flight-feathers blackish-brown, edged olive-green; central tail feathers olive-green, the rest blackish with broad olive-green fringes on outer webs; very pale sulphur-yellow on chin, throat, midline of belly and vent, otherwise buff below, greyer at side, with pale tawny-buff

flanks; axillaries and underwing-coverts white; iris light brown; bill blackish or horn-brown; legs brownish-grey. Sexes alike. Immature is like adult but slightly yellower below. **Voice.** Song remarkably melodious, a pleasant, quiet warble of indefinitely jumbled notes derived from flight call, reminiscent of song of a *Sylvia* warbler. Flight call a single “plic” or “tsip”, often several in quick succession; trilling “churr” when perched.

Habitat. Woody vegetation of all types, from moist forest, dry *Steganthus/Lanea* forest, savanna forest, and dense oil palm (*Elais guineensis*) and mango (*Mangifera*) plantations to small shrubs and trees around grassy cultivated patches of cassava (*Manihot esculenta*). Sea-level to highest peak, at 655 m.

Food and Feeding. Mainly small insects, especially ants (Formicidae); also small seeds. In pairs and in flocks of up to ten individuals. Forages from smallest bush to crowns of tallest emergent trees, but keeps mainly to lower strata in primary and regrowth forest.

Breeding. Laying Oct–Feb. Nest a small, neat, closely woven and quite robust cup of fine grass and vegetable fibres, placed among small twigs in small acacia tree (*Acacia*), cassava bush, or even in introduced “leafless” cactus *Rhipsalis* hanging on rock face in shady bouldery ground. Clutch 2 eggs, white, 18 × 13.5 mm. No other information.

Movements. Sedentary.

Status and Conservation. **VULNERABLE.** Restricted-range species: present in Annobón EBA. Abundant. Total population guessed at 7000–9000 individuals. The dominant bird species on the tiny island (17.5 km²) of Annobón, where the only other resident passerine is the Annobón race of Red-bellied Paradise-flycatcher (*Terpsiphone rufiventer smithii*). Population may even be growing with disturbance of vegetation. Nevertheless, it has a tiny global range, and any natural catastrophic events would put it at serious risk.

Bibliography. Anon. (2007n), Bannerman (1915b, 1948), Basilio (1957), Borrow & Demey (2001), Butchart & Stattersfield (2004), Collar & Stuart (1985), Collar *et al.* (1994), Fry (1961), Fry *et al.* (2000), Harrison (1990), Jones & Tye (2006), Sibley & Monroe (1990), Stattersfield & Capper (2000).

68. Malagasy White-eye

Zosterops maderaspatanus

French: Zostérops malgache **German:** Madagaskarbrillenvogel **Spanish:** Antojitos Malgache
Other common names: Madagascar White-eye; Kirk’s White-eye (*kirkii*); Hova (Grey-backed White-eye (grey-backed morphs))

Taxonomy. *Motacilla maderaspatana* Linnaeus, 1766, Madagascar.

Distinctive race *kirkii* sometimes treated as a separate species, or as a race of *Z. senegalensis*. Race *menaiensis* poorly defined and of uncertain validity; owing to its geographical isolation and different calls (which considered by some authors to be reasons for treating this as a separate species) it is probably best retained, pending further studies. Proposed form *hovorum* (Madagascar), formerly treated as a separate species, is not a valid taxon; original description was based on a single specimen of an aberrant form (with grey upperparts), two similar examples of which have since been found on Cosmolédo Atoll (SW Seychelles). Additional described taxa from Madagascar are *ampotakae* (a small form from Ampotaka, in dry SW plain) and *analogus* (a slightly larger montane form described from Manjakatomp, in Ankaratta Mts); both are treated as synonyms of nominate. Seven subspecies recognized.

Subspecies and Distribution.

Z. m. aldabrensis Ridgway, 1894 – Aldabra Atoll (possibly also still on Assomption), in SW Seychelles.

Z. m. menaiensis Benson, 1969 – Cosmolédo Atoll (Menai) and Astove, in SW Seychelles.

Z. m. kirkii Shelley, 1880 – Grand Comore (Njazidja), in NW Comoro Is.

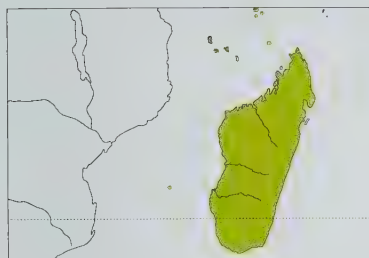
Z. m. comorensis Shelley, 1900 – Mohéli (Mwali), in SC Comoros.

Z. m. anjuanensis E. Newton, 1877 – Anjouan (Ndzuani), in EC Comoros.

Z. m. maderaspatanus (Linnaeus, 1766) – Madagascar, and Glorioso Is (off NW coast).

Z. m. voeltzkowi Reichenow, 1905 – Europa I, in S Mozambique Channel.

Descriptive notes. 10–12 cm; averages 11.2 g (nominate), 7.6 g (*aldabrensis*), 8.8 g (*comorensis*), 8.3 g (*kirkii*). Nominata race has yellow-green forehead to nape and cheek, white eyering broken at front by blackish loreal line; upperparts, including most of upperwing, dark olive-green, sooty primaries with narrow green edges on outer half, mainly sooty to blackish-brown tail; chin and throat yellow, underparts pale grey, side of breast darker grey, flanks washed russet, yellow vent and undertail-coverts; iris reddish to light brown; bill black above, grey below; legs bluish to dark grey. Sexes similar. Juvenile is more greenish than adult, with eyering tinged yellowish, greyish-brown eye. Races differ mainly in plumage tones and in size: *aldabrensis* is somewhat smaller than nominate, and more yellow, less green, on upperparts, with paler side of breast sometimes washed brownish; *menaiensis* is similar to nominate, but a little paler; *kirkii* differs from others in having entirely yellow underparts; *comorensis* has green of upperparts paler, more yellowish, than nominate, rather brighter yellow on chin and throat, tending to extend more to chest, chest and abdomen more buffy,



less greyish, especially on flanks; *anjuanensis* is larger than previous and less markedly buffy on chest, abdomen and, especially, flanks, with chin and throat brighter yellow than in nominate; *voeltzkowi* is like nominate, but has white inner edges of secondaries slightly broader, lower back towards rump rather brownish-olive instead of olive-green, belly light greyish-buff, and undertail-coverts pale yellow (lighter than yellow of throat), also differs from previous subspecies in darker upperparts and weaker yellow stripe on forehead. VOICE. Song consists of reedy notes; song of race *kiriki* (from exposed perch) loud and melodious, similar to

that of a *Serinus* finch. Contact call a constant soft disyllabic "pec-u" or "wee tseet" or "tsit tsit", also gives harsher trill; *menaiensis* reportedly has thinner call than *aldabrensis*; *kiriki* has very wide range of call notes.

Habitat. All types of wooded areas, including all original undisturbed forest types, mossy forest, forest edge, scrubby woodland, subdesert brush, dry plains, afforested areas, secondary forest with *Ravenala madagascariensis*, wooded savanna, dry forest, eucalypt (*Eucalyptus*) woods, parks and gardens in towns and villages; from sea-level to 2300 m. No preference for particular trees but less common in mangroves, and race *aldabrensis* found in casuarina (*Casuarina*) trees. Occurs at forest edge at high elevations, but absent from heathlands of Mt Karthala (Grand Comoro), where *mouroniensis* occurs, although some overlap between the two species.

Food and Feeding. Mainly insects, especially beetles (Coleoptera), caterpillars, bugs (Hemiptera), Neuroptera, flies (Diptera), ants (Formicidae), also spiders (Araneae). Also some seeds (e.g. *aldabrensis* said to be fond of casuarina seeds), small fruits e.g. deep purple berries (5 mm in size), over-ripe figs (*Ficus*), bramble berries (*Rubus rosaeifolius*), fruits of *Peiper* shrub, and flowers and nectar. In rather loose monospecific flocks of up to 40 individuals, also three or more individuals in mixed-species flocks, where present species and Common Newtonia (*Newtonia brunneicauda*) may have role of nuclear species; participating in more than 50% of 47 flocks studied in 1989, and seen more often in mixed flocks than in single-species ones; associates most often with Common Newtonia, Souimanga (*Cinnyris sovimanga*) and Long-billed Green Sunbird (*Cinnyris notatus*), and Common Jery (*Neomixis tenella*), but also with Madagascar Paradise-flycatcher (*Terpsiphone mutata*), Cryptic Warbler (*Cryptosylvicola randrianasoloi*), Crested Drongo (*Dicrurus forficatus*), and Red-tailed (*Callicolius madagascariensis*), Blue (*Cyanolanius madagascarinus*) and Tylas Vangas (*Tylas eduardi*), among others. Has been recorded in same mixed flocks as *Z. mouroniensis*. Searches all levels of vegetation, particularly between 5 m and 10 m; frequents treetops and tops of shrubs, especially those flowering or fruiting. Gleans through branches for small insects.

Breeding. Mid-Sept to Mar, coinciding with wet season, with peak in Oct–Nov. Nest a firm deep cup made of *Casuarina* needles, grassy stems, grass-heads and bark fibre, with softer material (fine grass and rootlets) inside, a few bits of plant down and moss stuck on the outside, measurements (race *anjuanensis*) 45–80 mm deep and 70–95 mm wide externally, 35–60 mm deep and 50–70 mm wide internally; placed in shrub or in tree fork at 2–8 m above ground, on downward branch of *Macaranga* tree or similar in dense vegetation, or high up in fig tree. Clutch usually 2 eggs but up to 4 reported, pale blue-green, 15.3–16.4 × 12.3–12.4 mm (nominate), average 17.7 × 13 mm (*anjuanensis*). No other information.

Movements. Not known.

Status and Conservation. Not globally threatened. Common in Madagascar and the Comoros; common in the Seychelles, where it is one of the two most abundant landbirds on Aldabra, but less so on Cosmolé and Astove. Local population of race *aldabrensis* on Assomption I may have been wiped out after wholesale destruction of the island. Apart from nominate, each race has a tiny range and is therefore vulnerable. Introduced cats and rats (*Rattus*) may become a threat. The protection as a nature reserve and World Heritage Site should secure the future of Aldabra Atoll. Measures to secure the habitat of race *menaiensis* on Cosmolé Atoll should also be taken.

Bibliography. Benson (1960, 1969), Bijnens *et al.* (1987), Cheke & Diamond (1986), David & Gosselet (2002b), Dee (1986), Dunning (1993), Eguchi *et al.* (1993), Forbes-Watson (1969), Gerlach (2007), Goodman *et al.* (1996), Langrand (1990), Louette (1988), Louette, Bijnens *et al.* (1989), Louette, Meire & Jocuqué (2004), Louette, Stevens *et al.* (1988), Rand (1936c), Ridgway (1895), Safford & Evans (1992), Salomonsen (1934), Sinclair & Langrand (1998), Stevens & Louette (1999).

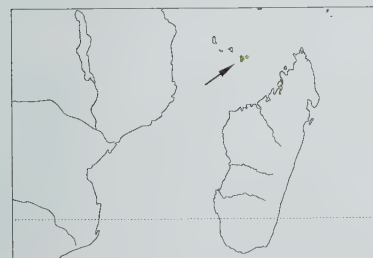
69. Chestnut-sided White-eye

Zosterops mayottensis

French: Zostérops de Mayotte **Spanish:** Antojitos de la Mayotte
German: Dotterbrust-Brillenvogel
Other common names: Mayotte/Chestnut-flanked White-eye

Taxonomy. *Zosterops mayottensis* Schlegel, 1867, Mayotte, Comoro Islands. Probably related to *Z. senegalensis*. Sometimes lumped with extinct *Z. semiflavus* of Seychelles (which was smaller, slightly less yellow and had less bright yellow frontal bar), or considered a race of *Z. maderaspatanus*. Monotypic.

Distribution. Mayotte (Maore), including Petite Terre (Pamanzi I), in SE Comoro Is.



Descriptive notes. 11 cm; 9.9 g. Has forehead bright citrine-yellow, lores black, white eyering; crown and upperparts greenish-yellow; flight-feathers and tail blackish, edged greenish-yellow on outer web, remiges broadly edged white on inner web; bright citrine-yellow below, including underwing-coverts, flanks washed brownish-red; iris reddish-brown; bill dark blue to black, base of lower mandible grey; legs lead-grey, soles dull ochraceous. Sexes alike. Juvenile is greener, less yellowish, than adult on upperparts, duller below, with less extensive chestnut. VOICE. No detailed information available; reported to

produce vocalizations typical of the genus.

Habitat. Both forest and more open woodland, mangroves. More often seen in drier E side of Mayotte; less common in patches of rainforest.

Food and Feeding. Vegetable matter, insects, caterpillars, spiders (Araneae). Forages in small groups through trees and shrubs.

Breeding. Nest found in Oct, an open cup of very fine fibres, covered on outside with fine grass-heads and a little spider web, 70 × 70 mm externally, 40 mm deep and 45 mm wide internally; placed c. 2 m above ground in lateral fork of heavily foliated bush. No other information.

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species; present in Comoro Islands EBA. Common on Mayotte, and fairly common on Petite Terre. The only white-eye present in its range. This species is less common than is the related *Z. maderaspatanus* (on Grand Comoro); reasons for this unknown, but possibly connected with the high densities of Frances's Sparrowhawk (*Accipiter francesii*) in forest habitat on Mayotte. As it is well adapted to man-made habitats, where insects and nectar abound, survival seems to be no problem. Numbers were randomly distributed over nine counting stations in 1992–1994.

Bibliography. Benson (1960), Forbes-Watson (1969), Gadow (1884), Louette *et al.* (2004), Milne-Edwards & Oustalet (1888), Sibley & Monroe (1990), Sinclair & Langrand (1998).

70. Seychelles Grey White-eye

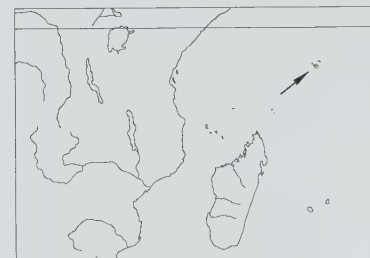
Zosterops modestus

French: Zostérops des Seychelles **German:** Mahebrillenvogel **Spanish:** Antojitos de Seychelles
Other common names: Seychelles (Brown) White-eye

Taxonomy. *Zosterops modesta* E. Newton, 1867, Mahé, Seychelles.

May be related to *Z. olivaceus* and *Z. chloronothos*, to which it bears closest resemblance and with which it shares similar wing-flipping action and staccato calls; recent DNA studies, however, suggest *Z. maderaspatanus* as closest relative. Birds on Mahé on average larger (longer wing and tarsus) than those on Conception, with a 28% genetic difference recorded. Monotypic.

Distribution. Inner Is (Mahé and adjacent Conception), in NE Seychelles. Introduced on Frégate I, North I and Cousine I.



Descriptive notes. 10–11 cm; 11.5–13 g. Has inconspicuous white eyering with tiny gap at front; dark olive-grey to brown above, paler on yellowish-washed rump; throat dirty pale mustard-yellow, underparts pale grey, flanks with brownish wash, belly with faint yellowish wash; iris dark reddish-brown; bill blackish-grey; legs grey. Sexes alike in plumage, but male reported as sometimes smaller than female. Juvenile is similar to adult, but bill yellow in first few weeks, gradually changing to grey. VOICE. Song, from perch throughout day (most often at dawn during breeding season, and sometimes throughout day), varied

and pleasant, of variable complex phrases of high-pitched notes. Calls described as soft, brief, nasal "cheer" for contact (similar to those of *Z. borbonicus*), louder and more persistent when moving between trees and shrubs, also soft trilling note and clipped "tik tik" contact calls; also loud or soft 3-note or 4-note calls, and reportedly warbling incubation change-over calls; "chewik" and chattering trills as alarm.

Habitat. Thick-foliaged broadleaved trees and dense shrubs in well-wooded country, mixed secondary forest, especially where certain tall trees (e.g. *Albizia falcataria* and *Pterocarpus indica* on Mahé) have underlying or adjacent scrub layer, open woodland, gardens and areas with mature trees; prefers secondary habitat with alien trees and shrubs. On Conception in mixed woodland and open glaciis (rocky glades) with associated vegetation; on Mahé open woodland and gardens; on Frégate (introduced from Conception) also in mixed woodland but readily adapted to mixture of gardens, glaciis and rehabilitated coastal woodland. Found in residential areas on Mahé (La Misère, Grande Anse/Barbarons, Anse Boileau, Cascade). Most frequent at 300–500 m on Mahé, and common at all altitudes on Conception.

Food and Feeding. Diet largely based on invertebrates, and berries and seeds; nectar also taken. Recorded items include tiny insects such as ants (Formicidae), aphids, mealy bugs (*Pseudococcus*), small green caterpillars and crickets, as well as spiders; fruits include *Lantana camara* and cinnamon (*Cinnamomum*). Seen in family groups and in fast-moving flocks of 2–5 individuals on Mahé, and up to about twelve on Conception; also in mixed flocks with Red Foddes (*Foudia madagascariensis*) and Seychelles Sunbirds (*Cinnyris dussumieri*) on Mahé. Forages in scrub layer of secondary forest, as well as in tops of a large variety of native and exotic trees, including cloves (*Syzygium aromaticum*), cinnamon, *Tabebuia*, *Calophyllum* and *Albizia*; probes among leaves and into bark crevices, gleans and snatches insects from leaves. In general, does not have a strong preference for native trees, but on Conception several native small trees (e.g. *Premna serratifolia*, *Tabernaemontana coffeoides*, *Canthium bibracteatum*) play a very important role in diet. On Mahé, of 16 species of foraging tree, only two were indigenous and these were exploited in only 3% of observations.

Breeding. Oct–Apr (sometimes from late Jul). Co-operative breeder, helpers contributing to nest-building and brood-rearing duties; complex system with large nesting families of up to eight individuals (laying up to 7 eggs in one nest) discovered on Conception. Nest a flimsy cup made largely of grass, also containing strips of bark, small dead leaves, rootlets, strands of wool or cotton, and moss, attached by spider web to 2–4 small twigs 4–20 m above ground in dense cluster of leaves at end of almost horizontal branch; recorded nesting trees *Pterocarpus*, *Swietenia*, *Hevea*, clove and lichi (*Litchi*) on Mahé, cinnamon, cashew (*Anacardium*) and *Tabebuia* on Conception. Clutch (for groups with one female) 1–2 eggs, pale greenish-blue with very faint brown spots; incubation period 13–15 days; fledging period 11–15 days.

Movements. Exchanges between different subpopulations on Mahé shown by colour-ringing.
Status and Conservation. **ENDANGERED.** Restricted-range species; present in Granitic Seychelles EBA. Previously listed as Critically Endangered; recategorized in 2006 following successful conservation action. Global population estimated at 330–450 birds in 2006. Accurate census in 1999 estimated population of Conception at c. 280 (244–336) individuals; same method used in 2006 gave c. 230 (200–290) birds. On Mahé, presently occurs mainly in three tiny areas (La Misère, Upper Barbarons and Cascade), each less than 5 km² in extent. In 1906 was still abundant, and reported as not infrequent in mountainous parts of the island between 330 m and 700 m around central massif; most native forests had then been cleared but supported a scattered tree growth and often thickets of cinnamon bushes. Species not recorded after 1936 until beginning of 1960s (having been thought extinct), when a small flock of about a dozen was located in the cinnamon forest at La Misère. Extremely rare (the least common bird species) on Mahé, where has declined since mid-1970s from c. 100 birds, to c. 50 birds in mid-1990s, with 34–40 individuals counted in 1999; seems now to be stable or slightly increasing, with 50–60 birds in 2007. In Feb 1997 a population of this species was discovered on Conception, a small island off Mahé, inhospitable to man because of its steep slopes and absence of beaches or streams, and therefore rarely visited since abandonment

of its plantation in mid-1970s. Decline in numbers on Mahé is due mainly to predation by the arboreal black rat (*Rattus rattus*), Common Myna (*Acridotheres tristis*) and Seychelles Black Bulbuls (*Hypsipetes crassirostris*), which are absent or less abundant (myna) on Conception. Forestry practices and commercial tea-growing on Mahé reported to be incompatible with the species' needs in mid-1970s, and relative scarcity of native fruit trees on Mahé may have contributed to its decline. Most of Mahé population lies outside the Morne Seychellois National Park. Protection of population on dry island of Conception against fire, as well as disease, is desirable; brown rat (*Rattus norvegicus*) eradicated in 2007. Rat control undertaken at the two main breeding sites on Mahé since 2006. Although the populations of this white-eye on Mahé and Conception are genetically isolated, this limited differentiation is not considered of taxonomic importance, and mixing individuals from both populations in order to increase genetic variation may be beneficial for the species. As part of the Seychelles White-eye Recovery Programme, this species was introduced to Frégate I in 2001, and by 2007 a population of c. 100 birds had become established; in 2007, also introduced to North I (25 birds) and Cousine I (23 birds). Captive breeding recommended only as a last resort for Mahé birds. Eradication of introduced predators and further introductions to suitable, predator-free islands recommended in Species Action Plan.

Bibliography. Anon. (2007n), Butchart & Stattersfield (2004), Collar & Stuart (1985), Collar *et al.* (1994), Crook (1960), Feare (1975), David & Gosselin (2002b), Gerlach (1997, 2007), Greig-Smith (1978, 1979), Henriette-Payet (2007), Newton (1867), Rocamora (1997a, 1997b, 2008), Rocamora & François (2000), Rocamora & Richardson (2003), Rocamora *et al.* (2003), Sinclair & Langrand (1998), Skerrett & Bullock (1992), Skerrett *et al.* (2001), Stattersfield & Capper (2000), Vesey-Fitzgerald (1940).

71. Mount Karthala White-eye

Zosterops mouroiensis

French: Zostérops du Karthala

German: Karthalabrillenvogel

Spanish: Antejitos de la Gran Comora

Other common names: Comoro/Grand Comoro White-eye

Taxonomy. *Zosterops mouroiensis* A. Milne-Edwards and Oustalet, 1885, Grand Comoro. Monotypic.

Distribution. Mt Karthala, on Grand Comoro (Njazidja), in NW Comoro Is.



Descriptive notes. 11.8 cm; 9.9 g. Has white eyering; olive-green top of head and upperparts, somewhat darker on upperwing and tail; throat and undertail-coverts yellow, rest of underside rather dull yellowish-green; iris reddish-brown; bill and legs black. Sexes alike. Juvenile is duller and with smaller eyering than adult. **Voice.** Song is a mellow warble, "fi, fi, fi, pi, pi, pyo, pyo"; typical mellow "fee fee fee pee pee" whistles and buzzy notes as contact.

Habitat. Restricted to unstratified stunted woodlands (with canopy at 7–8 m), colonizing a recent lava flow, dominated by *Philippia*

comorensis heath (which grows to 5 m in its lower reaches, at 1700 m, and to half this size in summit area of Mt Karthala, an active volcano), but where broadleaf shrubs are also common. Mainly at 1750–2361 m, but also down to c. 1500 m, below which *Z. maderaspatanus* (of race *kiriki*) occurs.

Food and Feeding. Recorded food items small purple berries, also some insects (e.g. caterpillars). No other information.

Breeding. Of eleven males in Sept, ten were in breeding condition. One nest found, made of very fine grass, outside covered with moss, externally 85 mm deep and 90 mm wide, inner cup 45 mm deep and 55 mm wide, suspended between two thin stems 4 m above ground and 1 m from top of a *Philippia* bush; contained 3 eggs, pale blue, 20.2 × 15.4 mm. No other information.

Movements. Not known.

Status and Conservation. \ **VULNERABLE.** Restricted-range species; present in Comoro Islands EBA. Rare. In 1958 the species was still common, and even found in evergreen forest at 1700 m. In early 1980s considered not uncommon but localized, as restricted to a narrow band of heath vegetation on Mt Karthala, where 17 individuals located in 1985 in point-counts made during pre-breeding season at 1885 m. Here, it is very much threatened by habitat degradation, as a hiking road to the rim of the crater was constructed in 1980s, as well as by eruptions from the volcano itself. Its conservation status may in the future have to be upgraded to that of Endangered or even Critically Endangered.

Bibliography. Anon. (2007n), Benson (1960), Bijlens *et al.* (1987), Butchart & Stattersfield (2004), Collar & Stuart (1985), Collar *et al.* (1994), Louette (1988, 2001), Louette & Stevens (1992), Louette, Bijlens *et al.* (1989), Louette, Meirte & Jocuqué (2004), Louette, Stevens *et al.* (1988), Milne-Edwards & Oustalet (1888), Safford & Evans (1992), Sinclair & Langrand (1998), Stattersfield & Capper (2000), Stevens *et al.* (1992).

72. Reunion Olive White-eye

Zosterops olivaceus

French: Zostérops de la Réunion

German: Olivbrillenvogel

Spanish: Antejitos de Reunión

Other common names: Mascarene Olive White-eye, Olive White-eye

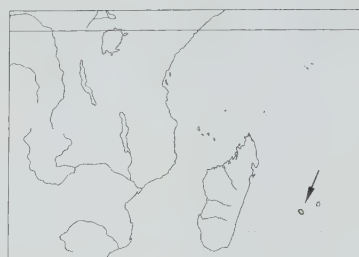
Taxonomy. *Certhia olivacea* Linnaeus, 1766, Madagascar; error = Réunion.

Forms a superspecies with *Z. chloronothos*; often considered conspecific, but the two differ strikingly in, especially, call and vocal behaviour. Monotypic.

Distribution. Réunion I.

Descriptive notes. 11 cm; 7.7–11.4 g. Dark white-eye with relatively long, decurved bill. Above, is dull dark olive-green, with blackish head and striking white eyering, rump brighter olive-green; grey below, browner on flanks, fading to yellowish on undertail-coverts; pale stripe running down side of puffed-out breast and flanks ("epaulette" effect); iris dark brown; bill and legs greyish. Distinguished from *Z. borbonicus* by darker plumage, obvious white eyering, dark rump and decurved bill. Sexes alike. Juvenile initially lacks white eyering, has green face uniform with rest of plumage. **Voice.** Song a loud warble with "tu" and "tchip" notes interspersed. Contact call a clipped "chip chip"; staccato call given especially in interactions around flowers; flight call "chuck chuck".

Habitat. Natural forest at higher altitude (except cloudforest in W), scrub-forest, heath. Scarce at 500 m and rare below that level; ranges up to 2300 m where *Hypericum* and *Sophora* flower.



Syzygium jambos etc. Reaches nectar by perching near the flower, or sometimes hovering in front, and probing into it from front; not observed to pierce the base. Insects sought by gleaning in foliage and probing in flowers; aerial flycatching sometimes observed. Occurs in isolated pairs, rather than in small flocks. Highly territorial in relation to flowers; vigorously defends especially the usually widely scattered *Hypericum* bushes.

Breeding. Jun–Jan. Clutch 2–3 eggs, pale blue-green. No other information.

Movements. Descends to lower elevations between Mar and May, but does not roam widely in lowlands. As flowering of foodplants is seasonal, vertical migration within mixed forest zone is necessary. After cyclones flowers are in short supply, and this species can appear at places where otherwise usually not seen.

Status and Conservation. Not globally threatened. Restricted-range species; present in Réunion EBA. Still reasonably common. Has become very rare in lowlands since 1920s, and has declined in mountains but much less so; population estimated at 154,000 individuals in 1970s, with a breeding distribution extending over 1500 km². Main predator is Madagascar Marsh-harrier (*Circus maillardi*).

Bibliography. David & Gosselin (2002b), Diamond (1987), Gadow (1884), Gill, F.B. (1970a, 1971a), Moreau (1957a), Sibley & Monroe (1990), Sinclair & Langrand (1998), Temple (1981), Warren *et al.* (2006).

73. Mauritius Olive White-eye

Zosterops chloronothos

French: Zostérops de Maurice

German: Mauritiusbrillenvogel

Spanish: Antejitos de Mauricio

Other common names: Olive White-eye (when treated as conspecific with *Z. olivaceus*)

Taxonomy. *Dicaeum chloronothos* Vieillot, 1817, no locality = Mauritius.

Forms a superspecies with *Z. olivaceus*; often considered conspecific, but the two differ strikingly in, especially, call and vocal behaviour. Monotypic.

Distribution. Mauritius.



Descriptive notes. 10 cm; 7.5–9 g. Rather dark white-eye with relatively long, decurved bill. Head to upper mantle grey, becoming olive-green on rest of upperparts, with uniform rump; paler below, tinged pinkish-buff on flanks, and becoming yellow on undertail-coverts; white eyering; iris dark brown; bill dark brown; legs pale horn to flesh-coloured. Distinguished from *Z. borbonicus* by noticeably decurved bill and obvious eyering. Sexes alike. Juvenile resembles adult. **Voice.** Song rather short and inconspicuous, hurried, consisting of warbled phrases interspersed with characteristic trilled call, repeated during several minutes; generally much briefer than song of *Z. borbonicus*, has been likened to that of a Dunnock (*Prunella modularis*). Contact call metallic "plik plik"; flocking calls e.g. "pit" during nectar-feeding, but silent when feeding on insects; flight call, agonistic calls and roosting calls also distinguished.

Habitat. Upland native forest with fairly even open canopy at 15–20 m, partly heavily degraded by guava (*Psidium*) and *Syzygium jambos*; found in the wettest forest (mainly inside 4000-mm isohyet) above 305 m; areas of dense guava avoided, but more open *S. jambos* thickets important sources of nectar and insects. Occurs also in the structurally quite different dwarf forests, but locally absent where canopy exceeds 5 m. Avoids gardens and invasive stands of woodland.

Food and Feeding. Nectar; also insects; possibly feeds also on sap of *Calophyllum eputamen*. More than 40 nectar foodplants recorded, favourites including endemic *Bertiera zaluzania*, *Sideroxylon puberulum*, *Sideroxylon cinereum*, *Labourdonnaia calophylloides*, and *Eugenia Syzygium* species, and introduced bottlebrush (*Callistemon citrinus*) and *Syzygium jambos*; native species of *Eugenia* and *Syzygium* visited assiduously, and even single flowers out of season are found. Insect prey include dragonflies (Odonata), beetles (Coleoptera), grubs, cocoon contents, adult insects up to 2 cm. Searches for insects through canopy foliage and bark, on branches, in herb layer, shrubs, saplings and fallen branches, and in inflorescences. Rarely hovers, but feeds restlessly in manner reminiscent of sunbirds (Nectariniidae) and sunbird-asities (*Neodrepanis*). Gleans items; aerial insects snapped up in flight. Small area around a favoured flower defended against other white-eyes. Suggested home range 20–30 ha; in areas rich in flowering species, seen to keep to home range of only 2 ha.

Breeding. Sept–Nov. During breeding season has large non-exclusive home range, but defends small area around nest-site. Nest completed within a few days, a cup made from leaf veins dressed externally with spider webs, lined with fibres, animal hair and especially feathers (unlike nest of *Z. borbonicus*), externally 63.4 mm wide, 80.3 mm long and 65.4 mm deep, inner cup 47.1 mm deep, placed 2–10 m above ground in tree fork. Clutch 2 eggs, rarely 3, pale blue; both sexes involved in incubation of eggs and brooding and feeding of young; incubation period 12–13 days; fledging period 14 days; adults perform "injured bird" distraction display near nest when young present; in one case juvenile fed by parents for c. 56 days, chased away at 61 days. Nesting success extremely low, at 7–17%, and five breeding pairs produced only a single fledgling each during three-year study; extremely severe nest predation by introduced crab-eating macaque (*Macaca fascicularis*) and black rat (*Rattus rattus*).

Movements. In non-breeding season wanders below usual lower altitudinal limit of 350–400 m (covering area of occupancy of 32 km² in 1993) over wide area of C plateau (area of occurrence 250 km²), including many relict patches of native vegetation; farthest in winter and at exceptional nectar sources. Long flights of up to 500 m often seen, sometimes over pine (*Pinus*) plantations, probably to reach favoured flowers.

Status and Conservation. **CRITICALLY ENDANGERED.** Restricted-range species: present in Mauritius EBA. Rare. Population fewer than 150 pairs, and declining. This species' mobility, extreme inconspicuousness and silent behaviour when not moving around make it very hard to count accurately. Found only in SW & C of the island. Continued degradation of native habitat (only 5% of native forest remains on Mauritius, all in a very degraded state), and nest predation by introduced Red-whiskered Bulbul (*Pycnonotus jocosus*), black rat, crab-eating macaque and Indian grey mongoose (*Herpestes edwardsi*) have reduced the population from 350 pairs in 1975 to c. 200 pairs by 1993, and 93–148 pairs in 2001. One-third of these survive in a 5-km² forested area to be included in Black River National Park, and highest densities (15–20 pairs/km²) were found between Montagne Cocotte and Piton Savanne, and native relicts of the Bois-Sec–Grand Bassin–Rivière du Poste area. Declines more severe in areas dominated by native vegetation than in those with substantial amounts of exotic *Cryptomeria* and *Pinus*; severe nest predation has possibly brought about a change in nest-site preference, as densely foliated introduced trees (especially *Cryptomeria japonica*) are unattractive to predators. Lengthy juvenile dependency period and fledging of only one young per nest limit productivity of a pair and make population more vulnerable to predation. On the other hand, this species' mobility may enable it to disperse more widely than do several of the other native forest birds, and allow immigrants to support dwindling populations in more remote areas. Translocation of individuals to predator-free island and targeted eradication of nest predators suggested as conservation measures.

Bibliography. Anon. (2007n), Butchart & Stattersfield (2004), Cheke (1987), Collar & Stuart (1985), Collar *et al.* (1994), Diamond (1987), Gadow (1884), Gill, F.B. (1970a, 1971a), Hansen *et al.* (2002), Horne (1987), Moreau (1957a), Nichols & Woolaver (2003), Nichols *et al.* (2004, 2005a, 2005b), Safford (1991, 1997), Sibley & Monroe (1990), Sinclair & Langrand (1998), Stattersfield & Capper (2000), Staub (1988), Temple (1974), Warren *et al.* (2006).

74. Yap Olive White-eye

Zosterops oleagineus

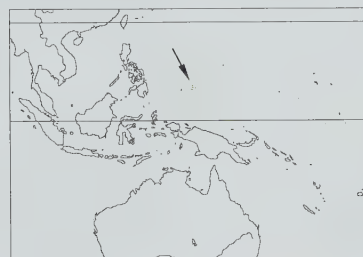
French: Zostérops de Yap **German:** Yapbrillenvogel **Spanish:** Antojitos de Yap
Other common names: Olive-coloured/Large Yap/Yap (Greater) White-eye, Yap Rukia

Taxonomy. *Zosterops oleaginea* Hartlaub and Finsch, 1872, Yap, Caroline Islands.

A fairly large, rather distinctive-looking taxon that has in the past been placed in a monotypic genus, *Kubaryum*, and was subsequently transferred to *Rukia*, where sometimes still retained;

however, DNA–DNA hybridization data indicate that it belongs in present genus. Possibly most closely related to *Z. semperi*. Monotypic.

Distribution. Yap, in W Caroline Is.



Descriptive notes. 12.5–13 cm. Has well-developed satin-white eyering interrupted at front by blackish loreal line, latter continuing under eyering; above, including forehead, generally brownish-citrine, flight-feathers and tail feathers blackish-brown with broad brownish edges; throat dull yellowish, becoming brownish-citrine (but paler than upperparts) towards upper breast, with centre of belly, flanks and remainder of underparts brownish-olive; iris reddish-white to reddish-brown; bill yellow-orange, darker on upper mandible; legs yellow-orange. Sexes similar, female perhaps darker than male. Juvenile undescribed. Voice. Me-

lodio song of monotonously repeated loud whistled phrases, pattern varying somewhat, but typically resembling the phrase “Tickle me, Peter” or “fickle-éé-feedle-dée”. Call a shrill harsh “cheee”.

Habitat. All types of forest, dense jungle, underbrush near swamps and other woody vegetation, including mangroves. Not confined to native vegetation.

Food and Feeding. No details of diet. Solitary, in small groups or, usually, in pairs. Generally forages in tops of small to medium-sized trees. Characteristically hangs with head downwards, exploring among leaves, flowers or fruits; especially fond of seed-pods of *Leucena* (tangen-tangen). Gleans items from foliage.

Breeding. No information.

Movements. Not known.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Yap Islands EBA. Confined to small island of Yap (less than 100 km²), where reported as rare. During a month's survey in 1940s, seen only twice. In 1970s was reportedly widely distributed, but more recently appeared to have become scarcer. In 1991 total population estimated at 19,619 individuals.

Bibliography. Anon. (2007n), Butchart & Stattersfield (2004), Collar *et al.* (1994), Engbring *et al.* (1990), Fisher (1950), Gadow (1884), Hartert & Finsch (1872), Mayr (1945b), Pratt *et al.* (1977, 1987), Sibley & Monroe (1990), Slikas *et al.* (2000), Stattersfield & Capper (2000).



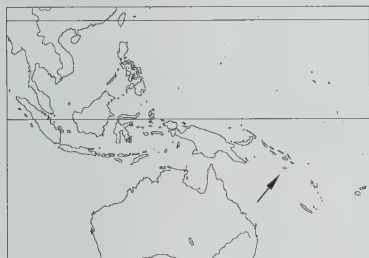
Genus *WOODFORDIA* North, 1906

75. Bare-eyed White-eye

Woodfordia superciliosa

French: Zostérops de Woodford **Spanish:** Antejitos de Woodford
German: Woodfordbrillenvogel
Other common names: Woodford's/Rennell/Eyebrowed White-eye

Taxonomy. *Woodfordia superciliosa* North, 1906, Rennell, Solomon Islands. May form a superspecies with *W. lacertosa*. Monotypic.
Distribution. Rennell, in SE Solomon Is.



Descriptive notes. 14–15 cm; 22.5–37 g. Has bare black lores and circumorbital skin bordered by white band which extends narrowly across lower forehead; otherwise dull brownish-olive above, more brownish on top of head, upperwing more olive; flight-feathers and tail blackish-brown, primary P2 fairly short in length (between P7 and P9); chin and upper throat dirty whitish, side of breast and flanks pale olive with slight buffy tinge, fading towards centre of underparts, and with pale yellowish-brown wash on centre of belly and undertail-coverts; iris light brown; slightly decurved bill brownish-horn, with pinkish base;

legs slaty grey. Sexes alike. Juvenile undescribed. **VOICE.** Song, 30–10 minutes before dawn, seldom heard, soft and very quick, with narrow range around medium pitch, similar to that of *Zosterops rennellianus* but briefer, less fast and perhaps lower-pitched. Contact calls among the most commonly heard bird sounds of Rennell, a petulant “chip” note repeated very rapidly (8 per second), and a soft mellow note repeated more slowly (5 per second); alarm a hoarse “ghae-ghae-ghae”.

Habitat. Primary forest, forest edge, open woodland, second growth, gardens and coconuts, but not on very exposed perches; found on almost all islets of L Teganu.

Food and Feeding. Small insects, including caterpillars, also spiders (Araneae), also small land-snails. Many fruits taken, including *Macaranga*, *Ficus benjamina*, *Ficus adenosperma*, *Diospyros*, *Breynia cernua*, *Acalypha grandis*, *Dysoxylum caulostachyum*, and especially *Pipturus argenteus*; feeding in papaya (*Carica*) trees also reported. Small fruits swallowed whole, larger ones pecked at. In small groups of mostly three individuals, but up to six recorded; joins mixed-species flocks. Forages at all heights, but spends less time in canopy than in lower and middle storeys. Gleans from upper and lower surfaces of leaves; hops up vines, gleams while hanging upside-down.

Breeding. Oct–Nov. Nest cup-shaped, 50–75 mm in diameter, 50 mm deep, made from mostly dead and dry fine fibres, vines, twigs and coarse grass and few bits of green moss, lined with fine grass, slung in fork in twig 20–30 m above ground. Clutch 2 eggs, sometimes 1, plain white with faint greenish-blue tint, 19.5 × 14.5 mm. No other information.

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species: present in Rennell and Bellona EBA. Very common and widespread. One of the three most common forest birds on the island, and the most abundant bird species of second growth and gardens.

Bibliography. Bradley & Wolff (1958), Diamond (1991), Doughty *et al.* (1999), Mayr & Diamond (2001), Mayr & Hamlin (1931), Mees (1969), Murphy (1929), Wolff (1976).

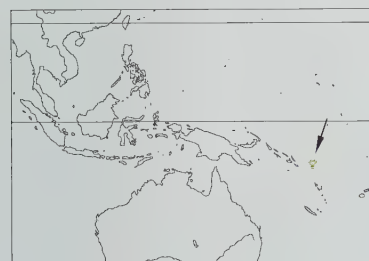
76. Sanford's White-eye

Woodfordia lacertosa

French: Zostérops de Sanford **German:** Sanfordbrillenvogel **Spanish:** Antejitos de Sanford

Taxonomy. *Sanfordia lacertosa* Murphy and Mathews, 1929, Santa Cruz Islands. Formerly placed in its own genus, *Sanfordia*, but resembles *W. superciliosa* sufficiently to be treated in same genus. May form a superspecies with *W. superciliosa*. Monotypic.

Distribution. Ndeni, in Santa Cruz Is (N of Vanuatu).



Descriptive notes. 15–16 cm. Has rather narrow white eyering, but off-white lores and some feathers below eye giving appearance of a large eyering; above, umber-brown, more rufous-brown on upperwing and tail; primary P2 fairly short in length (between P8 and P9); below, more or less cinnamon-buff with olive wash, particularly on throat; iris brown; bill straw-coloured; legs straw-coloured or light yellow. Differs from *W. superciliosa* mainly in head pattern, longer bill, and browner appearance. Sexes alike. Juvenile undescribed. **VOICE.** A typical “chip” note, uttered frequently during wandering in flocks.

Habitat. Degraded forest, primary forest, forest edge, secondary growth.

Food and Feeding. Pairs forage rather slowly in canopy and middle storey, sometimes feeding on fruits. No other information.

Breeding. No information.

Movements. Not known.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Vanuatu and Temotu EBA. Uncommon to fairly common.

Bibliography. Anon. (2007n), Butchart & Stattersfield (2004), Diamond (1991), Doughty *et al.* (1999), Dutson (2007b), Gibbs (1996b), Mayr (1945b), Mees (1969), Murphy & Mathews (1929), Stattersfield & Capper (2000), Stresemann (1931a).

Genus *RUKIA* Momiyama, 1922

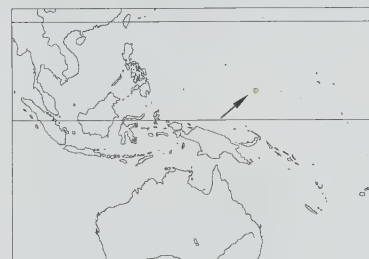
77. Faichuk White-eye

Rukia ruki

French: Zostérops de Truk **German:** Trukbrillenvogel **Spanish:** Antejitos de la Truk
Other common names: (Large/Great) Chuuk/Truk White-eye, Truk Greater White-eye, Teardrop White-eye

Taxonomy. *Tephros ruki* E. J. O. Hartert, 1897, Chuuk Islands. Structurally and vocally similar to *Cleptornis marchei*. Monotypic.

Distribution. Chuuk Is (occurs on four islands in Faichuk Group), in C Caroline Is.



Descriptive notes. 14–14.5 cm. Has indistinct white eyering (white feathers developed under eye only), lores dull black; dark brownish-olive upperparts and underparts, primaries rather darker, more blackish-brown, than remainder of feathers; iris reddish-brown; bill black; legs orange-rufous. Sexes alike. Juvenile undescribed. **VOICE.** A loud lilting warble. **Habitat.** Dense old-growth stands of native forest, especially rich and well-developed forest above 400 m on Mt Winipot (Tol South I), where endemic poison tree (*Semecarpus kraemeri*) may play an important ecological role in this species' survival. Few records from

disturbed forest near native woods.

Food and Feeding. No details on adult diet. Young fed with small to medium-sized insects, including tan-winged moths (Lepidoptera), soft-bodied winged green Orthoptera, and black Diptera/Hymenoptera. Forages by probing among inner branches, limbs, leaf tangles and vines; favours *Ficus* and *Semecarpus*.

Breeding. Apr. One nest described, cup-shaped, 7.5 cm in diameter and 7 cm deep, thin-walled, woven with bark strips, moss and dried grass-like plant fibres, placed 20 m up in terminal leaf cluster in poison tree; contained single chick 2–4 days old; chick fed by both sexes, female doing more than male. No other information.

Movements. Not known.

Status and Conservation. CRITICALLY ENDANGERED. Restricted-range species: present in East Caroline Islands EBA. Rare; current population estimated at c. 500 individuals. In 1984 found to be locally common on Tol South (382 individuals), and rare on Onei (19), Paata (32) and Polle (93); total range only c. 4 km². Has always been uncommon, or at least local, since its discovery in 1895; one scientist who spent more than 14 months in Chuuk Is failed to see a single individual of this species. Possibly dependent on the native poison tree, but both that and the white-eye may be under threat from the expanding human population. This species could easily be exterminated by a catastrophic weather event such as a large typhoon.

Bibliography. Anon. (2007n), Baker (1951), Brandt (1962), Butchart & Stattersfield (2004), Collar *et al.* (1994), Craig (1999), Engbring *et al.* (1990), Hartert (1900a), Mayr (1945b), Mees (1969), Owen (1977), Pratt *et al.* (1987), Pyle & Engbring (1988), Sibley & Monroe (1990), Stattersfield & Capper (2000).

78. Long-billed White-eye

Rukia longirostra

French: Zostérops de Ponapé **Spanish:** Antejitos Piquilargo
German: Langschnabel-Brillenvogel
Other common names: Pohnpei/Ponapé (Greater)/Large Ponapé White-eye

Taxonomy. *Cynnirorhyncha longirostra* Takatsukasa and Yamashina, 1931, Pohnpei Island. Behaviourally similar to *Zosterops*. Name *R. sanfordi* is a synonym. Monotypic.

Distribution. Pohnpei, in EC Caroline Is.



Descriptive notes. 13 cm; 17.9 g. Distinctive, with long, thin and curved bill like that of a honeyeater (Meliphagidae); the only white-eye with a bill longer than the tarsus. Plumage is buffy olive above, slightly greener on head, brighter on rump and more buffish on upper-tail-coverts; narrow eyering; flight-feathers and tail feathers blackish-brown with olive to brownish margins, primaries and secondaries with whitish to brownish inner edges; below, much lighter, buffy, strongest on flanks, and with chin, throat and centre of underparts slightly tinged greenish-yellow; iris chestnut-brown; bill brownish-black, basal half of lower mandible

brownish with green tinge; legs pale yellow to yellowish-orange. Sexes alike. Juvenile undescribed. **VOICE.** Song a downslurred whistle followed by short warble and burry chatter, e.g. “peer-cheturde-tr-r-r-r-r”; described also as a musical, deep-throated sibilant. Contact call a loud series of clear downslurred whistles, “peer-peer-peer”, less nasal than calls of other white-eyes.

On following pages: 79. Golden White-eye (*Cleptornis marchei*); 80. Bonin White-eye (*Apalopteron familiare*); 81. Bicoloured White-eye (*Tephrozosterops stalker*); 82. Rufous-throated White-eye (*Madanga ruficollis*); 83. Grey-hooded White-eye (*Lophozosterops pinaiae*); 84. Black-masked White-eye (*Lophozosterops goodfellowi*); 85. Scaly-headed White-eye (*Lophozosterops squamiceps*); 86. Javan Grey-throated White-eye (*Lophozosterops javanicus*); 87. Yellow-browed White-eye (*Lophozosterops superciliosus*); 88. Crested White-eye (*Lophozosterops dohrtyi*); 89. Pygmy White-eye (*Oculocincta squamifrons*); 90. Spot-breasted White-eye (*Heleia muelleri*); 91. Thick-billed White-eye (*Heleia crassirostris*); 92. Mountain Black-eye (*Chlorocharix emiliae*); 93. Giant White-eye (*Megazosterops palauensis*); 94. Bioko Speirops (*Speirops brunneus*); 95. Principle Speirops (*Speirops leucophoeus*); 96. Black-capped Speirops (*Speirops lugubris*); 97. Mount Cameroon Speirops (*Speirops melanocephalus*); 98. Cinnamon Ibon (*Hypocryptadius cinnamomeus*).

Habitat. Secondary forest and primary forest in hills and mountains, above 600 m.
Food and Feeding. No details of diet. In small flocks. Forages quietly in canopy, often with *Zosterops cinereus*. Feeds among flowers of gum tree. Flocks dash rapidly and wildly through forest understorey.
Breeding. Birds with enlarged gonads in Dec and Feb; one immature specimen in Apr. No other data.
Movements. Not known.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in East Caroline Islands EBA. Widespread, but uncommon. Reported as very rare in 1931 and rare in 1947–48, but this species is inconspicuous, and its apparent rarity may be due to its being overlooked. Vulnerable to encroaching agriculture in its preferred and limited montane habitat, where nearly 90% of sightings were made in c. 10% of the land area. Has apparently declined: encounter rates (individuals per hour) in Pohnpei forest above 200 m were 25.0 in 1983 and 4.1 in 1994 (84% decrease), and below 200 m 2.6 in 1983 and 0.5 in 1994 (83% decrease).
Bibliography. Anon. (2007n), Baker (1951), Buden (2000), Butchart & Stattersfield (2004), Craig (1999), Lack (1971), Mayr (1945b, 1967), Mees (1969), Owen (1977), Pratt *et al.* (1987), Sibley & Monroe (1990), Stattersfield & Capper (2000).

Genus *CLEPTORNIS* Oustalet, 1889

79. Golden White-eye

Cleptornis marchei

French: Zostérops doré **German:** Goldhonigfresser **Spanish:** Antojitos Dorado
Other common names: Golden Honeyeater, Cleptornis

Taxonomy. *Ptilotis marchei* Oustalet, 1889, Saipan, Northern Mariana Islands. Was initially placed in now defunct genus *Ptilotis* within honeyeater family (Meliphagidae), with a new genus provisionally established for it in the event that it should prove more distinct. Much later, DNA analysis indicated the affinities of this species and also genus *Apalopteron* to current family, in which both were then incorporated. Closest to *Rukia*. Monotypic.
Distribution. Saipan and Aguijan, in S Northern Mariana Is.



Descriptive notes. 14 cm; 20.2 g. Unmistakable. Head is yellow to orange, with narrow pale eyering; back yellowish-green, wing and tail feathers fringed orange-yellow; golden orange-yellow below, washed cinnamon-red on flanks and undertail-coverts; iris dark brown; bill and legs orange. Sexes alike in plumage, but male longer-winged (wing 76–80 mm) and longer-billed than female (wing 71–73 mm). Juvenile has duller, paler plumage than adult, with areas of brownish-yellow on back and side of head, sometimes brownish-yellow streaks on breast; dusky bill, duller-coloured feet. **Voice.** Song described as an extended rambling warble, sound-

ing like “sée mé-can you sée mé-I can sée yô-can you sée mée...”. Flock calls include harsh, strident, raspy “tchup” or “schick” during swift flight, and quick loud whistle; begging call of juvenile a plaintive mellow whistle; twanging calls similar to that of Hermit Thrush (*Catharus guttatus*).

Habitat. Understorey of wide variety of wooded and semi-open habitats, including strand forest and suburban areas, but generally absent from sword-grass savanna; more common in native limestone forest than in disturbed habitats. Only bird species on Saipan that is not found in L. Susupe marshes.
Food and Feeding. Generalized diet. Mostly berries with hard pits, which are swallowed whole; also fruits of *Momordica* (also seeds), *Premna*, *Ficus*, *Melanolepis*, *Psychotria* (also nectar), *Artocarpus*, *Lantana* (also flowers), *Carica* and *Muntingia*, and nectar and/or flowers of *Pisonia*, *Erythrina*, *Morinda* and *Aidia*. Also invertebrates, picked from bark and leaves of trees; flying insects. Typically in family groups (with food-begging immatures) of 3–4 individuals, but sometimes travels in groups of up to twelve, frequently noisy; during foraging followed 1–2 m behind by Rufous Fantails (*Rhipidura rufifrons*), which seen to hawk insects disturbed from leaves by the white-eyes. Forages from ground to treetops, but predominantly in top outer portion of trees, mostly by gleaning and probing among (dead) leaves, on branches and on fruit. Despite its long legs, not a ground-feeder. Territorial, with countersinging between neighbouring pairs throughout day.

Breeding. Nests found in all months except Nov; song and food-begging observed throughout year, but apparently not during protracted dry season. Nest cup-shaped and unlined, composed primarily of casuarina (*Casuarina*) “needles”, grasses, vine tendrils and coarse hairs, placed 1.5–6.5 m above ground in tree, e.g. *Casuarina equisetifolia*, *Guamia mariananae*, *Cynometra*, *Leucena*, *Citrus*, *Maltighia* or *Randia*. Clutch 2 eggs, pale bluish-green, with reddish-brown blotches concentrated at wide end, 20.3 × 15.1 mm; incubation by both sexes equally, period 14 days; fledging period 10–12 days.

Movements. Not known.

Status and Conservation. CRITICALLY ENDANGERED. Restricted-range species: present in Mariana Islands EBA. Confined to Saipan (122 km²), where it is abundant, with density of 532 birds/km², and the even smaller island of Aguijan (4 km²), where population estimated to number 2000 individuals (573 birds/km²). In 1982, global population estimated to total of 55,522 individuals. Recently introduced brown tree-snake (*Boiga irregularis*) a major predator, and very likely to lead to massive decrease in this white-eye’s numbers. Extirpated from Tinian and Rota in prehistoric times.
Bibliography. Anon. (2007n), Bruce (1978), Butchart & Stattersfield (2004), Collar *et al.* (1994), Craig (1990, 1996), Craig & Beal (2001), Engbring *et al.* (1986), Hartert (1898b), Marshall (1949), Oustalet (1889), Pratt *et al.* (1987), Sibley & Monroe (1990), Slikas *et al.* (2000), Stattersfield & Capper (2000), Steadman (1999), Stinson & Stinson (1994), Stott (1947).

Genus *APALOPTERON* Bonaparte, 1854

80. Bonin White-eye

Apalopteron familiare

French: Zostérops des Bonin **German:** Boninhonigfresser **Spanish:** Antojitos de las Bonin
Other common names: White-eyed Honeyeater; Mukojima White-eye/Honeyeater (*familare*)

Taxonomy. *Ixos familiaris* Kittlitz, 1830, Boninsima = Muko-jima, north Bonin Islands. Initially described as a bulbul (Pycnonotidae), subsequently assigned to the babblers (Timaliidae) and then the Old World warblers (Sylviidae), and until recently included in honeyeaters (Meliphagidae). Recent DNA–DNA hybridization and field studies indicate closer relationships with present family, and especially with *Cleptornis marchei*. Two subspecies recognized.

Subspecies and Distribution.

A. f. familiare (Kittlitz, 1830) – N Bonin Is (on Muko-jima).

A. f. hahasima Yamashina, 1930 – S Bonin Is (Haha-jima, Mukô-jima, Hira-shima, Ane-jima, Imôto-jima and Mei-jima).

Introduced (*hahasima*) on Chichi-jima, in C Bonin Is.



Descriptive notes. 13.5 cm. Nominat race has yellow head with golden crown and distinctive triangular black eye patch which extends in thin line to well-defined black forehead; lores yellow, conspicuous white eyering interrupted by very thin black line at front and rear; upperparts olive-green with grey tinge, outer web of primaries tinged brownish, tail olive-brown; throat yellow, underparts pale yellow, greyish wash on flanks; iris brownish; bill and legs dark grey. Sexes alike. Juvenile is very like adult. Race *hahasima* very similar, but has yellowish-green tinge on upperparts, and larger bill and tarsus. **Voice.** Song, rarely heard (given almost exclusively during 20–30 minutes before sunrise), rather complex and melodious, “chew-i, chit-chit-pee, chot-chot-pee, ch-ee” or “tu-ti-ti, ti-titu-tuoo”, usually 1.8–2.3 seconds, in quality not unlike that of a bunting (*Emberiza*) or Siberian Blue Robin (*Luscinia cyane*); also song flights from perch. Calls include soft “pee-yu”, “weet” and “pit”, and explosive “tit-tit”; harsher “weet-weet” and “zhree-zhree” when mobbing.

Habitat. Found almost everywhere on Haha-jima, despite clearance of native forest: mountain and valley forest, low secondary forest, forest edge, bushes, plantations, gardens, near habitation, roadside brush and shrubs (especially *Leucaena glauca*), cultivated areas, pine (*Pinus*) woods, *Pandanus* on hillsides. Rare in dry low shrubs on windy peaks and ridges. Breeds in best patches of native forest (evergreen broadleaf forest dominated by *Schima* and *Artisia*, with well-developed but patchy undergrowth of bamboos, tall tree-ferns and tangled shrubs); secondary habitats used mainly for foraging outside breeding season.

Food and Feeding. Mainly soft fruits, such as papaya (*Carica*), *Acacia farnesiana*, bananas (*Musa*), mulberry (*Morus*) and others, also flowers. Also insects, especially ants (Formicidae), but also caterpillars, beetles and their larvae (Coleoptera, including curculionids), crickets (Orthoptera), flies (Diptera), homopteran bugs, Neuroptera larvae; spiders (Araneae); small reptiles. In one study, c. 50% of diet was plant material, from at least 15 species. Forages singly, in pairs and in small parties of 5–6 individuals; searches among twigs and leaves as other white-eyes, on trunks in manner of nuthatches (*Sitta*) and woodpeckers (Picidae), and on the ground in manner of *Erethacus* robins. This diversity of feeding ecology may have developed in absence of other small passerines; adapted for both an arboreal and terrestrial foraging (has long tarsi and strong toes and claws), the latter particularly in non-breeding season.

Breeding. Mar–Jun, mostly May, 1 record Feb, and young being fed by adults in Aug; sometimes double-brooded. Mating system little known, but year-long pair-bond suggested by observations of roosting birds in twos (probably pairs); apparently no territorial song, and may occur in small parties in breeding season. Both sexes participate in building nest, a crudely shaped deep cup, external diameter 98 × 103 mm and depth 72 mm, internal diameter 59 × 66 mm and depth 46 mm, outer layer of dead leaves, coarse grasses, pine needles and moss, some twigs, bark and plant down, inner wall mainly of long fibres, stems and rootlets, locally with goat wool and albatross (Diomedidae) feathers, placed 1–12 m (mean 6 m) above ground in tree, in one study 70% placed in dominant *Shima* trees, but introduced trees also utilized. Clutch 1–4 eggs, usually 2, pale greenish-blue with brown spots mainly at large end, 19–20 × 15–16 mm; incubation of eggs and feeding of chicks by both sexes, no information on duration of these periods.

Movements. Post-breeding dispersal throughout most of range, and in non-breeding season found almost everywhere on Haha-jima. Unconfirmed reports of birds moving from Haha-jima to other islands in the group in autumn and summer.

Status and Conservation. VULNERABLE. Nominat race probably Extinct. Historically reported from three island groups in the archipelago. In 1930 nominat race already extinct on Nakôdo-jima, in N group (Mukojima chain) of Bonins, when also last specimens taken on Muko-jima; not found in 1941 on latter island. S race *hahasima* known to survive in total area of less than 100 km², distributed across five or fewer sites in S group (Hahajima chain), with main stronghold on Haha-jima (little over 20 km²), where population estimated at maximum of 3000–4000 individuals in 1969 and about same in 1974; 3.3–4.5 pairs/ha in 1995/96. Status in C group (Chichijima chain) unclear; there were rumours in 1987 of its continued existence or, more likely, of its reintroduction on Chichi-jima. Decline in numbers of this species the result of historical clearance of primary forest, and presently tourism and infrastructural development pose continued threats to remaining secondary forest. On smaller islands in particular, introduced cats and rats (*Rattus*) could also be a serious threat; in addition, *Zosterops japonicus* was introduced in c. 1900–1910, and the two species share habitat and diet, but a study in 1995–1997 revealed no negative ecological interaction between the two species. This zosteropid has been protected as a National Endangered Species since 1993; Bonin Is, known also as the Ogasawara Is, are a National Wildlife Protection Area, established mainly for the conservation of the white-eye. Perhaps better regarded as Endangered.
Bibliography. Anon. (2007n), Brazil (1991), Butchart & Stattersfield (2004), Collar *et al.* (2001), Deignan (1958), Higuchi, Nakane & Maru (1993), Higuchi, Nakane & Suzuki (1984), Inskipp *et al.* (1996), Kawakami & Higuchi (2002, 2003), Kittlitz (1830), Morioka & Sakane (1978), Sibley & Monroe (1990), Sonobe (1982), Springer *et al.* (1995), Stattersfield & Capper (2000), Suzuki (1993), Suzuki & Morioka (2005), Suzuki *et al.* (1999), Yamashina (1930).

Genus *TEPHROZOSTEROPS* Stresemann, 1931

81. Bicoloured White-eye

Tephrozosterops stalker

French: Zostérops de Stalker **German:** Kakopibrillenvogel **Spanish:** Antojitos Bicolor
Other common names: Bicolored/Rufescent Dark-eye, Rufescent/Stalker’s/Karopi/Ceram White-eye

Taxonomy. *Tephros stalkerii* Ogilvie-Grant, 1910, Gunung Karopi, central Seram. Genus may be closely related to *Zosterops* (possibly closest to *Z. cinereus*), differing from it only in colour (complete absence of green and yellow pigments) and size (somewhat larger). Monotypic.
Distribution. W & C Seram (Ahiolo and Manusela), in S Moluccas.



Descriptive notes. 12–13 cm; male 17 g, female 20 g, unsexed 15–21 g. Plain white-eye with few obvious features. Plumage is rusty brown above, with slightly more rufous outer edges of blackish-brown remiges and rectrices; lores and ear-coverts slightly paler and more greyish; white below, tinged brown on flanks and thighs, pale yellowish tinge on undertail-coverts; axillaries pure white; iris reddish-brown to brown; bill dark horn-black; legs grey-blue. Sexes similar. Juvenile undescribed. **VOICE.** No information.

Habitat. Forest edge, in dense secondary growth and patches with epiphytes; scrub, edges of clearings; areas of overgrown cultivation. At 500–1200 m; mainly 650–950 m at Manusela.

Food and Feeding. Seeds, berries; insects, including beetles (Coleoptera). Singly and in twos, inconspicuous; often in mixed-species foraging flocks, particular with *Zosterops stalkerii*.

Breeding. Adult feeding young in Aug. No other information.

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species: present in Seram EBA. Moderately common within its rather narrow altitudinal range.

Bibliography. Bowler & Taylor (1989a, 1993b), Coates & Bishop (1997), Inskipp *et al.* (1996), Mayr (1967), Mees (1953b, 1969), Sibley & Monroe (1990), Stattersfield *et al.* (1998), Stresemann (1914a), White & Bruce (1886).

Genus *MADANGA*

Rothschild & E. J. O. Hartert, 1923

82. Rufous-throated White-eye

Madanga ruficollis

French: Zostérops à gorge rousse

Spanish: Antojitos Golirrojo

German: Orangekehl-Brillenvogel

Other common names: Rufous-collared/Madanga White-eye, Buru Mountain White-eye, Rufous-throated Dark-eye

Taxonomy. *Madanga ruficollis* Rothschild and E. J. O. Hartert, 1923, Wa Fehat, Buru. Monotypic genus, with no obvious close relatives; perhaps closest to *Lophozosterops* and *Tephrozosterops*. Monotypic.

Distribution. W & C Buru (Mt Kapalatmada and Mada Range), in S Moluccas.



Descriptive notes. 13 cm. Has light greyish-olive crown, side of head and nape, paler on forehead and lores; rudimentary pale eyering consisting of very short scaly feathers; upperparts yellowish-green, remiges and rectrices browner with green edges; throat and upper chest bright cinnamon-rufous, rest of underparts dark greyish-olive, undertail-coverts yellowish-brown; iris black; bill blackish, paler base of lower mandible; legs pale brownish. Sexes alike but female considerably smaller. Juvenile undescribed. **VOICE.** No information.

Habitat. Montane forest at 820–1750 m, mainly above 1450 m; probably restricted to

small isolated pockets of elfin forest with strong epiphytic growth and stunted trees.

Food and Feeding. Few data; presumed to take invertebrates from bark and lichen. Forages in mixed-species flocks. Seen to climb up and down trunks in manner of a nuthatch (*Sitta*), for which pointed tail feathers and long strong toes appear to be adaptations.

Breeding. No information.

Movements. Not known.

Status and Conservation. **ENDANGERED.** Restricted-range species: present in Buru EBA. Uncommon and local. Four specimens collected in 1920s in mountains of W half of island. Revisited in 1990s, when two individuals observed in a mixed flock at Danau Rana, in far W; in 2006 a pair seen twice in C Buru. Although its montane habitat is supposedly secure, and the species is probably still common within its altitudinal range, habitat changes at Wa Fehat (noted in 1995), and its apparently very small population and range, make it very vulnerable. A nature reserve has been proposed.

Bibliography. Anon. (2007n), Butchart & Stattersfield (2004), Collar, Andreev *et al.* (2001), Collar, Crosby & Stattersfield (1994), Hartert (1924a), Inskipp *et al.* (1996), Mees (1969), Poulsen & Lambert (2000), Rheindt & Hutchinson (2007b), Robson (1996), Rothschild & Hartert (1923), Stattersfield & Capper (2000), Stattersfield *et al.* (1998), White & Bruce (1886).

Genus *LOPHOZOSTEROPS* E. J. O. Hartert, 1896

83. Grey-hooded White-eye

Lophozosterops pinaiae

French: Zostérops à froc gris **German:** Pinaibrillenvogel **Spanish:** Antojitos Cabecigris

Other common names: Seram/Pinaia/Brown-breasted White-eye, Grey-hooded Dark-eye

Taxonomy. *Oreosterops pinaiae* Stresemann, 1912, Mount Binaija, central Seram. Monotypic.

Distribution. Mountains of C Seram, in S Moluccas.



Descriptive notes. 14 cm; 25–30 g. Very large white-eye. Head and neck are deep olive-grey, with slight brownish tinge on crown and ear-coverts, merging on nape into green mantle and side of neck; forehead and supraloral region dirty white, lores pale grey, broad white eyering interrupted by pale grey loreal streak; flight-feathers and tail feathers blackish-brown, broadly margined green (except on primary P2); throat and side of breast deep greyish-olive, somewhat paler on chin, and becoming paler on flanks, which are washed with buff, and dirty whitish on middle of abdomen; undertail-coverts bright yellow; iris light red-

dish-brown; bill black, base of lower mandible dark yellowish-brown; legs brown-grey. Sexes alike. Juvenile undescribed. **VOICE.** No information.

Habitat. Montane forest at limits of tree-fern forest, 1100–2450 m; most common at higher elevations.

Food and Feeding. Feeds on insect larvae, berries, small fruits and seeds. Singly and in pairs at lower elevations, where occasionally present in mixed-species foraging flocks; in flocks of up to 20 or more individuals at higher elevations. Frequents canopy; forages in densely foliated tree crowns and in thick growths of arboreal epiphytes.

Breeding. No information.

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species: present in Seram EBA. Fairly common but local.

Bibliography. Bowler & Taylor (1989a), Coates & Bishop (1997), Hartert (1920), Inskipp *et al.* (1996), Mayr (1967), Mees (1953b, 1969), Stattersfield *et al.* (1998), Stresemann (1914a, 1931a), White & Bruce (1886).

84. Black-masked White-eye

Lophozosterops goodfellowi

French: Zostérops de Goodfellow

Spanish: Antojitos Enmascarado

German: Mindanaobrillenvogel

Other common names: Mindanao/Apo/Goodfellow's White-eye

Taxonomy. *Zosterops goodfellowi* E. J. O. Hartert, 1903, Mount Apo, Mindanao, Philippines. Forms a superspecies with *L. squamiceps* and *L. javanicus*; extremely close to black-faced races (*frontalis* and *elongatus*) of latter species. Three subspecies recognized.

Subspecies and Distribution.

L. g. malindangensis (Mearns, 1909) – W Mindanao (Mt Malindang), in S Philippine Is.

L. g. gracilis Mees, 1969 – NE Mindanao (Mt Hilong-Hilong, in Diuata Mts).

L. g. goodfellowi (E. J. O. Hartert, 1903) – C & S Mindanao (Mt Kitanglad, Mt McKinley, Mt Apo, Mt Matutum, Mt Mayo).



Descriptive notes. 13.3 cm; male 19.5 g, female 20.7 g, unsexed 18.2–22.3 g. Nominat race has forehead and supraloral region grey-brown, indistinct pale eyering (almost non-existent), lores and line to below eye black, greyish ear-coverts; crown, side of head, nape and upperparts dull olive-green; remiges and rectrices blackish, all with dull green outer margins, flight-feathers with whitish inner margins; chin and throat dirty white, gradually changing into greenish-grey on breast, and pale lemon-yellow on flanks and undertail-coverts; iris reddish-brown; bill black; legs greyish-olive, soles yellowish. Sexes alike. Juvenile has

much paler underparts and duller upperparts. Race *malindangensis* is close to nominate but smaller, has crown more greenish-grey (not same colour as back), darker ear-coverts, and slightly more brownish tint in grey of forehead and above lores; *gracilis* is on average smaller (except for bill), has brownish-tinged crown, light supercilium, darker green upperparts. **VOICE.** Musical whistle, “tu-pik chu-beer” and “su si deer”, the two often uttered together in a series.

Habitat. Submontane and montane forest and forest edge, from 1250 m to 2400 m.

Food and Feeding. No details of diet. In parties and in mixed flocks with *Hypocryptadius cinnamomeus*, *Zosterops montanus* and Black-and-cinnamon Fantail (*Rhipidura nigrocinnamomea*). Forages at all levels in vegetation.

Breeding. Birds with enlarged gonads in Feb–May. No other information.

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species: present in Mindanao and the Eastern Visayas EBA. Common to not uncommon, at least locally, e.g. common on Mt Kitanglad.

Bibliography. Delacour & Mayr (1946), Dickinson *et al.* (1991), Hachisuka (1930), Inskipp *et al.* (1996), Kennedy *et al.* (2000), Mayr (1967), McGregor (1909), Mees (1969), duPont (1971b), Rand & Rabor (1960), Sibley & Monroe (1990), Stresemann (1931a), Woods *et al.* (2003).

85. Scaly-headed White-eye

Lophozosterops squamiceps

French: Zostérops à tête rayée

Spanish: Antojitos Cabecirrayado

German: Schuppenkopf-Brillenvogel

Other common names: Streak(y)-headed Darkeye/White-eye, Celebes Grey-throated/Celebes Mountain White-eye, Scaly-crowned White-eye

Taxonomy. *Chlorocharis squamiceps* E. J. O. Hartert, 1896, Bonthain Peak, south Sulawesi. Forms a superspecies with *L. goodfellowi* and *L. javanicus*; race *heinrichi* resembles latter very closely. Six subspecies recognized.

Subspecies and Distribution.

L. s. heinrichi (Stresemann, 1931) – Tentolo-Matatin Mts, in NW Sulawesi.

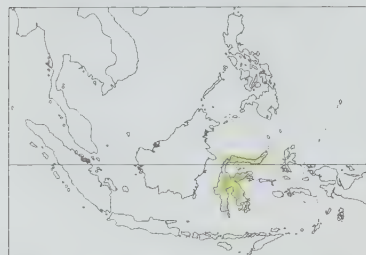
L. s. striaticeps Riley, 1918 – mountains of NC Sulawesi.

L. s. stresemanni (van Marle, 1940) – Mt Ambang and Mt Soputan, in NE Sulawesi.

L. s. stachyrinus (Stresemann, 1932) – Latimojong Mts, in SC Sulawesi.

L. s. squamiceps (E. J. O. Hartert, 1896) – Bonthain Peak (Lompobatang Mts), in S Sulawesi.

L. s. analogus (Stresemann, 1932) – Mengkoka Mts, in SE Sulawesi.



Descriptive notes. 12 cm; 14–15 g. N nominate race has crown dark sepia, becoming lighter inwards, feathers having grey base, white shaft streak and white edges at tip, sides of head grey; upperparts olive-green; throat and upper breast whitish, feathers with very narrow sepia outer edges, greyish-white of lower breast changing smoothly into yellow below, with distinctly greener flanks; iris dark red-brown; bill black; legs bluish-grey or green, soles yellow. Sexes similar. Juvenile with crown tinged greenish, and perhaps slightly paler yellow underparts. Races vary mainly in size and in plumage coloration: *striaticeps* has

buffy-white throat, narrower white shaft streaks, and grey edges of crown feathers; *analogus* is smallest (with next race), has white throat lacking black scaly feather edges; *heinrichi* is smallest (with preceding race), has greyish-sepia crown with broad grey edges and inconspicuous white shaft streaks; *stresemanni* has more boldly patterned sepia crown, broadly bordered with grey and with both shafts and adjacent median parts of feathers boldly white; *stachyrinus* is largest race, similar to nominate but with broader white shaft streaks and no white edges at tips of crown feathers. Voice. Song a warbled series, lasting 4–5 seconds, consisting of loud, clear, sibilant high-pitched notes, repeated at intervals of 5–9 seconds (or much less frequently). Generally silent, but occasionally a harsh chirruping trill.

Habitat. Primary montane forest and forest edge and secondary growth, at 1000–2500 m; absent from fragmented bush zone of tallest peaks.

Food and Feeding. Diet includes fruits. In pairs and small groups; often in mixed-species foraging flocks in association with *Zosterops montanus*, *Zosterops atrifrons*, Sulawesi Leaf-warbler (*Phylloscopus sarasinorum*), Island Verditer-flycatcher (*Eumyias panayensis*) and Citrine Canary-flycatcher (*Culicicapa helianthea*), Rusty-bellied Fantail (*Rhipidura teysmanni*), and Yellow-sided (*Dicaeum aureolimbatum*) and Grey-sided Flowerpeckers (*Dicaeum celebicum*). Forages mainly in canopy, but ranges down to understorey. Appears to use probing techniques more than gleaning.

Breeding. No information.

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species: present in Sulawesi EBA. Generally widespread and common. Not uncommon in C Sulawesi; apparently of restricted distribution in NE Sulawesi. Occurs in Lore Lindu National Park.

Bibliography. van den Berg & Bosman (1986), Coates & Bishop (1997), Holmes & Philipps (1996), Inskipp *et al.* (1996), Mees (1969), Riley & Mole (2001), Rozendaal & Dekker (1989), Sibley & Monroe (1990), Stresemann & Heinrich (1940b), Watling (1983), White & Bruce (1986).

86. Javan Grey-throated White-eye

Lophozosterops javanicus

French: Zostérops javanais **German:** Javabrillenvogel **Spanish:** Antojitos de Java

Other common names: Grey-throated Dark-eye/Black-eye/Tufted-eye, Grey-throated(!)/Javan White-eye

Taxonomy. *Sylvia Javanica* Horsfield, 1821, Java.

Forms a superspecies with *L. goodfellowi* and *L. squamiceps*. Races appear to intergrade; also, a individual with characters typical of nominate race has been found within area occupied by *frontalis*. Three subspecies recognized.

Subspecies and Distribution.

L. j. frontalis (Reichenbach, 1852) – extreme W Java (Mt Karang, Mt Salak, Mt Gede-Pangrango).

L. j. javanicus (Horsfield, 1821) – Java except extreme W and extreme E.

L. j. elongatus (Stresemann, 1913) – extreme E part of Java (Mt Ijen) and Bali.



Descriptive notes. 13 cm. N nominate race has forehead, lores and supercilium creamy white, white eyering narrow below eye and slightly wider above; crown, side of head and nape dark olive-grey, upperparts olive-green; remiges and rectrices blackish-brown with olive-green outer margins; throat pale greyish, feathers slightly mottled yellowish-white; breast greyish-white, changing into yellow on belly, brighter yellowish-citrine on flanks and breast side; iris brown; bill greyish-black; legs greenish-yellow, grey or greenish-brown. Sexes similar. Juvenile has greenish tinge on crown and nape. Race *frontalis* has blackish loreal

patch, narrow at front, posteriorly as wide as eye, and broadly interrupting narrow white eyering, a narrow band of pale buff feathers (tinged ochre near nostril) runs from forehead to above anterior part of eye; *elongatus* is similar to previous, but has slightly larger bill (most pronounced on Bali), longer supercilium with less ochre tinge, and dark lores extending through eyering to just behind eye. Voice. Song composed of melodious whistles and call notes. Loud, high, long-drawn cheeping, rather throaty “turr”, “teerrrr-teerrrr”, or “chee-ee-weet-chee-ee-weeeet”.

Habitat. Forest, dense secondary growth, neglected tea plantations, farmland, in mountains above 900 m; most commonly seen in top zones of mountains.

Food and Feeding. Fruits and nectar; also beetles (Coleoptera) and caterpillars. Fruits taken from the trees *Myrica javanica*, *Eurya acuminata*, the herb *Polygonum chinense*, shrubs *Rubus lineatus*, *Rubus fraxinifolius*, *Rubus moluccanus*, *Schefflera lucescens*, *Gaultheria*, *Vaccinium varingiaefolium* and *Viburnum coriaceum*; nectar of the mistletoe *Scurrula lepidota*, and shrubs *Vaccinium varingiaefolium* and *Vaccinium laurifolium*. In pairs and small flocks; joins mixed-species flocks, especially those with Mountain Leaf-warbler (*Phylloscopus trivirgatus*), but also White-browed Shrike-babbler (*Pteruthius flaviscapis*), Sunda Warbler (*Seicercus grammiceps*) and others. Forages mostly in canopy of not too tall trees, high in forest edge and interior at lower elevations.

Breeding. Jan and Mar–Dec. Nest a rather solidly built spherical cup 6–9 cm in diameter, 4–14 cm high and 2.5–4.5 cm deep, of thin fibres, leaf strips, rootlets and the like, covered externally with various mosses, pale green beard lichen (*Usnea*) (this sometimes the most important nest material), usually firmly attached to fork or between various vertical branches in tree or shrub (e.g. *Anaphalis*

javanica) in or near dense forest, and usually high up but sometimes only a few metres above ground. Clutch 2 eggs, fine pale bluish-green or rather deep blue, 18.3 × 13.5 mm. No information on incubation and nestling periods.

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species: present in Java and Bali Forests EBA. Common on mountains throughout Java. Very common above 1000 m on Bali. Occurs in Gunung Gede-Pangrango National Park.

Bibliography. Becking (1989), Docters van Leeuwen, H. (1929), Docters van Leeuwen, W.M. (1933), Hellebrekers & Hoogerwerf (1967), Holmes & Nash (1989), Hoogerwerf (1949, 1950), Inskipp *et al.* (1996), Kuroda (1933a), MacKinnon & Philipps (1993), Mees (1969, 1996), Sibley & Monroe (1990), Stattersfield *et al.* (1998).

87. Yellow-browed White-eye

Lophozosterops superciliaris

French: Zostérops à sourcils

German: Gelbbrauen-Brillenvogel

Spanish: Antojitos Cejiamarillo

Other common names: Eye-browed/White-browed White-eye, Yellow-browed Darkeye, Lesser Sunda Mountain White-eye

Taxonomy. *Zosterops superciliaris* E. J. O. Hartert, 1897, south Flores, Lesser Sundas.

Apparently closest to *L. dohertyi*. Two subspecies recognized.

Subspecies and Distribution.

L. s. harterianus (Rensch, 1928) – mountains of Sumbawa, in W Lesser Sunda Is.

L. s. superciliaris (E. J. O. Hartert, 1897) – mountains of Flores, in WC Lesser Sunda Is.



Descriptive notes. 13 cm. N nominate race has crown and upperparts dull olive-green, forehead and anterior part of crown tinged with fuscous; lores and broad superciliary stripe extending well behind eye pale yellow, accentuated by ill-defined blackish stripe from crown; side of head pale greyish-olive, narrow but complete white eyering; remiges and rectrices blackish-brown, broadly edged dull olive-green; dull yellowish-green below, most yellow on throat and centrally, greenest on sides; iris brownish-red; bill black; legs yellowish-grey. Sexes similar. Juvenile is duller than adult, less distinctly marked, and superciliary stripe not developed. Race *harterianus* has deeper yellow eyebrow than nominate. Voice. N nominate race gives rapid series of fairly high-pitched, bubbling, sometimes almost trilled, warbled notes (run together) interspersed with occasional brief “tchee-tchee”, the whole lasting for 6–17 seconds; also a ringing “peu-peu”.

Habitat. Mainly primary upper montane semi-evergreen rainforest; also casuarina (*Casuarina*) forest, logged and naturally degraded forest, forest edge, scrub, also very thin secondary growth; 1000–2140 m.

Food and Feeding. No details of diet. Usually in small groups, occasionally in larger parties, once a flock of 56 observed on Flores; often joins mixed-species flocks. Forages quietly in middle storey.

Breeding. Courtship feeding in Sept on Flores, and fledgling in Nov. A nest believed to belong to this species consisted mainly of narrow strips of bark and winged seeds of casuarina, built in fork of branch in casuarina forest. No other information.

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species: present in Northern Nusa Tenggara EBA. Common on Flores; thought to be much rarer on Sumbawa, but in recent survey found to be locally common, and presumably common in remaining montane forest. In view of its tolerance of logged and degraded forest, extent of forest remaining within its altitudinal range, and its refuge in higher-altitude montane forest, this species is thought not likely to be at any serious risk in the near future.

Bibliography. Butchart *et al.* (1996), Coates & Bishop (1997), Hartert (1897a, 1897b), Inskipp *et al.* (1996), Johnstone & Jepson (1996), Mees (1969, 2006), Pilgrim *et al.* (1997, 2000), Schmutz (1977), Stattersfield *et al.* (1998), Strange (2001), Verhoeve & Holmes (1999), White & Bruce (1986).

88. Crested White-eye

Lophozosterops dohertyi

French: Zostérops de Doherty

German: Schopbrillenvogel

Spanish: Antojitos Crestado

Other common names: Dark-crowned/Doherty's White-eye, Crested Dark-eye

Taxonomy. *Lophozosterops dohertyi* E. J. O. Hartert, 1896, Tambora, Sumbawa, Lesser Sundas.

Apparently closest to *L. superciliaris*. The short, rather inconspicuous crest and spotted eggs are unique within family. Two subspecies recognized.

Subspecies and Distribution.

L. d. dohertyi E. J. O. Hartert, 1896 – hills of Sumbawa and Satonda, in W Lesser Sunda Is.

L. d. subcristatus E. J. O. Hartert, 1897 – hills of Flores, in WC Lesser Sunda Is.



Descriptive notes. 12 cm. N nominate race has top of head blackish olive-brown, elongated crown feathers with sharply defined white dots in centres, spots becoming brownish and obsolete on hindcrown; narrow white eyering broken broadly at front, by black loreal streak, and narrowly at rear; blackish feathers at side of forehead, elongate yellowish spot behind eye, olive ear-coverts; upperparts, including upperwing-coverts, greyish-olive; remiges and rectrices blackish-brown with greenish outer edges; sulphur-yellow below, colour most intense on centre of belly and grading into yellowish-white on throat and chin; iris dark

brown; bill black; legs yellowish-grey. Sexes alike. Juvenile undescribed. Race *subcristatus* has shorter crest than nominate, paler crown sharply spotted only on forehead, yellow ear-coverts. Voice. On Flores (race *subcristatus*) distinctive and moderately rapid song of 14 clear, sweet whistles at even pitch, the series 5 seconds in duration, quite unlike typical white-eye notes and almost like those of *Turdus* thrush in quality; also a soft “tsip-tsip”.

Habitat. Primary semi-evergreen rainforest, tall secondary forest, wooded cultivation and scrub; degraded *Duabanga* forest and montane forest. Found in degraded forest only where closed canopy and extensive understorey remain. At 200–1400 m. Generally replaced by *L. supercilialis* above 1200 m.

Food and Feeding. No details of diet. Singly, in pairs and in groups of three or four individuals; often in mixed-species flocks with *Heleia crassirostris*. Forages quietly in understorey and dense scrub.

Breeding. Jul–Aug on Sumbawa; and Feb–Oct (peak May–Jun) on Flores. Clutch 2 eggs, sometimes 1 and rarely 3, light blue, sparsely to moderately dotted with variously sized coffee-brown spots, densest on blunt half, 17.9 × 13.6 mm. No other information available.

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species: present in Northern Nusa Tenggara EBA. Locally common in primary forest at 700–1000 m; generally scarce to rare in wooded cultivation and scrub. Optimum habitat for this species being lost at fast rate on Flores and Sumbawa, and it appears to be only moderately tolerant of degradation of habitat. Perhaps should be classified as Near-threatened.

Bibliography. Butchart *et al.* (1996), Coates & Bishop (1997), Hartert (1896, 1897a), Inskipp *et al.* (1996), Johnstone & Jepson (1996), Mees (1969, 2006), Pilgrim *et al.* (1997, 2000), Stattersfield *et al.* (1998), Strange (2001), Trainor (2002a), Verheijen (1964), Verhoye & Holmes (1999), White & Bruce (1986).

Genus *OCULOCINCTA* Mees, 1953

89. Pygmy White-eye

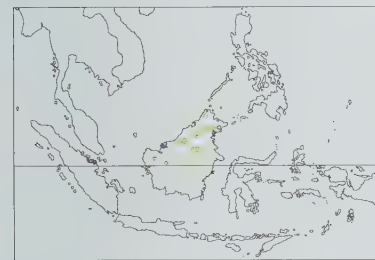
Oculocincta squamifrons

French: Zostérops pygmée **German:** Zwergbrillenvogel **Spanish:** Antejitos Pigmeo
Other common names: Pygmy Grey White-eye

Taxonomy. *Zosterops squamifrons* Sharpe, 1892, Mount Dulit, Sarawak, Borneo.

Genus closest to *Lophozosterops*. Monotypic.

Distribution. Hills and mountains of Borneo, ranging from Mt Kinabalu S along spinal chain to Mt Kenepai, and including Mt Magdalena, Kelabit Plateau, Mt Dulit, Hose Mts, Mt Penrissen, Long Laat, and Bangau.



Descriptive notes. 9–9.5 cm; three unsexed specimens 6.5–7.1 g. Plumage is olive-brown above, forehead with white-edged feathers (giving unkempt look); thin white eyering; greyish throat, yellowish-white underparts; iris greyish or buff-white; bill brownish-black; legs pale greyish or greenish. Sexes similar. Juvenile undescribed. Voice. Described as “chit-chit-chit”, or high-pitched “tsee-tsee...”.

Habitat. Hill forest and lower montane moss forest, especially edge vegetation, kerangas forest, sandy forest with dwarf vegetation, village clearings, secondary growth, dry scrub. Mostly above 800 m, and generally 550–1000 m, but

recorded to 2150 m; occasionally down to low altitudes (rarely to 50 m) in mixed dipterocarp forest.

Food and Feeding. Small fruits, small white and green berries, seeds; tiny insects also taken. Seen in flocks of 4–8 or more individuals; associates with White-bellied Erpornis (*Erpornis zantholeuca*), Chestnut-crowned Yuhina (*Staphida everetti*), other white-eyes and cuckoo-doves (*Macropygia*) when feeding on berries. Forages in crowns of tall trees, also in middle storey in edge vegetation; fast-moving, not settling anywhere for long. Uses foliage-gleaning in low growth. Will approach humans and cattle very closely in dense scrub.

Breeding. Males with enlarged testes in Jun and Jul. No other information.

Movements. Resident; wanders in search of fruiting trees.

Status and Conservation. Not globally threatened. Restricted-range species: present in Bornean Mountains EBA. Locally quite common, but inconspicuous. Fairly common in Kelabit Highlands.

Bibliography. Davison (1992), Hitoshi *et al.* (1996), Inskipp *et al.* (1996), Jenkins & de Silva (1996), MacKinnon & Phillipps (1993), Marsh (1989), Mees (1953b, 1954, 1969), Pfeiffer (1961), Sheldon *et al.* (2001), Smythies (1957), Smythies & Cranbrook (1981), Smythies & Davison (1999), Stattersfield *et al.* (1998), Wilkinson *et al.* (1991).

Genus *HELEIA* Hartlaub, 1865

90. Spot-breasted White-eye

Heleia muelleri

French: Zostérops de Timor **German:** Fleckenbrust-Brillenvogel **Spanish:** Antejitos de Timor
Other common names: Spot-breasted Dark-eye, Streak-breasted/Timor White-eye

Taxonomy. *H[eleia] Müller* Hartlaub, 1865, Timor.

Possibly forms a superspecies with *H. crassirostris*, but the two seem to be very well differentiated in plumage and vocalizations. Monotypic.

Distribution. Timor, in Lesser Sunda Is.

Descriptive notes. 13.5 cm. Has forehead and crown black with yellowish-green feather edges; lemon-yellow supercilium, a number of minute pale yellow feathers on eyelids (but not forming eyering), broad black lore stripe; black on nape gradually merging into uniform deep olive of upperparts; remiges and rectrices blackish-brown, broadly edged green; throat bright yellow, underparts yellowish-white with large dark grey spots, bolder on breast; iris red-brown; bill greyish-black; legs greenish-grey to grey-blue. Sexes alike. Juvenile is duller than adult, black crown mottling and dark breast spotting almost absent. Voice. Unmusical rattle lasting for 3–4 seconds, consisting of 10–20 very rapid mechanical notes initially rising and then falling; also a harsh but weak grating noise.

Habitat. Primary and tall secondary monsoon and evergreen forest, including some remnant patches, also woodland; appears to favour lower-lying areas with closed-canopy forest. Lowlands to 1300 m.



Wetar EBA. Uncommon and local, occasionally moderately common; apparently rare in E Timor, with only known recent sight record in Aug 1972. In W Timor found at all five major study sites in 1993, especially in evergreen forest at 1000 m. Although apparently not at immediate risk in W parts of range, further forest destruction could change this situation.

Bibliography. Anon. (2007n), Butchart & Stattersfield (2004), Coates & Bishop (1997), Collar & Andrew (1988), Gadow (1884), Inskipp *et al.* (1996), Mayr (1944a), Mees (1969), Noske (2003), Noske & Saleh (1996), Sibley & Monroe (1990), Stattersfield & Capper (2000), Stattersfield *et al.* (1998), White & Bruce (1986).

91. Thick-billed White-eye

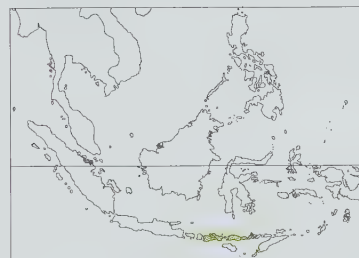
Heleia crassirostris

French: Zostérops à bec fort **German:** Nacktaugen-Brillenvogel **Spanish:** Antejitos Picogordo
Other common names: Lesser Sunda Lowland White-eye, Sunda/Stripe-headed/Flores White-eye

Taxonomy. *Zosterops crassirostris* E. J. O. Hartert, 1897, south Flores, Lesser Sundas.

Possibly forms a superspecies with *H. muelleri*, but the two seem to be very well differentiated in plumage and vocalizations. Birds from Sumbawa perhaps slightly larger and with perhaps more cream colour on crown, sometimes separated as *junior* (described from Batu Dulang), but differences from Flores birds considered insufficient to warrant naming of geographical races. Monotypic.

Distribution. Sumbawa and Flores (Lesser Sunda Is).



Descriptive notes. 13.5 cm. Has creamy-white forehead, black forecrown with creamy-white feather edges, black on lores and broad ring below eye (forming blackish face mask), eyering consisting of tiny black feathers implanted on rim of eye, black ear-coverts; bare area below blackish, above and particularly behind eye; hindcrown and upperparts dark olive brown; plain underparts whitish-buff with very pale yellow tinge; iris brown-white to yellow; bill pale grey; legs reddish-grey. Differs clearly from *H. muelleri* in plumage pattern and in heavier bill. Sexes alike. Juvenile has uniformly buff forehead and crown. Voice. Song a very rapid

series of loudly whistled, almost trilled notes on even pitch, repeated at c. 4 notes per second, each bout lasting c. 6 seconds, more like song of a whistler (*Pachycephala*) than of a white-eye; described also as a mellow, melancholy whistle interspersed with single trilled notes, each phrase starting hesitantly, working up to trill at end; longer phrases have several trills separated by longer whistles, with abrupt changes in pitch. Contact call a quiet, deep, unobtrusive “chup...chup...”.

Habitat. Mainly primary and degraded semi-evergreen rainforest and moist deciduous monsoon forest; also degraded forest edge, dry forest and *Eupatorium* scrub. Wide altitudinal range, 50–2000 m.

Food and Feeding. No details of diet. Usually in groups of up to five individuals, also singly and in pairs; often in mixed-species flocks. Forages in understorey and lower middle storey. Gleans along slender branches and fine twigs.

Breeding. Adults with brood patch and carrying nesting material in early Aug on Sumbawa; season Mar–Oct (peak Apr–Jun) on Flores. Clutch 1–4 eggs, normally 2 or 3, usually white, occasionally pale blue, 19.1 × 13.9 mm. No other information.

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species: present in Northern Nusa Tenggara EBA. Generally uncommon to rare; locally moderately common. Occurs in very low densities. Moderate tolerance of degraded and dry forest indicate that it is presently not at any immediate risk; because of great pressure from small-scale agriculture on forests in lower half of its altitudinal range, this species should be closely monitored.

Bibliography. Butchart *et al.* (1996), Coates & Bishop (1997), Hartert (1897a, 1897b), Inskipp *et al.* (1996), Mees (1969, 2006), Pilgrim *et al.* (1997, 2000), Stattersfield *et al.* (1998), Strange (2001), Trainor (2002a), Verheijen (1964), Verhoye & Holmes (1999), White & Bruce (1986).

Genus *CHLOROCHARIS* Sharpe, 1888

92. Mountain Black-eye

Chlorocharis emiliae

French: Zostérops à lunettes noires **Spanish:** Antejitos Ojinegro
German: Schwarzzring-Brillenvogel

Other common names: (Olive) Black-eye

Taxonomy. *Chlorocharis emiliae* Sharpe, 1888, Mount Kinabalu, Borneo.

Geographical variation somewhat clinal, from large, long-tailed and dark in N of range to smaller, relatively shorter-tailed and paler in S. Four subspecies recognized.

Subspecies and Distribution.

C. e. emiliae Sharpe, 1888 – Mt Tambuyukon and Mt Kinabalu, in N Borneo.

C. e. fusciceps Mees, 1954 – Maga Mts (S part of Crocker Range), in N Borneo.

C. e. trinitiae Harrison, 1957 – Mt Trus Madi, in N Borneo.

C. e. moultoni Chasen & Kloss, 1927 – mountains of N & W Borneo: Mulu, Murud, Tama Abu Range and Poi (Pueh) Range (in Sarawak) and Mt Niyut (in W Kalimantan).



Descriptive notes. 11–12 cm; one unsexed specimen 13.9 g. Nominative race has top of head and upperparts dark olive-green with distinct blackish cast (blackish very pronounced on crown, least so on rump); black lores connected to black ring around eye, this black mask bordered with lighter yellow area of variable width; below, plumage somewhat lighter and more yellowish than upperparts, especially centrally; iris brown; bill brown above, yellowish-orange below; legs dark yellowish-brown to blackish, soles yellow. Sexes alike. Immature has brown iris and dull orange to blackish bill. Races vary in darkness of plumage and in size: *trinitae* is like nominate, but brighter and more yellow, with almost pure yellow belly, more yellow at side of head; *moultoni* is smaller, relatively shorter-tailed, lighter, and more yellowish in colour; *fusciceps* is like last, but somewhat darker, more sepia-coloured on crown and forehead. Voice. Song, often heard in dawn choruses, a melodious “wit-a-wit, wit wit wheer”, not unlike that of a *Turdus* thrush. Twittering call notes “twit-u” or “stwet-u”, or “te-wio”; in flight jangling calls and a stuttering “guguguju”.

Habitat. Montane moss forest and stunted growth at higher elevations. On Mt Kinabalu above 3300 m predominantly heathers (*Erica*), conifers, rhododendrons (*Rhododendron*), pitcher plants, mosses, lichens, etc., mostly up to 10 m tall, with few trees in sheltered gulleys; at 3800–4200 m habitat becomes bare rock with little pockets and clefts with stunted heather, moss, and the like. Found throughout this habitat from treetops to near ground, and in dwarf clumps of heather close to bare summit. From 1650 m to 4000 m Mt Kinabalu; from 1250 m but chiefly above 1600 m on Mt Mulu; 1550–2600 m on Trus Madi, and 1850–2250 m on Tambuyukon.

Food and Feeding. Insects and vegetable matter. Insects preferred, include e.g. grasshoppers (Orthoptera), perhaps ants (Formicidae). Vegetable matter taken only very sparingly (even when stomach empty), includes small fruits (*Rubus*), nectar (*Schima*, pink to dark red flowers of *Rhododendron acuminatum* and *Rhododendron buxifolium*, *Eugenia*, and sometimes *Elaeocarpus*), possibly pollen; pierces flowers of *Rhododendron rugosum* in search of nectar. In pairs or in small flocks of up to five individuals. Forages in tree crowns and lower, down to small bushes. Insects taken from hanging inflorescences, bunches of new leaves, thick lichen and among foliage.

Breeding. Feb–Mar, Jun and Sept. Nest a rather flat compact cup of tendrils and coarse dead grasses with some lichens and staghorn moss (*Lycopodium*), heather roots incorporated, lined with finer grasses and moss fibres of brilliant orange colour (giving vivid and unusual effect); built at 1–8 m in fork in branches of *Leptospermum* tree in dense heath. No other information.

Movements. Some vertical movement; downhill movements during droughts, e.g. in 1983 recorded at 1500 m on Kinabalu.

Status and Conservation. Not globally threatened. Restricted-range species: present in Bornean Mountains EBA. Locally common; much the commonest bird species above 2300 m on Trus Madi and above 3300 m on Mt Kinabalu. Very localized in W of range (Mt Poi and Mt Niyut).

Bibliography. Allen & Berwick (1958), Argent (1985), Davison (1992), Davison & Chew (1996), Davison (1992), Harrison (1956a, 1956b), Hitoshi *et al.* (1996), Inskipp *et al.* (1996), Jenkins & de Silva (1996), MacKinnon & Philipps (1993), Mees (1954, 1969), Prieme & Heegaard (1988), Sheldon & Francis (1985), Sheldon *et al.* (2001), Smythies (1957), Smythies & Cranbrook (1981), Smythies & Davison (1999), Steinheimer (1999), Strange (2001).

Genus *MEGAZOSTEROPS* Stresemann, 1930

93. Giant White-eye

Megazosterops palauensis

French: Zostérops des Palau **German:** Bronzebrillenvogel **Spanish:** Antojitos de las Palaos
Other common names: Palau (Greater)/Large Palau White-eye

Taxonomy. *Cleptornis palauensis* Reichenow, 1915, Babeldaob, Palau.

Rather atypical member of the family. Has sometimes been placed in genus *Rukia*. Monotypic.

Distribution. Palau Is (Babeldaob, Urukthapel and Peleliu).



Descriptive notes. 13.5–14 cm. Large, relatively dull white-eye with heavy bill. Has pale yellowish supercilium from before eye, widening backwards, narrow indistinct pale yellow eyering, and dusky loreal area leading to dark greyish ear-coverts with irregular pale yellow mottling; dark fulvous olive above, crown feathers greyish towards bases (giving mottled appearance); pale fulvous olive below, flanks slightly more buffy; iris greyish to dark rufous-brown; bill pale brown above, orange-yellow below; legs tawny or olive-green, soles yellowish. Sexes alike. Juvenile undescribed. Voice. Song one of the most bizarre, some downward-inflected strained

whistles followed by long trill or rhythmic rattling, surging in intensity while simultaneously upslurred whistles, trills and descending siren-like slurs uttered polyphonically; altogether sounding like two canaries (*Serinus*) singing at same time. Calls include harsh scolding chatter, also loud grating calls during mutual chases; short sibilant downslurred whistle during feeding or in flight.

Habitat. Native forests and *Leucaena* thickets.

Food and Feeding. Caterpillars, ants (Formicidae); also fruits, and nectar from flowering trees. Reportedly lives solitary or in pairs, usually not travelling in flocks, although may apparently form flocks in Dec. Forages in tops of low trees and brambles, preferring upper part of tall vine-draped trees; also feeds in vine tangles close to ground.

Breeding. No information.

Movements. Not known.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Palau EBA. Fairly common to abundant on Peleliu in rela-

tively undisturbed jungle, common on Urukthapel. Apparently only one record from Babeldaob. Total population in 1991 estimated at 13,876 individuals. Absence from neighbouring islands of Palau Group (e.g. Koror, Eil Malk) difficult to explain. Population possibly declining as a result of gradual habitat loss. Introduction of predators could have serious adverse effects; in particular, arrival of brown tree-snake (*Boiga irregularis*), which has caused extinctions on other Pacific islands, would have devastating effect on present species' numbers.

Bibliography. Anon. (2007n), Baker (1951), Butchart & Stattersfield (2004), Craig (1999), Engbring (1988), Greenway (1958), Lack (1971), Marshall (1949), Mayr (1945b), Mees (1969), Owen (1977), Pratt, Bruner & Berret (1979, 1987), Pratt, Engbring *et al.* (1980), Reichenow (1915), Stattersfield & Capper (2000).

Genus *SPEIROPS* Reichenbach, 1852

94. Bioko Speirops

Speirops brunneus

French: Zostérops de Fernando Po

Spanish: Antojitos de Fernando Póo

German: Braunbrillenvogel

Other common names: Fernando Po Speirops

Taxonomy. *Speirops brunnea* Salvadori, 1903, Bioko.

Monotypic.

Distribution. Pico Basilé (Mt Malabo), in NC Bioko I (Fernando Póo).



Descriptive notes. 13–13.5 cm; 14–18.5 g. Has top of head dark brown, darkest on crown, pale narrow line at base of upper mandible, reddish tinge on nape and hindneck; cheek and ear-coverts greyish-brown; upperparts brown, less dark than crown, flight-feathers blackish-brown, edged rusty, tail feathers dark brown above and blackish below; underside brown, slightly paler than back, more greyish on chin and upper throat, and slightly paler on belly and undertail-coverts; underside of remiges dark grey-brown; iris dark; bill dark horn; legs dusky brown. Sexes alike. Juvenile undescribed. Voice. No song described. Various calls

include frequently uttered soft “peep” and rapid “trik-trik-trik” twitters during foraging, squeaky “tweet” in flight; also reported a long trill, “rrrrrrrruuu”.

Habitat. Open areas and clearings in fairly open lichen (not moss) forest, montane heathland scrub, and tree savanna; forest with *Hypericum*, *Pittosporum*, *Syzgium* and *Schefflera*. At 1900–2800 m.

Food and Feeding. Insects, including hairless caterpillars 10–25 mm long; also berries and seeds. In groups of 3–5 individuals, sometimes up to 30 together; often in mixed flocks with Green Longtails (*Urolais epichlorus*), Oriole Finches (*Linurus olivaceus*) and Western Mountain Greenbuls (*Andropadus tephrolaemus*). Forages at 0.5–6.5 m above ground; tends to keep in moderately leafy cover, out of direct sunshine.

Breeding. Birds in breeding condition in Oct and Dec. No other information.

Movements. Not known.

Status and Conservation. **VULNERABLE.** Restricted-range species: present in Cameroon Mountains EBA. Common on higher slopes. The commonest bird species in 50-km² area of lichen forest on Mt Malabo; absent from suitable forest in S part of the island. Surveys in late 1980s and mid-1990s indicated that this species is still present in small groups and that its habitat remains largely intact. It is thought, however, that it may be threatened by fires and by extensive forest clearance.

Bibliography. Anon. (2007n), Borrow & Demey (2001), Butchart & Stattersfield (2004), Collar & Stuart (1985), Collar *et al.* (1994), Eck (1995), Eisenraut (1973), Feiler & Nadler (1992), Fry *et al.* (2000), Pérez del Val *et al.* (1994), Stattersfield & Capper (2000), Wells (1968), Wolff-Metternich & Stresemann (1956).

95. Principe Speirops

Speirops leucophoeus

French: Zostérops de Principé

German: Silberbrillenvogel

Spanish: Antojitos Plateado

Other common names: Prince's Island/Principe Island Speirops

Taxonomy. *Parinia leucophoea* Hartlaub, 1857, Gabon; error = Principe.

Possibly belongs to the superspecies formed by *S. lugubris* and *S. melanocephalus*. Monotypic.

Distribution. Principe I, in Gulf of Guinea.



Descriptive notes. 12.5–14 cm; two specimens 14.7 g and 14.9 g. Has pale grey forehead, crown and nape, dark grey lores, very narrow white eyering, whitish cheek and ear-coverts, dark grey upperparts (considerable variation in amount and shade of grey in all these areas); flight-feathers dark brown, secondaries and tertials narrowly fringed olive-grey, tail dark brown; pale grey to greyish-white below, underside of flight-feathers shiny dark grey with whitish inner edges, underwing-coverts greyish-white; iris golden-brown; bill dark grey above, whitish below; legs pearl-grey, soles yellow. Sexes alike. Juvenile undescribed. Voice. Possible song a repeated series of rattling, tuneless notes, or perhaps fast, sibilant “whee-tsiu-tsiu-tseu” and “tsee-tsiu” or “tsiupti-ti-ti”. Calls include various high-pitched trills, rattles and single notes, e.g. a soft “rrrrrrr”, a short “tiup tiup”, also “tuctuctuctuctuct” flight call.

Habitat. Primary forest, but more commonly in forest regrowth, trees and bushes in farmland, and cocoa and coffee plantations shaded by large *Erythrina* trees. Lowlands.

Food and Feeding. Insects, spiders (Araneae), berries, possibly nectar and other vegetable matter. In pairs, and in parties of up to 15 individuals, keeping together closely. Forages mostly in middle

strata of vegetation at c. 8 m, also in undergrowth and canopy; restless and mobile, moving among leaves and foliage. Gleans leaves and other twigs in manner of a tit (Paridae).

Breeding. Mainly Jun–Jul (hatching), but records also of nest-building in Jan and laying in Sept. Nest a delicate loosely woven open cup 9 cm across and 6 cm deep, made from fine grasses and fine twigs or petioles, or dry twigs and moss, attached with moth-cocoon silk to twigs. Clutch 2 eggs, white, 19 × 16 mm. No other information.

Movements. Not known.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Príncipe EBA. Frequent to common but somewhat local. In 1970s was still abundant at all altitudes, but may have declined since; evidence of local persecution and of a possible decline as a result of plantation development and pesticide use was found during a survey in 1987. Can still be found in groups of up to 15 birds in forest regrowth and cocoa plantations.

Bibliography. Anon. (2007n), Atkinson *et al.* (1991), Bannerman (1914, 1948), Borrow & Demeý (2001), Butchart & Stattersfield (2004), Christy & Clarke (1998), Collar *et al.* (1994), Dohrn (1866), Eck (1995), Feiler & Nadler (1992), Fry *et al.* (2000), Jones & Tye (1988, 2006), Keulemans (1866), Snow (1950), Stattersfield & Capper (2000).

96. Black-capped Speirops
Speirops lugubris

French: Zostérops de Sao Tomé **Spanish:** Antejitos de Santo Tomé
German: Trauerbrillenvogel

Other common names: Sao Tome Speirops

Taxonomy. *Zosterops lugubris* Hartlaub, 1848, São Tomé. Forms a superspecies with *S. melanocephalus*, and formerly considered conspecific, but morphologically and ecologically different; *S. leucophoeus* possibly belongs to same superspecies. Monotypic.

Distribution. Mountains of São Tomé I, in Gulf of Guinea.



Descriptive notes. 13.5–15 cm. Has forehead, crown and nape matt black, thin buffy line between nostril and lores; white lores and broad white eyering; upperparts dark greyish-olive; flight-feathers dark brown, edged olive, tail feathers blackish, fringed olive at bases; throat and underparts greyish-olive or buffy olive, indistinct whitish spots on chin and upper throat, whitish thighs, dull yellowish-olive undertail-coverts; underwing shiny grey with white shafts, creamy-white underwing-coverts; iris pale reddish-brown to brown; bill yellow-brown, culmen darker near tip; legs flesh-coloured. Sexes alike. Juvenile undescribed.

VOICE. Musical, whistled song, loud and powerful for so small a bird; mimics various other bird species. Contact call a short, dry trill (not whinnying like that of *Zosterops*); various other calls described as dry rattling, a high-pitched soft flight call, nervous trilling alarm, sharp “whseew”.

Habitat. Shady understorey of tall humid primary forest and secondary forest, patches of dry forest in savanna, around lakes and along watercourses, cocoa and coffee plantations; at all altitudes but mainly above 900 m.

Food and Feeding. Small berries, e.g. *Cestrum levigatum*, pieces of avocado (*Persea*), probably nectar; also insects, including caterpillars. In pairs, and in parties of 10–12, occasionally up to 25 individuals, which move from tree to tree; also in mixed flocks with *Zosterops ficedulinus*, Sao Tome Paradise-flycatcher (*Terpsiphone atrochalybeia*), Giant Weaver (*Ploceus grandis*), Newton’s Sunbird (*Anabathmis newtonii*) and Sao Tome Oriole (*Oriolus crassirostris*). Forages in lower strata at 5–10 m, sometimes down to 1 m above ground; also in herbaceous plants, on walls of old buildings and in dense bushes. Gleans items from leaves and twigs.

Breeding. Nest-building Dec to mid-Jan and eggs in Apr–Jun. Nest a delicate but quite thick-walled deep open cup, made from fine fibres, placed in forked twig 4 m up in lower canopy of *Chincona* tree. Clutch 2–3 eggs, white, plain or very finely speckled with grey, 19 × 13.5 mm. No other information.

Movements. Sedentary.

Status and Conservation. Not globally threatened. Restricted-range species: present in São Tomé EBA. Common to abundant throughout, especially at higher altitudes and perhaps in S of island; the dominant bird species on São Tomé. Formerly occurred also on I das Rolas, a tiny island (5 km²) off S coast, but now extinct there.

Bibliography. Atkinson *et al.* (1991), Bannerman (1948), Bocage (1891, 1904), Borrow & Demeý (2001), Christy & Clarke (1998), Eccles (1988), Eck (1995), Feiler & Nadler (1992), Fry *et al.* (2000), Gadow (1884), Günther & Feiler (1985), Jones & Tye (2006), Nadler (1993), de Naurois (1994).

97. Mount Cameroon Speirops
Speirops melanocephalus

French: Zostérops du Cameroun **Spanish:** Antejitos del Camerún
German: Kamerunbrillenvogel

Other common names: Cameroon White-eye/Speirops

Taxonomy. *Zosterops (Speirops) melanocephala* G. R. Gray, 1862, Mount Cameroon. Forms a superspecies with *S. lugubris*, and formerly considered conspecific, but differs morphologically and ecologically; *S. leucophoeus* possibly belongs to same superspecies. Monotypic.

Distribution. Mt Cameroon, in SW Cameroon.

Descriptive notes. 13 cm; 9–12.5 g. Has very dark brown, slightly glossy crown to nape, hindneck and side of head, greyish-white forehead and lores contrasting strongly with dark cap, very narrow white eyering; upperparts grey-brown, slightly greyer on rump; flight-feathers dark brown, all except outer primaries fringed whitish to olivaceous grey-brown; tail feathers dark brown above, blackish below; greyish-white chin and upper throat (contrasting with dark cheek), buffy grey below, more buff on flanks, with whitish thighs and pale grey vent; underwing silky white; iris pale brown to yellow, brownish-white or grey; bill yellowish or white, sometimes tipped pinkish; legs



white to pinkish-white or pale greyish-flesh. Sexes alike. Juvenile undescribed. **VOICE.** Song, very loud for size of bird, 2–2.5 seconds in duration, a sequence of staccato, tuneless, rising and falling notes, similar in quality to song of *S. leucophoeus*; another song type much richer, described as 7–8 sweet notes, first rising and then falling in pitch. A rattling “trrr” call and soft “cheep, cheep” calls also reported.

Habitat. More open parts of forest, forest clearings, thickets and bushy patches, avoiding denser closed-canopy areas, and generally confined to clearings in lower parts of range; at highest altitudes occurs in forest edge and

patches of vegetation in windswept grassland. At 1800–2750 m, sometimes to 3000 m.

Food and Feeding. Insects; also berries and other vegetable matter. Feeds singly, in pairs and in parties of 5–15 individuals; also in mixed flocks with White-bellied Crested-flycatcher (*Elminia albiventris*), Northern Double-collared Sunbird (*Cinnyris reichenowi*) and *Zosterops senegalensis*. Forages in canopy and middle levels. Actively inspects mossy holes, branches, leaves and twigs; tears apart fresh flowers and buds.

Breeding. Birds with enlarged gonads in Nov–Dec and Mar. No other information.

Movements. Resident; some vertical movement, e.g. seen at 1850–2800 m in Dec but less commonly at 1950–2150 m in Jan.

Status and Conservation. **VULNERABLE.** Restricted-range species: present in Cameroon Mountains EBA. Common; generally, not difficult for human observer to see c. 15 individuals in a day. This species is confined to a relatively narrow altitudinal belt in a small mountain range. Main threats are habitat destruction by natural fires and lava flows (active volcano); also fires set regularly by hunters, despite official management of the site by the Mount Cameroon Ecotourism Project.

Bibliography. Anon. (2007n), Bannerman (1948), Borrow & Demeý (2001), Butchart & Stattersfield (2004), Collar *et al.* (1994), Eck (1995), Eisentraut (1968, 1973), Feiler & Nadler (1992), Fry *et al.* (2000), Gadow (1884), Louette (1981), Stattersfield & Capper (2000), Stuart & Jensen (1986).

Subfamily HYPOCRYPTADIINAE
Genus *HYPOCRYPTADIUS*

E. J. O. Hartert, 1903

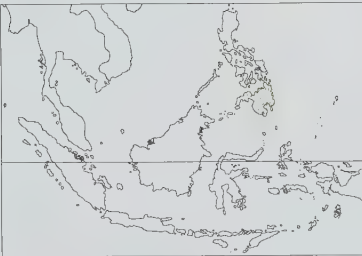
98. Cinnamon Ibon
Hypocryptadius cinnamomeus

French: Zostérops cannelle **German:** Zimtbrillenvogel **Spanish:** Antejitos Canelo

Other common names: Cinnamon Rufous-eye/White-eye

Taxonomy. *Hypocryptadius cinnamomeus* E. J. O. Hartert, 1903, Mount Apo and Mount Kitanglad, Mindanao, Philippines. True affinities unclear; may merit placement in separate family. Birds from Gandawan (on Mt Malindang) described as race *malindangensis* and those from Daggayan (in Misamis Oriental) as *pallidigula*, but differences from birds in rest of species’ range considered trivial. Treated as monotypic.

Distribution. Mountains of Mindanao, in S Philippines: recorded from Mt Malindang, Misamis Oriental (and coastal mountains at Daggayan), Mt Kitanglad, Mt Hilong-Hilong, Mt Apo, Mt Matutum, Mt Mayo.



Descriptive notes. 15 cm; male 28.3 g, female 30.1 g, 22 unsexed 24.7–31.5 g. Has top of head and upperparts entirely bright cinnamon, flight-feathers blackish-grey with cinnamon outer edges and inner webs; tail feathers largely cinnamon, mixed with grey (especially towards tips); chin, throat and breast light cinnamon, becoming paler on lower breast and flanks, with lower flanks and undertail-coverts pale buffy grey, centre of belly dirty white; iris reddish to pale yellowish-red; bill bluish-grey, blackish tip; legs bluish-grey. Sexes alike. Juvenile undescribed. **VOICE.** Call a soft whistle, “chuuu, pee chuuu” or “pee chuuu chuuu”, al-

most whining in quality, and often given continuously by several individuals together.

Habitat. Submontane and montane mossy forest and forest edge; above 1000 m.

Food and Feeding. Insects. In groups; also as core species in mixed flocks with *Zosterops montanus*, *Lophozosterops goodfellowi*, Black-and-cinnamon Fantail (*Rhipidura nigrocinnamomea*), Elegant Tit (*Periparus elegans*) and Mountain Leaf-warbler (*Phylloscopus trivirgatus*). Forages in all storeys of forest. Gleans prey from small branches and leaves.

Breeding. Birds with enlarged gonads Feb–May. No other information.

Movements. Not known.

Status and Conservation. Not globally threatened. Restricted-range species: present in Mindanao and the Eastern Visayas EBA. Common at least locally, e.g. on Mt Kitanglad. Probably reasonably common in all parts of range.

Bibliography. Delacour & Mayr (1946), Dickinson *et al.* (1991), Hachisuka (1930), Inskipp *et al.* (1996), Kennedy *et al.* (2000), Mayr (1967), McGregor (1909), Mees (1969), duPont (1971a, 1971b), Rand & Rabor (1960), Sibley & Monroe (1990), Stresemann (1931a), Woods *et al.* (2003).

Class AVES

Order PASSERIFORMES

Suborder OSCINES

Family PROMEROPIDAE (SUGARBIRDS)



- Medium-sized nectarivores with long, slender decurved bill, strong feet with sharp-clawed medium-sized toes, short rounded wings, very long tail; plumage brown above, more rufous crown and chest, yellow undertail-coverts.
- 23–44 cm (including elongated tail of 15–38 cm).



- Southern Africa.
- Mainly fynbos and protea scrub in montane areas.
- 1 genus, 2 species, 3 taxa.
- No species threatened; none extinct since 1600.

Systematics

The relationships of the sugarbirds are complex. The two species in the genus *Promerops* were first considered to be related to the Australian honeyeaters (Meliphagidae), a conclusion reached on the basis of tongue structure, nest construction and behavioural similarities. C. G. Sibley and J. E. Ahlquist, however, from their studies of egg-white protein in the 1970s, regarded the sugarbirds as specialized starlings (Sturnidae), but the egg-white protein was later reanalysed and found to be similar to that of the sunbirds (Nectariniidae). Ten years later, S. L. Olson and P. L. Ames proposed a transfer of this family to the thrushes (Turdidae) on the basis of the morphology of the syrinx, which was considered to be homologous to the "turdine thumb" of the thrushes. In a subsequent study, in 1994, M. R. Farquhar and colleagues compared the feather ultrastructure and skeletal morphology of the families Meliphagidae, Nectariniidae and Promeropidae. Their results indicated that it was not possible to clarify the taxonomic position of *Promerops* on the basis of these characters alone.

The sugarbirds have been treated by some recent authors as a subfamily, Promeropinae, of Nectariniidae, but others prefer to accord them family rank until further taxonomic evidence is forthcoming; the latter was, for example, the treatment adopted by P. A. R. Hockey and colleagues in the seventh edition of *Roberts Birds of Southern Africa*, published in 2005. The two species, the Cape Sugarbird (*Promerops cafer*) and Gurney's Sugarbird (*Promerops gurneyi*), are very similar to each other in many respects and form a superspecies.

During a long-term study investigating avian haematozoa in African birds, a blood parasite was found in Gurney's Sugarbird that was apparently indistinguishable from *Leucocytozoon annelobiae*, a form known from the Little Wattlebird (*Anthochaera chrysoptera*) of the Meliphagidae. *Leucocytozoid* parasites are supposedly specific to a host family, and on this basis the sugarbird parasite was named as a new species, *L. deswardti*. The presence of what appeared to be the same parasite in African sugarbirds and Australasian honeyeaters has prompted some speculation on the origins and evolution of these birds, which could have shared a common ancestor before becoming separated by continental drift some 40 million years ago. However, recent work on the DNA of haematozoa reveals that while some are indeed host-specific, others are mobile across lineages, so the debate continues.

Very recent molecular work indicates that the sugarbirds appear to have no close living relatives. It shows them as an old

lineage, basal to a sizeable clade of passerines, Passeroidea, which includes the sunbirds, leafbirds (Chloropseidae), sparrows (Passeridae), buntings (Emberizidae), and wagtails and pipits (Motacillidae), amongst others. Much still remains to be discovered and agreed upon, but in the meantime there certainly appears to be a good case for retaining the sugarbirds in their own separate family.

Morphological Aspects

Both sugarbirds resemble a large, long-tailed sunbird. They have mostly streaky brownish plumage with yellow undertail-coverts, while bill and legs are black. The brown, floppy tail of the Cape Sugarbird is exceptionally long, with a maximum length of 38 cm. The female of this species has a shorter tail, and the sexes can be easily separated in the field by this character alone. The tail of Gurney's Sugarbird is noticeably shorter than that of the Cape Sugarbird, with a maximum length of 19.3 cm for males and about 15.5 cm for females, while the tail of some unsexed individuals of Gurney's Sugarbird measures less than 11 cm.

In terms of plumage, the Cape Sugarbird typically shows a dull brown breastband which is variable in colour, but not so solidly red nor so richly chestnut as the breast of Gurney's Sugarbird. In addition, the Cape Sugarbird has a pale creamy forehead and crown, whereas Gurney's has a chestnut-red forehead and crown. Immatures of both species have browner plumage and are shorter-tailed than adults; furthermore, they lack the bright yellow on the undertail-coverts, which are, instead, olive-yellow.

The skull anatomy of *Promerops* was described by W. J. Bock, who compared it with those of sunbirds and honeyeaters. The sugarbird skull was found to be similar to that of the meliphagids, with no unique or special homologues in cranial osteology. The tongue of the sugarbirds is similar to that of the honeyeaters, and this similarity is believed to be the result of convergent evolution. Both families possess a tongue which is long and protrusible, and which differs from that of other species groups in being distally almost tubular and in having a brush-like tip divided into four parts, unlike the split tip found in, for example, the sunbirds. The tongue tapers gradually from its base, and the tip of the tongue is flexible, as is the case also with meliphagids and other nectar-feeding birds that have a frilled-tipped tongue. The tubular, frilled tongue strongly resembles that of the meliphagids, having evolved

Sugarbirds are fairly large nectarivorous passerines of the southern African shrublands. They have a complex and uncertain evolutionary history, and have variously been treated as relatives of the sunbirds (Nectariniidae), starlings (Sturnidae), honeyeaters (Meliphagidae) or thrushes (Turdidae). Molecular evidence has suggested that they may share a divergent lineage with two enigmatic monotypic African genera: *Arcanator* (Dapple-throat) and *Modulatrix* (Spot-throat), but the latest results appear to refute this, concluding that the sugarbirds have no close living relatives; they emerge as basal to a large, diverse clade of passerines, and would appear to be of ancient origin. Both sugarbird species look rather like overgrown sunbirds with streaky brown plumage, black legs, yellow undertail-coverts and a long tail. The spectacular tail of the male **Cape Sugarbird** is the longest in the family. It is particularly conspicuous in aerial displays during which males undulate dramatically several metres above the top of the vegetation. The sexes are highly dimorphic in tail length, the tails of females being much shorter. This species is restricted to the South African Fynbos biome, mostly within the Western Cape Province, where it is common. It is particularly fond of Protea flowers, and often occurs where these are cultivated or grown ornamentally, for example at the Kirstenbosch National Botanical Gardens.



[*Promerops cafer*.
Above: Modimolle,
Limpopo, South Africa.
Photo: Warwick Tarboton.

Below: Kirstenbosch
National Botanical
Gardens, Cape Town,
South Africa.
Photo: Pete Morris]

adaptively for nectar-feeding. The brush-tipped tongue of the sugarbirds also exhibits other adaptations. First, the narrow and slightly concave bristles collect and channel the nectar by capillary attraction into a central trough; second, the long and numerous bristles at the tip of the tongue can be spread out in several directions, enabling nectar to be collected from a wider area within a flower. The tongue musculature is consistent with a hypothesis that the Promeropidae may have evolved from the Meliphagidae.

The long decurved bill of the sugarbirds is likewise adapted for nectar-feeding, and resembles that of the sunbirds. In Nectariniidae, the longer-billed species are more efficient in reaching nectar in flowers than those with a shorter bill; in most species, males have a longer bill than females, and are regarded as more effective pollinators of flowers than females; and males, with the longer bill, tend to be larger than females and are also aggressively dominant over them. In both sugarbird species, the bill of the males is longer than that of the females, and the former are able therefore to force the bill more easily into protea (*Protea*) inflorescences than can the shorter-billed females. The mean culmen length of male Cape Sugarbirds is 3.1 cm, longer than that of male Gurney's Sugarbirds, which is 2.9 cm. The former species is adapted to exploit the fynbos Proteaceae, most of which have closed involucre bracts. Most of the grassland protea species along the Drakensberg escarpment and in Zimbabwe have open involucre bracts, and Gurney's Sugarbird, with its shorter culmen, is better adapted for foraging on them.

An interesting adaptation in the wing of the sugarbirds involves modified primary feathers, which have a large bulge or lobe on the outer vanes. This specialized modification affects primaries P5–P7 of Cape Sugarbirds and primary P6 of Gurney's Sugarbird. The bulges on the primaries are responsible for the audible “frrt-frrt-frrt” sounds produced during flight and in aerial displays, and a wider primary bulge is thought to produce a louder sound during display-flights. Males with a wider P6 bulge and with greater wing and tail lengths may be older, and the modification of the primaries might thus fulfil a function in sexual selection.

Gurney's Sugarbirds moult their primary feathers mainly during the period from October to March. The primaries are replaced descendantly, from the outer feathers to the inner ones, while the secondaries are replaced ascendantly, from the inner wing inwards towards the body. It is interesting that the wing moult of Gurney's Sugarbird coincides with the species' breeding season, when much energy is required for the successful rearing of young. As male sugarbirds need long tail feathers for territorial defence and display, tail moult occurs over a protracted period throughout the year; the moult proceeds from the central rectrices towards the outermost feathers. Cape Sugarbirds moult their primaries from October to January or later, before their breeding season starts in April.

Sugarbirds have fairly strong toes, and remarkably sharp claws, as many a bird-ringer has discovered! These are important in facilitating access to flowers, but also lead the birds into some conflict with human activities (see Relationship with Man).

Habitat

Both sugarbirds live in close association with protea scrub, where they are dependent on nectar for food. The genus *Protea* belongs in the Proteaceae, a plant family virtually confined to the Southern Hemisphere. Africa is home to well over 100 species of protea, 91 of which grow naturally in southern Africa; of these, 71 are found in the coastal region of the Cape.

The Cape Sugarbird is resident in the Fynbos biome, which is centred on the Western Cape Province of South Africa and extends eastwards into the Eastern Cape. Its search for nectar has led to its becoming adapted also to cultivated gardens and protea nurseries. This sugarbird's range has not contracted much, although it is rarer at the easternmost limit, in the Amatole Mountains, where protea populations, especially those of *Protea subvestita*, have been eradicated by veld fires.

The geographical range of Gurney's Sugarbird extends eastwards along the mountains of the Eastern Cape to the KwaZulu-Natal midlands and farther up the escarpment in Mpumalanga and the northern provinces. Further, isolated populations occur

in the Soutpansberg, Blouberg and Waterberg ranges, in Limpopo Province, where they occupy areas with protea species. The subspecies *ardens* of Gurney's Sugarbird occurs from the Nyanga Mountains to the Chimanimani Range in easternmost Zimbabwe and adjacent Mozambique, where it is common, for example, in protea nurseries. Gurney's Sugarbird is associated mainly with *Protea roupelliae* woodland at altitudes mostly above 1800 m. It is common also in *Protea caffra*, *Protea gaugedi* and vegetation with other protea species in the eastern parts of South Africa.

General Habits

Both members of this family occur solitarily, in pairs or in family parties, although it is often the case that apparently solitary individuals are, in fact, accompanied by a mate, which is hidden in nearby foliage. Small groups of up to a dozen or so individuals are sometimes observed outside the breeding season. Sugarbirds are active throughout the year, the males often chasing one another and occasionally chasing off females. Both species are strong fliers, flying directly and with little, if any, undulation, but it becomes increasingly undulating during social interactions. When returning to a perch on a bush, they land with an upward “flip-jump”, a movement made without any apparent slowing down or breaking of the flight.

Studies of the Cape Sugarbird, the better-known of the two species, have revealed that the birds typically alternate periods of active feeding with periods of rest and of socializing, when many individuals come together. The species is very lively for a couple of hours early in the morning, after which it becomes silent and disappears deep inside a protea bush, where it dozes and preens for some time. This pattern of behaviour is repeated through the day. Sugarbirds are less active during the middle part of the day, remaining silent and hidden in the protea bushes, although they may give away their presence by vocalizations or by indulging in chasing activities. Furthermore, they seem to dislike wind, and tend to keep within cover for longer periods on windy days than on calm ones. The extremely long tail of the Cape Sugarbird is blown sideways or up and above the bird's head by the strong winds that are typical of the fynbos habitat.

At dusk, following a short bout of noisy social interaction involving conspicuous perching and chasing, the sugarbirds drop down into the lowest branches of a protea bush, where they spend the night. Partners roost together, and communal roosting by small groups is not uncommon. In some locations, flocks of several hundred individuals sleep together.

The male spends much time perched prominently on a bushtop, foraging actively at flowers and flicking its wings, but it spends as much or more time within the thick, dense foliage of protea bushes. Characteristically, it dives from its bushtop perch down into cover, and later, after a variable period, it shoots up and out of the thickest foliage and back to its perch. It moves at speed and, when leaving its bushtop perch, it makes a slight jump before darting over and downwards; on returning to its perch, it again makes a slight jump before alighting. During the breeding season, male sugarbirds spend most of the time perched on top of their favourite protea bush, from where they deliver their characteristic jangling territorial advertising songs (see Voice) for long spells, with interruptions for foraging or preening.

When a sugarbird is in relaxed posture, the head is sunk into the shoulders and the bill pointed slightly upwards. When alert, it lifts the head somewhat higher. Comfort behaviour performed by sugarbirds includes bill-wiping on perches, especially after feeding on insects, and indirect head-scratching, in which the leg is raised behind and over the lowered wing to reach the head.

Cape Sugarbirds have been observed to bathe, and they usually do so in dew, or in protea foliage made wet by dew or rain. They are particularly fond of bathing after heavy rain. The bathing individual makes a series of plunges into the leaves, dipping its head into the wet foliage and fluttering the wings in order to splash moisture over the plumage. There are extremely few observations of the bathing behaviour of Gurney's Sugarbird, but the basic details appear to differ little from those applicable to the Cape Sugarbird.

Gurney's Sugarbird

differs from the Cape Sugarbird (*Promerops cafer*) in having a more solidly and richly coloured breastband. Its forehead and forecrown are also chestnut-red, rather than pale creamy, and its tail is noticeably shorter, reaching a maximum length of only some 19 cm in males, as opposed to 38 cm. The nominate race, pictured here, occurs in northern and eastern South Africa, with a major population distributed along the Drakensberg escarpment. The race *ardens* occurs to the north, in Zimbabwe and adjacent Mozambique. Both forms are associated with the common open-country flowering plants of the region, such as proteas and aloes. The individual pictured here is visiting a flowering *Aloe arborescens*, an important plant in horticulture and medicine.

[*Promerops gurneyi*
gurneyi,

Giant's Castle Game
Reserve, KwaZulu-Natal,
South Africa.

Photo: HPH Photography/
Photo Access]



Voice

Sugarbird songs are a series of grating, twanging, creaky and clicking notes, which are delivered from the top of a bush or other perch, and also from the interior of a bush. Both species use the songs mainly to advertise their territories. The song of the Cape Sugarbird is a jumble of harsh, grating notes which are interspersed with "chit-chit-chit" calls and longer rambling "tschaak-tschaak" or "chee-chee" notes. Some authors describe it as resembling the sound made by a squeaky or rusty gate or as having a twangy quality similar to that of the call of the Fork-tailed Drongo (*Dicrurus adsimilis*). The song of Gurney's Sugarbird, on the other hand, is less grating than that of its congener and is a faster, rapid high-pitched jumble of twittering and twanging notes, but it does have the same rambling, squeaking qualities. A song bout of Gurney's Sugarbird often lasts for five minutes or more, and sessions of singing can continue for 20 minutes.

The "threat song" of the Cape Sugarbird is similar to the advertising song, but is faster and more intense. Females also utter a soft sibilant song, which is shorter than that of males. Cape Sugarbirds' calls are varied, and include a loud, tinny "tcheek-tcheek" and a rapid, repeated "skedge-skedge" ending with slurred drongo-like or starling-like nasal sizzling. Gurney's Sugarbirds also utter short stuttering "chit-chit" notes for long spells, most often when they are excited, and these are interspersed with hurried, loud "churrs" and hard chatters. The "chit-chit" notes increase in tempo, and both sounds serve as advertisement and also indicate anxiety.

Both species have a harsh alarm call, as well as other high-pitched ones. Cape Sugarbirds give a mild, high-pitched "tweet-tweet" call and flutter the wings when excited, this call becoming shorter and more explosive when the sugarbird's anxiety increases. They also emit a single harsh, wheezy sound which resembles the sound of cloth being ripped, "ssrrr-ssrrr". The alarm calls of Gurney's Sugarbirds are similar to those of its congener but are harsher in quality, "skirrit skirrit" or "skirr-sik", repeated several times. Alarm calls are given also by captured individuals when held in the hand or when being extracted from mist-nets; in these circumstances, other males respond to such calls by flying towards the site of the net and may even be captured when flying in the direction from where distress calls are coming.

Although by definition not vocalizations, the mechanical sounds made by the modified feathers in the wings and tail likewise constitute significant and characteristic components of the birds' acoustic repertoire (see Morphological Aspects, Breeding).

Food and Feeding

The diet of both sugarbirds consists of the nectar of flowers, together with small insects and spiders (Araneae). Flowers regularly visited by Cape Sugarbirds in the fynbos include several species of protea, but the sugarbird shows a preference for, mainly, *Protea repens*, *P. lepidocarpodendron*, *P. neriifolia*, *P. laticolor* and *P. longifolia*, along with other plant genera such as *Leucospermum* and *Mimetes*, notably *L. conocarpodendron*, *M. fimbriifolius* and *M. hirtus*. In the Mediterranean-type climate in which they are found, these species have a winter flowering season which is at its peak between April and August. The sugarbirds also visit both natural and cultivated heathers (*Erica*), *Watsonia* and red hot pokers (*Kniphofia*), as well as aloes (*Aloe*), tree-fuchsia (*Halleria lucida*), Cape honeysuckle (*Tecomaria capensis*) and alien invaders such as eucalypt species (*Eucalyptus*) and sisal (*Agave sisalina*).

The Cape Sugarbird is an important pollinator of the above-mentioned fynbos protea species. It will make several probes in one single inflorescence before moving on to the next one, whereby pollen, which becomes attached to the sugarbird's forehead, is transferred to the next inflorescence and pollination occurs. The brush-type flowers of *Protea* and *Leucospermum* provide perches with many large inflorescences and unopened flowers which serve as potential landing platforms. When a Cape Sugarbird forages on protea inflorescences, it usually perches on top of them, leans down into the flower to reach the nectaries, and "sucks" or probes

for nectar between stamens or bracts. When foraging on *P. multibracteata*, it perches on top of the flower and probes on the far side of the mass of stamens. *Protea lepidocarpodendron* has a more cylindrical flowerhead with densely packed florets, as also does *P. neriifolia*, and the sugarbird leans far down on the side of the flower and probes through bracts from the outside. When foraging into inflorescences, the head and the front half of the sugarbird's body disappear from view as it reaches into the deep cup of the protea. During a feeding session, the bird visits more than one flowerhead of any one bush or tree.

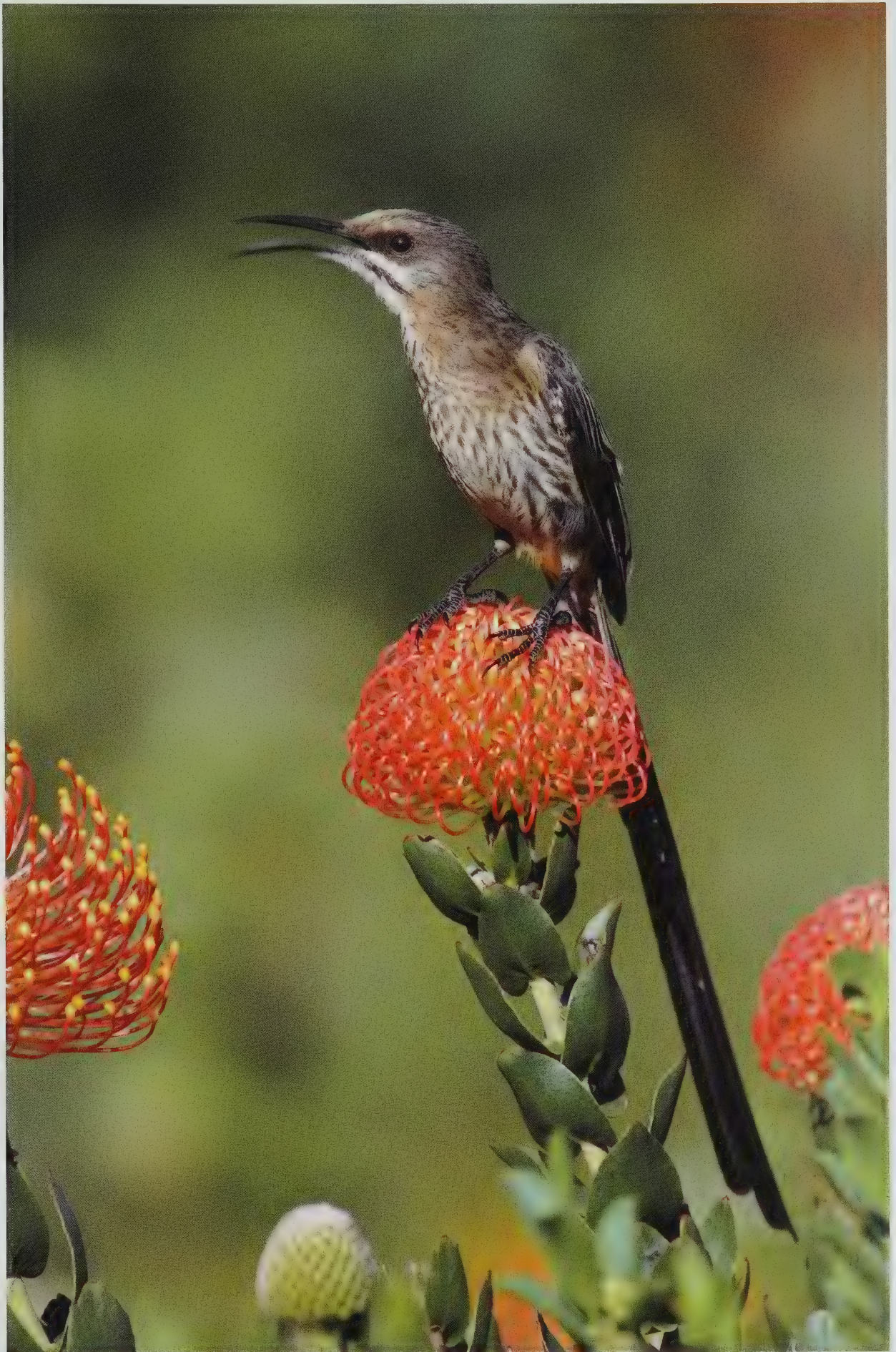
Nectar is low in protein and amino acids, and the sugarbirds must therefore supplement their diet with animal food in the form of arthropods. In a study of the Cape Sugarbird's energy requirements, it was found that *P. repens* inflorescences contained high concentrations of reduced sugars but were low in proteins and amino acids, and the sugarbirds consequently had to visit a very large number of flowers on a daily basis in order to satisfy their energy requirements. The sugarbirds supplement their diet with insects, mostly beetles (Coleoptera) and ants and bees (Hymenoptera), taken from the protea flowers. It was mainly these insect orders that were found in the *P. repens* inflorescences utilized as a food source by Cape Sugarbirds. K. M. Calf and her co-workers raised the question of whether sugarbirds foraged for insects from the inside or the outside of protea flowers, and whether the insects are ingested accidentally or on purpose, but these matters remain to be resolved. Sugarbirds also catch small flying insects such as flies (Diptera), moths (Lepidoptera) and aphids (Aphidoidea) by flying into the air to heights of up to 10 m, snapping up the prey and then returning to the perch to consume it.

In South Africa, Gurney's Sugarbirds forage almost exclusively on the nectar of *Protea roupelliae* in its mountain habitat, and during the winter they visit *Aloe arborescens* blooms on mountain cliffs and in cultivated areas. In some places, they seem not to move away from protea patches, especially in localities where sufficient flowers are available for them. They also feed on nectar of the proteas *P. laticolor*, *P. gagedi*, *P. caffra* and *P. subvestita*, most of which occur in association with *P. roupelliae*, and that of several grassland and forest-margin species, such as *Greyia radlkoferi*, *Greyia sutherlandii*, tree-fuchsia, *Watsonia* and *Kniphofia*. In cultivated areas, during the winter months, they exploit several species of aloe, primarily *A. arborescens*, and of protea, mainly *P. neriifolia* and *P. repens*, as well as introduced Australian bottlebrush (*Callistemon viminalis*) and eucalypts. When feeding at *P. roupelliae* inflorescences, Gurney's Sugarbird perches on the top of the flower, which does not have closed involucral bracts, and probes with quick movements of the bill for nectar. It then moves in a clockwise direction while inserting its bill repeatedly into different parts of the flower. During a feeding session, the sugarbird tends to remain among the flowers of a single bush, but it will also fly to other protea bushes in the vicinity. Females of this sugarbird have frequently been observed to probe for nectar in closed inflorescences by forcing the bill between the floral bracts.

Invertebrates taken as food by Gurney's Sugarbird consist mainly of beetles, bees and ants, while spiders make up a small proportion of the diet. The beetle portion consists mostly of scarabaeid species such as *Tanaos sanguineus* and *Cyrtothyrea testaceogutta*, which occur in large numbers in *P. roupelliae* inflorescences. Sugarbirds, during their feeding activities, have been seen to take honeybees (*Apis mellifera*) at aloe inflorescences, nectar-feeding being temporarily interrupted in order to catch the bee. The remains of honeybees have been recorded in stomach contents of sugarbirds in both mountainous and suburban localities. As an offshoot of their nectar-feeding, sugarbirds are important for transferring tiny flower mites between plants, and large populations of mites can live in the birds' nasal cavities.

Breeding

Both sugarbird species are socially monogamous, nesting exclusively in protea trees. They are very similar to each other in details of the nest, the lining of which incorporates protea fluff or seeds, in clutch size, generally consisting of two eggs, and in details of



The male **Cape Sugarbird** is highly aggressive at the onset of the breeding season, often chasing intruders from the territory. He is usually seen perching prominently atop a bush or a protea flower, from where he delivers his characteristic song. The vocal repertoire of both sugarbirds is remarkably variable. Their primary songs tend to be a weird series of grating, twanging, creaky and clicking notes.

The most complex renditions are given by males, but females also sing with a softer, more sibilant version of the same. Both species also have characteristic alarm calls, one harsh and grating, likened to the sound made by tearing cloth, and others high-pitched and varying in intensity. They are also known to give various hissing, wheezing and musical notes of unknown function.

[*Promerops cafer*,
Kirstenbosch National
Botanical Gardens,
Cape Town, South Africa.
Photo: Andy & Gill Swash]

the nestling development. The males of both species are very aggressive at the onset of the breeding season, guarding their territories against intruders. The male usually sits on a prominent perch on top of a bush or on a protea flower, from where it delivers its highly characteristic jumbled series of jangling notes (see Voice). Through the day the males perform impressive display-flights, that of the Cape Sugarbird being particularly striking, by rising to heights of 10 m or more and then flying in a series of undulations during which it produces a clacking noise by jerking the long tail feathers up and down. During these aerial displays the male utters its territorial song, a harsh, grating and scratchy "tschaak-tschayli-chitchit".

In the winter-rainfall area of the Western Cape, the Cape Sugarbird's peak egg-laying period is from mid-April to the end of May. Here, *Protea lepidocarpodendron*, locally a dominant species, has an extended flowering season, while farther away across the Cape Flats, in the Hottentots Holland Mountains, *P. neriifolia* has an earlier peak in flowering, and the sugarbirds there consequently commence breeding earlier; the ranges of these two proteas do, however, overlap extensively. The peak breeding season for Gurney's Sugarbird in South Africa is between November and February, coinciding with the peak flowering period of *P. roupelliae*. This species tends to breed later in the season in KwaZulu-Natal, in the Eastern Cape Province of South Africa and in Zimbabwe, where observations of nesting from late summer to early winter all seemed to be correlated with flower availability of protea species. Recently fledged young, still dependent on the adults, were captured in Mpumalanga during mid-winter, in June, egg-laying having therefore taken place during late April or early May. These late breeding attempts were possibly triggered by the arrival of suitable conditions, when sufficient protea nectar was available after high rainfall in the surrounding mountainous areas.

Calf and co-workers compared the territorial behaviour of the two sugarbird species during the breeding season and found that Cape Sugarbird territories were smaller than those of Gurney's Sugarbird. This was because the former contained a higher tree density and a greater diversity of protea species. Cape Sugarbirds are highly territorial during the breeding season, and defend resources for themselves, their mates and their offspring. This territory ownership was found to be male-based, and the territory sizes and locations of males varied slightly when males returned in the subsequent season to their territories. Severe weather conditions and predation are the main influences in mating and reproductive success. Even so, male Cape Sugarbirds defending larger territories achieved greater reproductive success than did those with smaller territories.

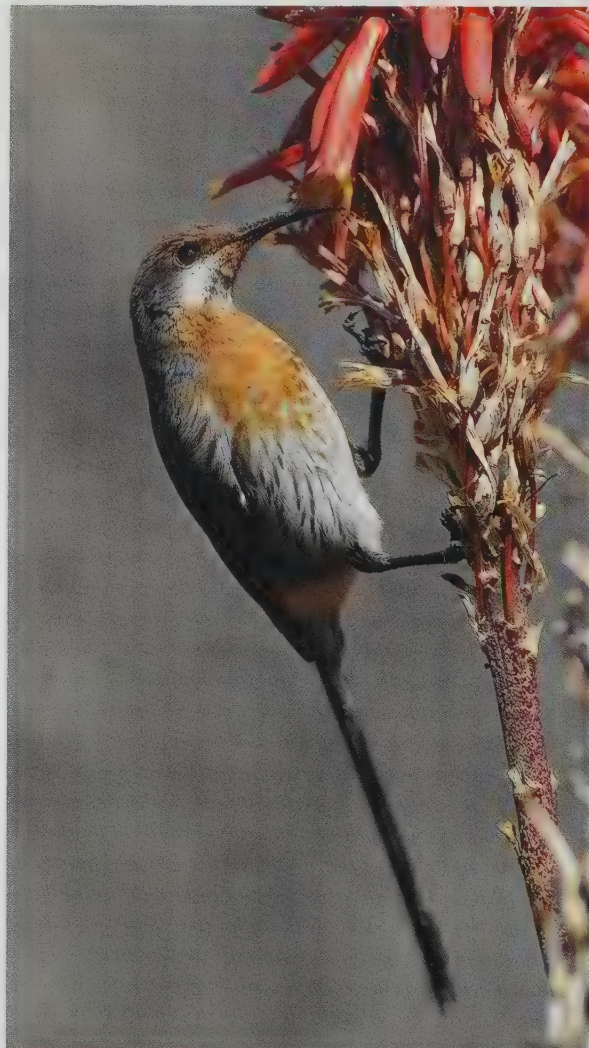
In the protea-grassland areas where Gurney's Sugarbirds occur, territory sizes were observed to change in response to inflorescence and arthropod availability and to associated increased competition from other males in adjoining territories. This species' territory sizes have been observed to decrease during the middle part of the breeding season, November–December, when more protea inflorescences and insects are available, and to increase again nearer the end of the breeding season, in January–February, when fewer resources are available for the sugarbirds. Fewer territorial sugarbirds are present at the end of the breeding season, and low inflorescence availability may result in larger territory sizes. The changes in sugarbird territory sizes documented in the study by Calf and colleagues were confirmed in the Lydenburg area of Mpumalanga, where seasonal densities at selected protea clumps were high during October–November and, again, lower at the end of the breeding season, in February–March. Fire in protea grassland also influences sugarbird densities, as bushes are damaged by fire, and the sizes of clumps therefore also determine sugarbird territory sizes.

The combination of large territory sizes and low food availability leads Gurney's Sugarbirds to expend large amounts of energy in moving between inflorescences of several bushes within the territory. The reduced availability of nectar and arthropods may also be a contributing factor in the finding that territories of Gurney's Sugarbird are larger than those of Cape Sugarbirds, which results in the former being subject to heavier energy constraints with regard to mating and reproductive success than are experienced by Cape Sugarbirds. It was noted also that, within

one and the same population, male Gurney's Sugarbirds with a longer tail and a wider bulge on the sixth primary feather (see Morphological Aspects) defended larger territories with more protea inflorescences available and achieved greater success than did younger, shorter-tailed males with a narrower primary bulge.

As both sugarbird species are highly territorial during the breeding season, they will drive individuals of both their own species and other potential competitors out of their respective territories. The Cape Sugarbird gapes widely if another bird approaches too close to it, and harsh alarm calls are then uttered. Gurney's Sugarbird will fly at speed towards other birds, such as *Ploceus* weavers, and will chase them in flight with rapidly beating wings, and they have also been seen to attempt to chase larger bird species such as Red-winged Starlings (*Onychognathus morio*). Both sugarbird species have been observed to behave aggressively towards Malachite Sunbirds (*Nectarinia famosa*), although C. J. Skead mentioned that Gurney's Sugarbird would tolerate Malachite Sunbirds on the same bush, and that, if the two species met on the same flower, it was the sunbird that had to give way to its larger, more aggressive food competitor. At Lydenburg, in Mpumalanga, D. H. de Swardt observed that Gurney's Sugarbird displaced a sunbird from its flower on a protea bush by "jumping" towards the sunbird and chasing it away, usually while uttering aggressive alarm calls and other vocalizations.

The nest-sites favoured by sugarbirds provide protection against the inclement conditions of the winter and summer thunderstorms. The nest is placed in the centre of a thick-leaved protea bush, where it is sheltered from the elements. Cape Sugarbirds prefer protea bushes, such as *P. eximia*, *P. grandiceps* and *P. neriifolia*, the large leaves and dense foliage of which provide shelter and protection against the wind. Nearly all South African nests of Gurney's Sugarbird are in a *P. roupelliae* bush or solitary tree,



Sugarbirds consume a large quantity of nectar, along with a range of small insects and other arthropods. The bills of both species are adapted for extracting nectar, being long, slender and slightly decurved. **Gurney's Sugarbird** has a shorter bill than the Cape Sugarbird (*Promerops cafer*), perhaps related to food-plant differences. In particular, it has been noted that many protea species in the Fynbos biome tend to have closed involucral bracts, whereas most of the protea species found along the Drakensberg escarpment have open ones. The shorter bill of Gurney's Sugarbird is thus perhaps adapted to these more accessible sources of nectar. Although the bill of the female, shown here, is shorter than that of the male, it remains long enough to reach nectar sources in a wide range of flowers, including this Aloe.

[*Promerops gurneyi*
gurneyi,
Drakensberg,
KwaZulu-Natal,
South Africa.
Photo: HPH Photography/
Photo Access]

When a **Cape Sugarbird** forages on protea inflorescences, it typically does so by perching on top of the flower and probing for nectar between stamens or bracts. It extracts the nectar through an unusual brush-like tongue, similar to those of probably unrelated nectarivores, such as honeyeaters (*Meliphagidae*). Sugarbirds are often forced to reach far down into the deep cup of a protea in search of nectar, at which time the head and the front half of the body may disappear from view, as seen here. On species with more cylindrical flowerheads and densely packed florets, the nectaries are accessed by probing through bracts from the outside; this is an example of nectar predation rather than pollination.



[*Promerops cafer*,
Helderberg Nature
Reserve, near Somerset
West, Cape Town,
South Africa.

Photo: Giuliano Gerra &
Silvio Sommazzi/Justbirds]

situated on the periphery of a protea clump, and usually located on the south-western aspect of the tree. Nests are in most cases well hidden among the protea leaves, either situated in a fork of a branch or among small branches, or built on to the base of an old inflorescence with a cluster of terminal twigs surrounding it.

The nest of *Promerops* is an open cup, built mainly from twigs of *Cliffortia* species, heath stems and dry grass, and compactly lined with coarse but soft, dry protea seed down or fluff. Other nest materials used by Gurney's Sugarbirds include *Widdringtonia nodiflora* and *Stoebe vulgaris*, and this species sometimes utilizes additional available material from the surrounding forest margins and streams; for example, the dry pinnules of bracken (*Pteridium aquilinum*) were used on the outside rim of one nest. When constructing the nest, Cape Sugarbirds will take advantage of fynbos restios (*Restionaceae*) such as *Leptocarpus paniculatus* and *Thamnochortus fruticosus* growing in the immediate vicinity, and they will also incorporate *Helichrys* species (*Asteraceae*) in the structure. Once the basic structure is complete, the female uses her body to shape the nest until a rough cup is formed. Nests of Cape Sugarbirds, with an average internal depth of 60 mm, are deeper than those of Gurney's Sugarbirds, which have a corresponding measurement of about 40 mm. Old or unused nests are wind-buffed and blown out of the tree, and the seeds in the nests are dispersed by wind, or rain, to germinate.

The female builds the nest and collects most of the material, but the male may occasionally visit, perhaps contributing a few items; it is suspected that the females also choose the nest-site. Construction of the Cape Sugarbird's nest takes an average of eight days, and the lining of the nest takes a further three days, the first egg being laid one to five days after the nest has been completed. Few comparable data are available for Gurney's Sugarbird, most nests of which are built within five to 15 days.

Sugarbird clutches consist mostly of two eggs, although there are rare instances of three-egg clutches being laid by Cape Sugarbirds. The second egg is laid usually on the second day, or within 48 hours after the first one. Sugarbirds generally have one brood in a season, but the Cape Sugarbird is occasionally double-brooded; both species commonly lay replacement clutches. The egg is an elongate oval in shape, and it varies from being

pale coffee-coloured to being dull salmon-pink, with dark brown spots and scrawls. The dark spots and blotches are spread all over the egg, but they tend to form a ring around the broad end. The eggs of Gurney's Sugarbird are more cream to buffy brown in colour. With both species, it is the female alone that incubates the eggs, and she leaves the nest only for short feeding bouts, these breaks in incubation occurring mostly in the early morning or late afternoon. The incubation period for both species is 16–17 days, incubation starting when the clutch is complete.

Hatching in Cape Sugarbird nests takes place mostly during the early hours of the day or in the late afternoon; the parents carry the empty eggshells away. On hatching, the sugarbird nestling has pinkish skin with blackish-grey down on the head, back and wing areas, and the eyes are closed. The base of the culmen is of a pale orange-flesh colour with a thick yellow gape-flange, and the tip of the bill is blackish. At an age of five days, the blackish-grey down on the head, back and wings becomes longer and darker. The skin darkens and the feather tracts start to develop, while a thicker yellow gape-flange starts to become apparent at the base of the pinkish bill. At seven to nine days, the primary and secondary feather tracts develop and start to break through the feather pins. The nestling's eyes start to open, and they are fully open on the ninth day, when the bill starts to look curved and becomes blackish, but with the lower mandible still flesh-coloured. From the eleventh day onwards, the soft down is replaced by feathers with buffy-brown edges, the scales of the tarsi become fully developed and are glossy black, and the culmen lengthens, with the upper mandible blackish and the lower mandible flesh-coloured. Body feathers have now replaced the downy feathers, and the wing feathers, having broken through the pins two days before, are now longer. From the 19th day, the primaries, the brownish-edged secondaries and the tail feathers are almost fully grown, but there are still few down feathers on the body; the dark brownish coloration of the breast and crown is similar to that of adults, but with a few downy feathers remaining between the reddish feathers.

The female Cape Sugarbird broods the chicks from time to time during the day until they are six days old, and at night until they are 14 days old. The duration of the development period of the chicks of both species varies between 17 days and 23 days.

Young start to leave the nest on the 19th day, on average. The offspring remain for a few days in the nest tree, where they probably also sleep for a night or two, and fly short distances after the adults, which feed them for as much as a further three or four weeks.

Sugarbird nestlings are fed mainly with small, winged insects, including small beetles, which are brought to the nest by both parents, the female making more feeding visits than the male. Cape Sugarbirds deliver food to the nest every 10 minutes or so, with more visits in the morning and late afternoon, while the frequency of visits to the nest by Gurney's Sugarbird is more varied, up to every 22 minutes. When the adult alights on the nest, the nestlings respond by craning the neck, with the bill held wide open, begging for food. When the young become larger, they merely stand on their heels. With both species, nest sanitation is maintained by both sexes, which carry away faecal sacs to nearby bushes up to 5 m from the nest-site.

Breeding success is rather variable for the Cape Sugarbird in the studies available to date. The majority of nest failures recorded were the result of predation by other birds, rodents, mongooses (Herpestinae) and snakes. In addition, the introduced Argentine ant (*Linepithema humilis*) is known to attack and kill small chicks of this species. It has been suggested that the breeding success of Gurney's Sugarbird is associated with food availability, but further research is needed in order to determine if this really is the primary limiting factor in breeding.

Limited information is available on the longevity of sugarbirds. De Swardt and W. J. Peach analysed the ringing data (see Movements) for Gurney's Sugarbird, from which they estimated a survival rate of 80.7% and an average life expectancy of 4.8 years. These authors concluded that the "average" sugarbird could survive beyond seven years of age. The oldest Gurney's Sugarbird was resighted after 13 years, having been recaptured 3 years earlier when it was 10 years of age. The oldest Cape Sugarbird recorded in ringing studies was 14 years and six months when it was recaptured.

Movements

Both sugarbird species are resident, but in the non-breeding season they are itinerant, undertaking short-distance movements in response to the flowering phenology of important foodplants in their distributional ranges. For example, there are movements of Cape Sugarbirds to the coastal plains, where they track *Leucospermum conocarpodendron* in September–March, during the austral spring and summer, and to hillsides where *Protea repens* is in bloom during the winter months of May–August. Movements of between 27 km and 44 km have been recorded for Cape Sugarbirds, and one individual moved 365 km.

In the case of Gurney's Sugarbird, a seasonal pattern of vertical movement between the *P. roupelliae* populations in the mountains and nearby suburban areas has been observed in a Mpumalanga town. One individual was recovered 37 km north-east from the locality where it was initially captured. Juvenile Gurney's Sugarbirds disperse a few kilometres from the natal territory, and two were recaptured more than six years later. In some areas they are sedentary, especially where there are botanical gardens and protea nurseries where nectar is available all year. During the past twenty years, in Mpumalanga, it has been observed that in years with high rainfall the protea flowering period is prolonged, while in years with lower rainfall fewer flowers are available and the sugarbirds then disperse into the mountain valleys and to nearby towns.

Both sugarbird species also move in response to fires, which are of frequent occurrence in their protea habitat. The birds return to such sites only when their foodplants have matured, or else they move to unburnt protea clumps.

Since the 1950s, more than 7300 Cape Sugarbirds have been ringed, most of them in the Western Cape, and more than 800 recoveries or recaptures have been obtained. Fewer Gurney's Sugarbirds have been ringed, although the total exceeds 1000 individuals, the majority of these, 760, in the Lydenburg area of Mpumalanga. Some 210 recaptures and recoveries of this species have been obtained, most of them again from Mpumalanga.



Their foraging ecology means that sugarbirds probe several times into each flower, and visit several flower heads per tree or bush, before moving on to another plant. Each time they probe a flower, pollen attaches to the forehead, as demonstrated by the yellow dusting on the face of this Cape Sugarbird. When it moves to a new plant, this bird will transfer pollen to another inflorescence, perhaps fertilizing the carpel. For this reason, sugarbirds play a vital role in pollinating a wide variety of flowering plants, many of them highly threatened, in the Fynbos biome and the montane grasslands of south-east Africa.

[*Promerops cafer*, Caledon, South Africa. Photo: Roland Seitre]

Relationship with Man

The South Western Cape floristic region hosts the largest concentration of fynbos plant species, which are endemic in this region, and includes some very rare and even endangered species. Moreover, the protea plants are important not only for the Cape Sugarbird and other nectarivores as a food source, but also for local farmers and others, through the export trade in cut flowers. In this region alone, the plants provide South African farmers with a total annual income of more than 60 million rands, in an industry that employs more than 4000 farm workers. Fynbos plants are nowadays harvested from protea plantations, while a smaller number are still harvested from natural mountain fynbos where Cape Sugarbirds and other nectarivores are common. Although no direct competition between sugarbirds and man occurs, it is known that sugarbirds can damage protea inflorescences considerably while foraging on them. Damage is caused mainly when they probe flowers for nectar and their sharp claws leave scratch marks on the nearest leaves, making the flowers unsuitable for the export market. Several commercially important protea species, mainly *P. cynaroides*, *P. magnifica* and *P. grandiceps*, are damaged in this way, whereas less damage is caused to *Leucospermum* species. Several measures have been used in attempts to prevent sugarbirds from harming flowers, the principal ones of which are the chasing-away of the birds, covering the flowers in bags, placing plastic strips on bushes, and the installation of systems broadcasting bird sounds. A few isolated instances of poisoning have been reported, but, as the sugarbirds are legally protected species, any incidents of poisoning must be

reported and the persons responsible prosecuted. Happily, it appears that poison is no longer used as a control measure by protea farmers, who now, instead, actually welcome birdwatchers into their plantations. Bird-capturing, and also bird-ringing, operations can easily be conducted, but these are generally ineffective in terms of removing the birds permanently from the protea plantations. In the Drakensberg escarpment, in KwaZulu-Natal, several farmers have started to establish protea plantations, concentrating their efforts mainly on the grassland protea species. In such plantations, Gurney's Sugarbirds are, as might be expected, often proving to be common.

In contrast to the possible harm inflicted on plants by sugarbirds, these birds play a significant role in the pollination of plants. The Cape Sugarbird is important as a pollinator of fynbos protea species, as well as other plant species, including cultivated ones (see Food and Feeding). Gurney's Sugarbird plays a similar part in the pollination of, especially, *P. roupelliae* in the higher-lying habitats which it occupies.

The two members of the genus *Promerops* are much sought-after species in birding circles, especially because they occur only in certain isolated localities and in conservation areas. The Cape Sugarbird's limited distribution in the fynbos means that birdwatchers wanting to observe it are normally taken only to particular localities in the Western Cape with reasonable access, such as the Kirstenbosch National Botanical Gardens, the Cape of Good Hope Nature Reserve and other protected areas. In the Drakensberg range, where Gurney's Sugarbird is localized, the Sani Pass area, adjacent to Lesotho, is one of the best-known destinations for birders wishing to see this sugarbird and other high-altitude bird species.

Status and Conservation

Both members of the family are found only in southern Africa, where they are common within their restricted ranges. Cape

Sugarbirds are less common in extreme eastern parts of their distribution, where, in the past, they overlapped in range with Gurney's Sugarbird. The latter is uncommon at its southernmost limit in South Africa, but is common farther north along the escarpment in KwaZulu-Natal and Mpumalanga. Gurney's Sugarbird is noted as being absent especially in areas where protea species are rare, and it probably goes undetected in many fairly inaccessible mountainous areas. It is less common in Zimbabwe, and exists as localized populations in the Waterberg, Blouberg and Strydpoort mountain ranges of Limpopo Province, in northern South Africa. The overall geographical ranges of the two species appear not to have changed dramatically during the past few decades.

Cape Sugarbird densities vary from up to 20 pairs per square kilometre, as found near Port Elizabeth, in the Eastern Cape, to four individuals in 100 ha of strandveld fynbos vegetation in the Western Cape. In mountain fynbos, densities of 2–4.1 birds/ha are recorded, while densities in cultivated protea stands are even higher. In *Protea roupelliae* habitats in Mpumalanga, Gurney's Sugarbird reaches estimated densities of 4.6 birds/ha, and more than 20 individuals of this species have been captured at single sites where sufficient inflorescences were available. The subspecies *ardens* of Gurney's Sugarbird is estimated to number a few thousand individuals in Zimbabwe, where it is common in protea nurseries.

The main conservation problems facing both species are loss of habitat through development, fires in fynbos or grassland, and the afforestation of protea savanna. Protea veld in fynbos is being gradually replaced by such developments as agriculture, and coastal lowland fynbos is being destroyed by developers for the building of holiday homes and through water impoundment. In addition, the illegal persecution of sugarbirds by poisoning or shooting in areas where protea flowers are cultivated for commercial trade has been a cause for concern. The appropriate management of the Cape Sugarbird fynbos habitat requires that fire, preferably during March and April, be on a frequency cycle of between 10 and 15 years. This is necessary in order to maintain as many protea species as possible in the fynbos habitat. In the Eastern Cape, uncontrolled fires have eradicated large areas of *Protea subvestita* populations in the Amatole Mountains, an area where the two sugarbird species historically co-occurred. Hot fires in late summer kill the growing tips of grassland proteas, leading to total crown loss, as *P. roupelliae*, unlike other proteas, does not resprout. Block-burning in *P. roupelliae* populations during the autumn months, in April/May–June, on a three-year rotation, or after the first spring rains in August/September, has been suggested as a means of ensuring that suitable habitat is available for sugarbirds, but such methods too must be applied with great caution and the implications for other species of plant and animal given full consideration.

General Bibliography

- Anon. (2007b), Bennett & de Swardt (1989), Bennett, Earlé, du Toit & Huchzermeyer (1992), Bock (1985, 1994), Broekhuysen (1959), Brown (2005a, 2005b), Burger *et al.* (1976), Butchart & Stattersfield (2004), Calf (2000a), Calf & Downs (2002), Calf *et al.* (2001, 2003a, 2003b, 2003c), Cheke & Mann (2001), Coetzee & Giliomee (1985), Coetzee & Middelmann (1997), Collins (1983b), Cowling (1992), Daniels (1987), Daniels *et al.* (2001), Dickinson (2003), Earlé *et al.* (1991), Farquhar *et al.* (1996), Feldheim *et al.* (2006), Fraser (1997a), Freeman (2003), Friedmann (1952), Fry (2000), Hall & Moreau (1970), Hockey *et al.* (2005), Holm & Marais (1992), Jackson, Nicolson & Lotz (1998), Jackson, Nicolson & van Wyk (1998), Maclean (1993), Manson (1985), Martin *et al.* (1988), McMahon & Fraser (1988), Mentis *et al.* (1974), Mostert *et al.* (1980), Nevill (1987), Olson & Ames (1984), Oschadleus & Fraser (1988), Paton & Collins (1989), Peach *et al.* (2001), Rebelo (1987a), Richardson *et al.* (1992), Salomonsen (1933, 1967b), Seiler & Fraser (1985), Sibley (1996), Sibley & Ahlquist (1974, 1990), Sibley & Monroe (1990, 1993), Siegfried (1985b), Skead, C.J. (1964a, 1964b, 1967), Skead, D.M. (1963), Steinbacher (1984b), Steyn (1997), de Swardt (1990, 1991b, 1992a, 1992b, 1993, 1997, 1998, 2001a), de Swardt & Bothma (1992), de Swardt & Louw (1994), de Swardt & Peach (2001), Symes, Downs & McLean (2001), Tarboton (2001), van Wilgen *et al.* (1990), Wooller (1982), Yom-Tov, McCleery & Oatley (1994).

Both sugarbird species live in socially monogamous pairs and breed once or twice a year. The nests, built exclusively by the female, are untidy cup-shaped structures of twigs, bracken, rootlets and other plant fibres. The nest of the Cape Sugarbird is placed 1–2 m up in a protea bush and lined with soft plant down. A clutch of two eggs is typical. After an incubation period of around 17 days, the chicks hatch and are then brooded by the female, and fed by both sexes for a further 17–21 days until they fledge. The fledglings remain on the natal territory, being fed by their parents, normally for another 21 days or so.

[*Promerops cafer*, South Africa.
Photo: Peter Steyn/
Photo Access]





PLATE 37

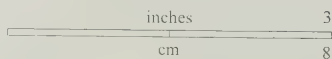


PLATE 37

Family PROMEROPIDAE (SUGARBIRDS) SPECIES ACCOUNTS

Genus *PROMEROPS* Brisson, 1760

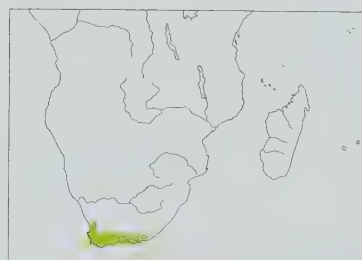
1. Cape Sugarbird

Promerops cafer

French: Promérops du Cap **German:** Kaphonigfresser **Spanish:** Mielero-abejaruco de El Cabo
Other common names: (Cape) Long-tailed Sugarbird

Taxonomy. *Merops cafer* Linnaeus, 1758, Cape of Good Hope, South Africa. Forms a superspecies with *P. gurneyi*; some evidence of former hybridization between the two in Eastern Cape. Monotypic.

Distribution. S South Africa (Western Cape, SW & S Eastern Cape).



Descriptive notes. 24–44 cm (including elongated tail of up to 38 cm); male 30.5–43.5 g, female 26–39 g. Medium-sized passerine with long, somewhat decurved bill, and long to exceedingly long, graduated tail. Male has forehead and crown grey-brown, black malar stripe bordered by white moustachial stripe and chin; upperparts brown, streaked blackish, rump and uppertail-coverts olive-green with faint black streaks; tail very long, 12–38 cm (during moult in Oct and Nov shorter, sometimes similar to female length), dark brown; primaries P5–P7 with rounded bulge on inner webs, narrow outer webs emarginated; breast rufous-brown, rest of underparts buffish-white, dusky streaks on lower breast, belly and flanks; undertail-coverts

bright yellow; iris dark reddish-brown; bill black; legs dark brown to blackish. Differs from *P. gurneyi* in having longer tail, duller crown, less rusty-tinted breast. Female is similar to male but smaller, with shorter tail (8–18 cm). Immature is duller than adult, colours of breast and belly not well demarcated, undertail-coverts pale brown, no flank streaks, gape bright yellow, tail short. Voice. Song consists of grating, chirping, chipping and twanging notes, “k-swip-chirring-ka-swip-chik-chik”, varying in intensity. Also various hissing and musical notes; rasping alarm call, also harsh wheezing alarm note likened to sound of cloth being torn. Mechanical noises made by male in display, using modified feathers of wings and tail (see pages 488, 492).

Habitat. Proteoid shrublands in fynbos; also suburban gardens, and in areas where alien plants e.g. eucalypts (*Eucalyptus*) and agaves (*Agave*) present. Attracted to artificial environments with year-round food supply, such as botanical gardens. Sea-level to mountains.

Food and Feeding. Nectar of several fynbos *Protea* species (mainly *P. repens*, *P. lepidocarpodendron*, *P. neritifolia* and others) and of *Leucospermum* (e.g. *L. conocarpodendron*), *Mimetes* and *Aloe*; also that of heaths (*Erica*) and *Tecomaria*, *Watsonia*, red hot poker (*Kniphofia*), agaves and eucalypts; and visits several introduced species, e.g. eucalypts and bottlebrush (*Callistemon viminalis*). Insects eaten include mainly beetles (Coleoptera), bees (Hymenoptera) and flies (Diptera), with ants (Formicidae), wasps (Hymenoptera), aphids (Aphidoidea) and moths (Lepidoptera) less frequent; spiders (Araneae) also taken.

Breeding. Season mainly Apr–Jul in SW of range and later, Jun–Jul, in E, coinciding with *Protea* flowering season; sometimes double-brooded. Socially monogamous, but some extra-pair copulations occur; loosely colonial nester, but strongly territorial. Nest built by female, taking 5–10 days, an untidy cup made from twigs, bracken (*Pteridium*) and rootlets, lined with brown-coloured plant down from dead flowerheads, placed 0.25–2.4 m above ground in forked branch, hidden by foliage, in protea bush (e.g. *P. eximia*, *P. grandiceps*, *P. neritifolia*) or in *Leucadendron*, heath, *Rhus* or other woody plant; territory small, 0.2–0.4 ha. Clutch 2 eggs, rarely 3, occasionally 1; incubation by female (starting with second egg), period 17 days; chicks brooded by female, fed by both sexes, nestling period 17–21 days; young fed by parents for c. 21 days after leaving nest. Breeding success 33–60–80% in three studies, nest failures due mainly to adverse weather conditions (driving rain, low temperatures), and to predation by other birds, rodents, mongooses (Herpestinae) and snakes; also, small chicks sometimes attacked and killed by introduced Argentine ants (*Linepithema humilis*). Maximum recorded longevity in ringing studies 14 years 6 months.

Movements. Non-migratory, but undertakes local movements occur in response to flowering seasons of foodplants, e.g. those of *Leucospermum conocarpodendron* on coastal plains (Sept–Dec) and *Protea repens* on hillsides (Jun–Aug); moves into sandplain fynbos on W coast in spring and early summer, in order to exploit flowering by procumbent sandveld pincushions (*Leucodendron hypophyllocarpodendron*, *L. tomentosum*, *L. parile*, *L. rodolentum*); also moves in response to fire, and returns to previously burnt areas once foodplants mature. Often returns to same area after local movements. In SW of range, ringed individuals recorded moving up to 365 km. Records of vagrants in C South Africa (S Free State) thought to be result of drought conditions in Eastern Cape. One bird seen 40 km offshore from Cape Point, heading out to sea.

Status and Conservation. Not globally threatened. Locally common. Densities in mountain fynbos 2–4.1 birds/ha and up to 20 pairs/km²; 14 birds/ha in cultivated protea stands. Serious long-term threats are destruction of coastal lowland fynbos for development and agriculture, and invasion by alien plants; other threats include elimination of seed regeneration of proteas by overly frequent burning, alien-plant infestation in mountains, and water impoundment. Damage to flowers caused by sugarbirds in commercial protea plantations is generally minimal, but can sometimes lead to persecution. Present species is an important pollinator of proteas. Occurs in several protected areas in mountain ranges of Cederberg, Swartberg and Outeniqua, and also in Cape of Good Hope Nature Reserve, Tsitsikama National Park and Kirstenbosch National Botanical Gardens. Altogether, 5000–10,000 individuals reckoned to be present in at least 34 protected areas, out of a total population of 10,000–100,000 birds.

Bibliography. Altwegg & Underhill (2006), Bennett, Earlé, du Toit & Huchzermeyer (1992), Broekhuysen (1959, 1971), Brown (2005a), Burger *et al.* (1976), Calf (2000a, 2000b), Calf *et al.* (2003a, 2003b, 2003c), Cheke & Mann (2001), Coetzee & Middelmann (1997), Collins (1983a, 1983b, 1983c), Collins *et al.* (1990), Craig & Simon (1991), van den Elzen & van den Elzen (1983), Fraser (1997a), Fraser & McMahon (1992), Freeman (2003), Fry (2000), Grégoire *et al.* (2007), Henderson & Cherry (1998), Jackson, Nicolson & Lotz (1998), Jackson, Nicolson & van Wyk (1998), Maclean (1993), McCarthy (2006), McMahon & Fraser (1988), Mostert *et al.* (1980), Oschadleus & Fraser (1988), Rebelo (1987a, 1987c), Richardson, D.M. (1990), Scharnke (1932), Schürer (1987), Schürer & Bock (1993), Seiler & Fraser (1985), Seiler & Prys-Jones (1989), Skead (1964a, 1964b, 1967), Steyn (1997), de Swardt (1992b), Tarboton (2001), Tjørve (2007), Tjørve & Scholtz (2007), Tjørve *et al.* (2005), Winterbottom (1962).

2. Gurney’s Sugarbird

Promerops gurneyi

French: Proméròps de Gurney **Spanish:** Mielero-abejaruco de Gurney **German:** Natalhonigfresser

Other common names: Natal Sugarbird, Gurney’s/Natal Long-tailed Sugarbird, Chestnut-headed Sugarbird

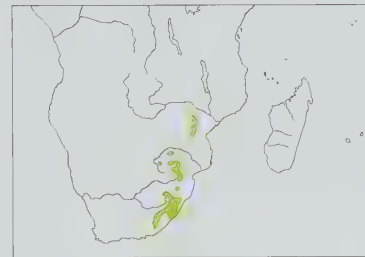
Taxonomy. *Promerops gurneyi* J. Verreaux, 1871, KwaZulu–Natal, South Africa.

Forms a superspecies with *P. cafer*; some evidence of former hybridization between the two in Eastern Cape. Races separated geographically, and perhaps ecologically isolated; research required on possible taxonomic implications. Two subspecies recognized.

Subspecies and Distribution.

P. g. ardens Friedmann, 1952 – E highlands of Zimbabwe and adjacent W Mozambique (Chimanimani Mts).

P. g. gurneyi J. Verreaux, 1871 – N & E South Africa from Limpopo Province (isolated populations) S along Drakensberg escarpment.



Descriptive notes. 23–29 cm; male 30–46.5 g, female 23–43 g. Medium-sized passerine with long, somewhat decurved bill and long, graduated tail; deep russet crown and breast. Male nominate race has forehead to nape rich chestnut, black lores, short white supercilium, grey-brown ear-coverts, white moustachial stripe, indistinct thin brown malar stripe; upperparts grey-brown, streaked darker, rump and uppertail-coverts yellowish-olive with faint black streaks; tail long, 11–19.3 cm, dark brown; primary P6 with rounded bulge on inner web (bulge width 13.1–16.1 mm, usually widest on older males), and narrow outer web

emarginated; throat whitish, breast russet, belly and flanks whitish with brown streaks, undertail-coverts bright yellow; iris dark hazel to reddish-brown; bill and legs black. Female resembles male but somewhat smaller, with shorter bill, shorter tail (8.3–13.6 cm), primary edge smaller (9.8–12.2 mm in width) or lacking. Immature is duller than adult, secondaries edged brownish, breast greenish-russet, undertail-coverts greenish-yellow, tail relatively short; gape-flange yellow for few months after leaving nest. Race *ardens* is somewhat darker than nominate, rump greener, less yellowish, uppertail-coverts tinged greenish, breastband richer and brighter chestnut, flanks more heavily streaked. Voice. Song a jumbled series of rapid high-pitched twittery and twanging notes, “swip-cheek-cheek-cha-wing-king-ching”. Also short “sa-weep-chi-chi” calls for long spells, especially when excited. Harsh “sskirrit” alarm call. Mechanical noises made by male in display, using modified feathers of wings and tail (see pages 488, 492).

Habitat. Nominative race mainly in montane scrub dominated by protea (*Protea*) species; distribution coincides with that of *Protea roupelliae* in grassland. Recorded also in mixed *P. roupelliae*–*P. caffa* veld, but absent in lower-altitude areas of *P. caffa* (e.g. mountain ranges in Gauteng Province). Has become resident in protea nurseries; a non-breeding visitor to aloes (*Aloe*) in gardens. N race (*ardens*) occurs in areas dominated by proteas and brachystegia (*Brachystegia*), sometimes in riparian woodland; favours drier, W-facing slopes with abundance of flowering shrubs, e.g. *Protea*, *Sirelitzia*, *Erythrina*.

Food and Feeding. Nectar, mainly of proteas (*Protea roupelliae*, *P. caffa*), *Greyia radikoferi* and *G. sutherlandii*, tree-fuchsia (*Halleria lucida*), *Aloe* (e.g. *A. arborescens*), *Watsonia*, red hot poker (*Kniphofia*) and eucalypts (*Eucalyptus*), and including cultivated proteas, aloes and other flowers; also insects, mainly beetles (Coleoptera) and bees and ants (Hymenoptera); also few spiders (Araneae). Large numbers of beetles (including *Tanaos sanguineus*) associated with *P. roupelliae* inflorescences were found in stomach contents.

Breeding. In South Africa, season mainly Sept–Feb, occasionally in other months (Jun–Jul), coinciding with flowering of main foodplant (*Protea roupelliae*); in N of range (race *ardens*) recorded in Jul, Oct and Apr. Socially monogamous, but some extra-pair copulations may occur; solitary nester, territorial. Nest built by female, taking 5–15 days, an open cup made from stems and leaves of e.g. bracken (*Pteridium aquilinum*), *Helichrysum* and heath (*Erica*), lined with fine material and with fluffy, brown-coloured protea seeds, placed 1.7–2.7 m (up to 8 m) above ground in protea tree or at edge of clump, mostly in old floral bract; territory large, 2.5–3 ha (changing in response to inflorescence and arthropod availability). Clutch 2 eggs (occasionally only 1 reported, but possibly incomplete); incubation by female, period 16–17 days; chicks brooded by female, fed by both sexes, nestling period 19–23 days; young fed for further 20 days after leaving nest. Breeding success in South Africa 46.1% (Mpumalanga) to 55.5% (Free State), failures attributed to adverse weather conditions (rain), predation, and desertion of nest by adults. Maximum recorded longevity at least 13 years; estimated annual survival 80.7%.

Movements. Primarily resident, with local dispersal and short altitudinal shifts. Disperses from protea areas during winter months, mainly after peak Oct–Feb flowering period of *Protea roupelliae*, but also in response to veld fires. Short-distance altitudinal migrant between low-lying town areas and higher parts of mountains in E South Africa, individuals returning to same mountain localities in summer, mean distance moved 7 km; one moved 37 km to E. Seasonal movements during winter, especially in Drakensberg escarpment to midlands. Resident populations in protea nurseries augmented by non-breeding visitors during winter months.

Status and Conservation. Not globally threatened. Locally common; uncommon in SC Eastern Cape (Amatole Mts), where *Protea subvestita* populations destroyed by uncontrolled fires. Probably under-reported, as it inhabits mountainous terrain. In N South Africa (Mpumalanga), mean density 4.6 birds/ha and more than 20 birds/ha recorded in *P. roupelliae* woodland with sufficient inflorescences. Race *ardens* estimated to number a few thousand individuals in Zimbabwe, where common in protea nurseries. Main threats to species are uncontrolled grassland fires in protea savanna and afforestation of grassland habitat; management of protea grassland therefore a priority. Sometimes causes damage in commercial protea-farming areas in KwaZulu–Natal, which can lead to control measures being introduced. Present species is an important pollinator of plants. Occurs in several protected areas, e.g. in Marakele, Golden Gate and Drakensberg National Parks and in Blyde River Canyon and Amatole Forest Complex, all in South Africa; in Zimbabwe, race *ardens* protected in Nyanga and Chimanimani Mountain National Parks.

Bibliography. Bennett, Earlé & Peirce (1992), Bennett, Earlé, du Toit & Huchzermeyer (1992), Brown (2005b), Calf (2000a, 2000b), Calf & Downs (2002), Calf *et al.* (2001, 2003c), Cheke & Mann (2001), Collar & Stuart (1985), Daniels (1987), Daniels *et al.* (2001), Downs (1997, 2004), Downs & Perrin (1996), Earlé *et al.* (1991), Friedmann (1952), Fry (2000), Holm & Marais (1992), Irwin (1981b), Maclean (1993), Manson (1985), Martin *et al.* (1988), McCarthy (2006), Mironov & Kopij (2000a, 2000b), Nevill (1987), Schürer (1987), Skead, C.J. (1964b, 1967), Skead, D.M. (1963), Steyn (1973), de Swardt (1990, 1991b, 1992a, 1992c, 1993, 1997, 1998, 2001a, 2004), de Swardt & Bothma (1992), de Swardt & Louw (1994), de Swardt & Peach (2001), Symes, Downs & McLean (2001), Tarboton (2001), Tjørve *et al.* (2005).

Class AVES

Order PASSERIFORMES

Suborder OSCINES

Family MELIPHAGIDAE (HONEYEATERS)



- Tiny to very large, typically slender passerines with variably long and usually decurved bill, short to long tail; generally drab plumage, often with conspicuous wing patches of yellow or white, many with areas of bare facial skin or wattles.
- 9–50 cm.



- Australasia and Oceania, and marginally Oriental Region.
- Rainforest, sclerophyll forests and woodlands, shrubland, heath, grassland, mangroves.
- 42 genera, 175 species, 375 taxa.
- 8 species threatened; none extinct since 1600.

Systematics

The honeyeaters (Meliphagidae) comprise one of the most characteristic, numerous, speciose and widespread components of the Australo-Papuan bird fauna. Although centred in Australia and New Guinea, the group has outliers westwards to the Moluccas and Bali, north to the Northern Mariana Islands and Micronesia, and east through New Zealand and the south-western Pacific to Samoa and Tahiti. Two recently extinct genera, *Moho* and *Chaetoptila*, once thought to have been honeyeaters but apparently unrelated to the Meliphagidae, occurred in the Hawaiian Islands. Excluding the Hawaiian species, there are at least 42 genera and 175 species in the family as currently constituted.

The first extensive classification of the honeyeaters was that of H. F. Gadow in 1884, in Volume 9 of the *Catalogue of the Birds in the British Museum*. Gadow placed them together with the sunbirds (Nectariniidae) in a larger grouping, Cinnymorphae. He recognized three subfamilies: Myzomelinae, with *Myzomela* and *Acanthorhynchus*; Meliphaginae, comprising 20 genera; and Zosteropinae, the last containing the white-eyes, which are now segregated as the family Zosteropidae, and two honeyeater genera, namely *Melithreptus* and *Plectorhyncha*. Within Meliphaginae, species were placed in generic combinations that are considerably different from those used in the latter half of the twentieth century and up to the present day.

It was the 1967 classification of F. Salomonsen in J. L. Peters's *Check-list of Birds of the World* that introduced the generic circumscriptions and names that have been employed until just recently. Salomonsen accepted 39 genera. Unfortunately, there was no supporting document to accompany the linear sequence which could have explained the classification adopted. The reasons for several aspects of this sequence, and its implied association of genera, were not obvious, and some details of the arrangement were confusing. The classification of H. E. Wolters, in 1979, included 49 genera. Both Salomonsen's treatment and that of Wolters contained several genera that have subsequently been removed to other families.

Although a few papers went beyond mere linear classifications for small subsections of honeyeaters, K. P. Koopman's revision of the genus *Myzomela* being one example, there was no major attempt to address the evolution and diversification of the Meliphagidae within a broader framework until R. Schodde, in 1975, scrutinized the Australian taxa within the context of the whole family. He proposed that, among Australian honeyeaters,

the larger-bodied forms retained more ancestral characters than the smaller ones. Those considered to be the most generalized honeyeaters, the *Melidectes*, *Pycnopygius* and *Ptiloprora* species, were centred on the cool rainforests of the New Guinea highlands and were at the bases of two major lineages. Schodde identified one lineage comprising many larger-bodied forms, such as the genera *Melidectes*, *Pycnopygius*, *Anthochaera*, *Philemon*, *Acanthagenys*, *Entomyzon*, *Manorina*, *Meliphaga*, *Lichenostomus* and *Melithreptus*. The other lineage contained smaller-bodied honeyeaters, many with a thin, curved bill, and included the genera



The family Meliphagidae contains 175 species spread across 42 genera. The core of honeyeater distribution lies in Australia and New Guinea, but the family also extends north to Micronesia, west to Wallacea and east through New Zealand into Oceania. The genus *Acanthorhynchus* is endemic to Australia and contains two small, fairly long-tailed species with long, slender decurved bills. Both are attractively plumaged and sexually dichromatic, the **Western Spinebill** particularly so. The striking adult male is adorned with black, white, grey and rufous, while the female is much less distinctively marked.

[*Acanthorhynchus superciliosus*, Cheyne Beach, Waychinicup National Park, Western Australia, Australia. Photo: Drew Fulton]

Ptiloprora, *Phylidonyris*, *Acanthorhynchus*, *Certhionyx*, *Conopophila* and *Lichmera*. There were also genera of uncertain affinity, such as *Timeliopsis*, *Glycichaera*, *Melilestes* and *Myzomela*, which could not be easily placed in one lineage or the other.

Honeyeaters are diverse in size and morphology. They include species that are nectarivorous, insectivorous or frugivorous, or, more commonly, combine nectar-eating and insect-eating. Many species have a long, narrow, decurved bill, adapted for the procuring of nectar. The most striking feature of honeyeaters is the tongue, which is prolonged and protrusible. The tip of the tongue of most meliphagids is modified into a brush (see Morphological Aspects). The morphological analyses undertaken by W. J. Bock and H. G. Morioka revealed significant variation in the structure of the palate and the ectethmoid-mandibular articulation across the family.

Traditionally, the Meliphagidae were linked with the sunbirds, the white-eyes and other nectarivorous birds. Several lines of molecular evidence, including the studies by C. G. Sibley and J. E. Ahlquist of DNA-DNA hybridization, the various protein-electrophoretic studies of L. Christidis and Schodde, and the various DNA-sequencing studies of P. G. P. Ericson and colleagues and F. K. Barker and colleagues, have indicated that the honeyeaters belong to an Australo-Papuan clade, which also includes the pardalotes (Pardalotidae), thornbills (Acanthizidae), bristlebirds (Dasyornithidae) and Australasian fairy-wrens (Maluridae). The meagre fossil record of honeyeaters has been summarized by W. E. Boles. Fossils of Quaternary age have been found in Australia, New Zealand, the south-western Pacific and Hawaii. The oldest known fossils are from the Late Tertiary of Australia, and are of Pliocene and Miocene age. Some of these Pliocene specimens are represented by tarsometatarsi that resemble those of modern members of the genera *Meliphaga* and *Lichenostomus*.

Several molecular and biochemical studies undertaken in the decades since the late 1980s have changed our understanding of the composition of the Meliphagidae. In particular, MacGregor's Honeyeater (*Macgregoria pulchra*), a New Guinea species formerly classified as a bird-of-paradise and placed in the family Paradisaeidae, is now known to be a honeyeater, and the Australian chats, herein separated as the family Ephianuridae (see HBW12, pages 612-626), should likewise be included in Meliphagidae. The affinities and systematics of these are discussed in greater detail later in this section.

All of the other changes have involved the removal of species from the family, and are given brief mention here. The affinities of the New Guinea longbill genus *Toxorhamphus* have for long been controversial. This genus was aligned by some authors with the sunbirds in Nectariniidae and by others with the honeyeaters. On the basis of morphological characteristics, the other New Guinea longbill genus, *Oedistoma*, was generally considered to be part of the honeyeater assemblage. The history of classification of these two genera has been well summarized by Sibley and Ahlquist. Grooved nostrils and a quadrid tongue were originally given as some of the characters for including *Toxorhamphus* and *Oedistoma* in the Meliphagidae. The studies by Sibley and Ahlquist, Christidis and colleagues and Barker and colleagues have provided strong evidence for concluding that the four species of *Oedistoma* and *Toxorhamphus* are not honeyeaters but are, instead, part of the berrypecker complex (Melanocharitidae).

The African sugarbirds (*Promerops*) have at various times been included in the thrush family (Turdidae), in the starlings (Sturnidae) and, more commonly, in the honeyeaters, the last-mentioned treatment being based largely on the morphology of the corneous tongue and its associated musculature, as described by Bock. Other treatments for the sugarbirds have included the placing of them with the sunbirds (Nectariniidae) or in their own monotypic family, Promeropidae. Both data derived from DNA-DNA hybridization and data from DNA-sequencing have indicated that the sugarbirds are not related to the honeyeaters. Although the DNA-DNA hybridization data suggested links between the sugarbirds and the sunbirds, the DNA studies of Barker and colleagues indicate that they are, in fact, part of a basal African passeroid assemblage.

The Golden White-eye (*Cleptornis marchei*), confined to the Northern Mariana Islands, was traditionally treated as a honey-

eater, but behavioural and ecological observations by H. D. Pratt strongly indicated that it was, in reality, a white-eye. Both the studies of Sibley and Ahlquist and the mitochondrial-DNA sequence data of M. S. Springer and colleagues have corroborated Pratt's suspicions. In vocalizations, *Cleptornis* is most similar to the genus *Rukia* from the Caroline Islands. Another zosteropid previously treated as a honeyeater is the Bonin White-eye (*Apalopteron familiare*), restricted to the islands of that name, south of Japan. This species had at different times been assigned also to the bulbuls (Pycnonotidae) and the babblers (Timaliidae). Although several characters, including tongue structure, bill, and nest and eggs, were cited by H. G. Deignan in support of its honeyeater affinities, interpretation of this evidence was ambiguous. Nevertheless, field observations of the Bonin White-eye by H. Morioka and T. Sakane identified similarities in ecology and behaviour to the other white-eyes. The mitochondrial-DNA data of Springer and colleagues supported the view that this species is not a honeyeater but is, indeed, a white-eye, and most closely allied to the Golden White-eye. The eggs of the two are very similar, and it has been suggested that these two species, along with the white-eye genus *Rukia*, comprise a single genus, for which the name *Apalopteron* has priority.

An interesting case is that of the Stitchbird (*Notiomystis cincta*). This New Zealand species, known also as the Hihi, has generally been treated as a honeyeater, albeit an unusual one. Following analyses of DNA sequences and a re-evaluation of several behavioural and skeletal characters, however, A. C. Driskell and her colleagues separated the Stitchbird into its own monophyletic family, Notiomystidae. According to their DNA-based phylogeny, and that of J. G. Ewen and his colleagues, the Stitchbird is most closely allied to the New Zealand Wattlebirds (Callaeidae), although the two groups diverged from one another some 34 million years ago.

As with the above genera that have been found not to be honeyeaters, recent work has revealed that the Hawaiian genera *Moho* and *Chaetoptila* are likewise not meliphagids. Unfortunately, all five species in these two genera, the Kauai O'o (*Moho braccatus*), Oahu O'o (*Moho apicalis*), Bishop's O'o (*Moho bishopi*) and Hawaii O'o (*Moho nobilis*) and the Kioea (*Chaetoptila angustipluma*), are now considered extinct (see Status and

The genus *Pycnopygius* comprises three medium-sized, rather nondescript meliphagids from New Guinea. All have a medium-length, marginally decurved bill, and are broadly grey-brown in plumage. The **Marbled Honeyeater** and its congeners are superficially similar in appearance to friarbirds (Philemon), a characteristic that is thought to be by design rather than coincidence. Several honeyeater species, as well as several orioles (Oriolidae), mimic the larger, more aggressive friarbirds in order to feed undisturbed by their side.

[*Pycnopygius cinereus marmoratus*, Ubaigubi, EC New Guinea. Photo: William S. Peckover]



Conservation). Using DNA extracted from museum specimens collected in the 1800s, R. Fleischer and his colleagues found no support for the placement of these Hawaiian genera within the family Meliphagidae, or even within the "parvorder Corvida" as defined by Sibley and B. L. Monroe. They found both *Moho* and *Chaetoptila* to be members of the "parvorder Passerida", forming a divergent lineage within an unusual clade containing three other avian families, namely the waxwings (Bombycillidae), the silky-flycatchers (Ptilonotidae) and the Dulidae, the last consisting of a single species, the Palmchat (*Dulus dominicus*). These two Hawaiian genera are convergent in morphology, behaviour and ecology with the Australasian honeyeaters, but they remain unique taxonomically, possibly to the level of family. They are not derived from South Pacific ancestors, in common with the other Hawaiian endemics other than the Elepaio (*Chasiempis sandwichensis*), which has been shown by the DNA study of C. E. Filardi and R. G. Moyle to be allied to the monarch-flycatchers (Monarchidae) centred on the Australo-Papuan region.

There have been no recent attempts to recognize subfamilies and tribes within the honeyeaters. Morphological assessments have focused on limited character bases and have produced little general consensus. A particular difficulty is the fact that circumscription of several genera is still unresolved. In placing the Australian chats (Epthianuridae) within the honeyeaters, Schodde and I. J. Mason treated these as a separate subfamily, Epthianurinae, on the basis of a few apparently divergent skull characters. The DNA findings of Driskell and Christidis, however, clearly place the Australian chats deep within the honeyeaters. The extensive DNA-sequencing study of relationships of largely Australian and New Guinean genera undertaken by Driskell and Christidis identified five major assemblages. Apart from one, which is monogeneric, these assemblages comprised a mixture of large-bodied and small-bodied genera. Although several critical genera and species were not included in the study, the assemblages identified are probably the best reflection of higher relationships within the Meliphagidae and form the basis of the classification currently adopted here. The main divergence from this is that, in the present arrangement, the Australian chats are excluded, having already been treated as a separate family, Epthianuridae.

Assemblage 1. The DNA-sequence data have identified the Eastern Spinebill (*Acanthorhynchus tenuirostris*) and the Western Spinebill (*Acanthorhynchus superciliosus*) as the sister-group to the rest of the honeyeaters examined to date. Schodde and Mason suggested that the spinebills resembled the genera *Myzomela* and *Certhionyx* in certain features of the skull and palate. They noted, however, that the spinebills comprise one of the more distinctive genera of honeyeaters in terms of external morphology and behaviour, as well as in having tomial toothings of the bill and an extensively tubed tongue. Having one basal group of honeyeaters with two species and a single genus restricted to the heathlands and woodlands of eastern and southern Australia, while the other basal group comprises the remaining 173 species and 41 genera and ranges throughout Wallacea, Australasia and the Pacific, is an intriguing biogeographical and evolutionary scenario. Driskell and Christidis suggested that the honeyeaters arose during the mid-Tertiary, when heathlands were widespread in Australia. The two species of spinebill are very similar to each other and are considered to represent eastern and western replacements, respectively, of a single superspecies. In terms of genetic differentiation the two are in fact quite distinct, with a level of divergence similar to that observed between distinct subgenera of honeyeaters. This indicates that the two spinebills diverged several million years ago, but that they have retained a strong degree of similarity in morphology and plumage pattern.

Assemblage 2. In complete contrast to the spinebill group, the second assemblage is the largest in terms of genera and species. It is distributed throughout Australia, New Zealand, New Guinea and possibly the Solomon Islands, the last depending on the affinities of taxa not yet subjected to DNA analysis. Within this assemblage, one intriguing clade identified by the DNA-sequencing analyses of Driskell and Christidis comprises the New Guinean *Pycnopygius*, the arid-adapted Australian *Certhionyx* and the New Zealand endemics *Prosthemadera* and *Anthornis*. DNA analysis of other Melanesian and Polynesian honeyeater genera



The **Tui** is the only member of the genus *Prosthemadera*. It is endemic to New Zealand and its offshore islands. One of the larger honeyeaters, the Tui is morphologically distinctive, having broad, rounded wings and tail, strong legs and feet, and a sturdy, slightly decurved bill. The wings are modified with notches in the eighth primary; only adults have the notches and those of males are larger than those of females. The notches enable the Tui to produce a variety of whirring wing noises in aggressive and courtship displays.

[*Prosthemadera novaeseelandiae novaeseelandiae*, Tiritiri Matangi Island Open Sanctuary, New Zealand.
Photo: Mark Jones/
The Roving Tortoise Photos]

may help to elucidate the origins and evolutionary history of this biogeographically challenging pattern. The three species of New Guinean *Pycnopygius*, the Plain Honeyeater (*Pycnopygius ixoides*), the Marbled Honeyeater (*Pycnopygius cinereus*) and the Streak-headed Honeyeater (*Pycnopygius stictocephalus*), are rather nondescript meliphagids having superficial resemblances to the smaller friarbirds (*Philemon*), as well as to the Tawny-breasted Honeyeater (*Xanthotis flaviventer*) and the quite unrelated Brown Oriole (*Oriolus szalayii*). According to J. M. Diamond, the tendency for some smaller species of honeyeater and oriole to develop similarities in overall appearance to larger species is a form of mimicry that allows the smaller species, in this case *Pycnopygius*, to feed alongside the larger, more pugnacious ones, in this case friarbirds and orioles (see Morphological Aspects, Voice). In such instances, external morphology is a poor indicator of systematic relationships. DNA-sequencing information aligns *Pycnopygius* with the Pied Honeyeater (*Certhionyx variegatus*) of Australia. These two genera are, in turn, linked to a clade that comprises the Tui (*Prosthemadera novaeseelandiae*) and the New Zealand Bellbird (*Anthornis melanura*), both confined to New Zealand. Until recently, *Certhionyx* was considered to include a further two species, the Black Honeyeater (*Sugomel nigrum*) and the Banded Honeyeater (*Cissomela pectoralis*), generally aligned with the Pied Honeyeater owing to similarities in external appearance, all three having black-and-white plumage, a small body and a longish decurved bill. DNA-sequencing studies, however, indicate that the three are unrelated and that each belongs to a different assemblage, the Pied Honeyeater being part of "assemblage 2", the Black Honeyeater belonging to "assemblage 4" and the Banded Honeyeater lying within "assemblage 5". Consequently, *Certhionyx* is a monotypic genus comprising only the Pied Honeyeater. Morphology provides few clues to the affinities of the Pied Honeyeater; the body shape and bill type are more reminiscent of *Phylidonyris*, and the small blue wattle below the eye has some similarity to the eye skin of *Manorina* and *Melithreptus*. To date, no strong shared morphological features have been found that link the Pied Honeyeater with *Pycnopygius*, *Prosthemadera* and *Anthornis*.

According to molecular-clock estimates based on the data of Driskell and her colleagues, the Tui and the New Zealand Bellbird diverged from each other about 3 million years ago, follow-

ing a single colonization event in New Zealand. Morphologically, the two species are quite distinctive and, if it were not for their shared biogeography a close relationship between the two would not be obvious. The two genera do, however, have similarly patterned eggs. The extinct Chatham Islands *Anthornis* taxon *melanocephala* is generally considered a subspecies of the New Zealand Bellbird, but it was treated as a separate species, the "Chatham Island Bellbird", by R. Holdaway and his colleagues, a decision based on a broad acceptance of the phylogenetic species concept. The Chatham Island Bellbird had yellow eyes, whereas all other forms have red eyes, and it was, moreover, the largest of all subspecies, but determination of whether it represented a separate species requires more detailed examination.

Due to superficial similarities in facial pattern, the genera *Meliphaga*, *Lichenostomus*, *Xanthotis*, *Guadalcanaria*, *Oreornis* and *Foulehaio* have been thought to be closely related. Driskell and Christidis, however, found that, rather surprisingly, *Meliphaga*, *Lichenostomus*, *Xanthotis* and *Foulehaio* appeared not to be closely related; *Meliphaga* and *Lichenostomus* were part of assemblage 2 but not as sister-clades, while *Xanthotis* and *Foulehaio* were part of assemblage 5 but, again, not as sister-lineages.

The Guadalcanal Honeyeater (*Guadalcanaria inexpectata*) is a large grey meliphagid with a dusky malar line and an elongated yellow plume on the side of the neck. These characters have prompted several authors to associate this species with *Meliphaga* and *Lichenostomus*, and it was placed in the former genus by Salomonsen. Nevertheless, the DNA-based studies have revealed that plumage patterns are poor indicators of generic affinities within the honeyeaters, suggesting that *Guadalcanaria* is best retained as a genus of indeterminate affinities pending DNA analysis.

Both the protein-electrophoretic study of Christidis and Schodde and the DNA-sequencing analyses of J. A. Norman and colleagues identified two major lineages within *Meliphaga*. The "lewinii group" consists of Lewin's Honeyeater (*Meliphaga lewinii*) and the Yellow-spotted Honeyeater (*Meliphaga notata*) from Australia and the Puff-backed Honeyeater (*Meliphaga aruensis*) from New Guinea. These three replace each other geographically, and even where Lewin's and Yellow-spotted Honeyeaters meet, in north-eastern Queensland, they largely replace each other altitudinally. The Puff-backed Honeyeater has been found to comprise two genetically distinct forms, one of which is

restricted to the extreme south-east of its range; in terms of genetic distance, the two forms have diverged from each other to the same extent as have Lewin's and Yellow-spotted Honeyeaters. The second main lineage, the "analoga group", comprises the Scrub Honeyeater (*Meliphaga albonotata*), Hill-forest Honeyeater (*Meliphaga orientalis*), Mimic Honeyeater (*Meliphaga analoga*), Tagula Honeyeater (*Meliphaga vicina*), Graceful Honeyeater (*Meliphaga gracilis*), Spot-breasted Honeyeater (*Meliphaga mimikae*), Forest Honeyeater (*Meliphaga montana*), Yellow-gaped Honeyeater (*Meliphaga flavirictus*), White-lined Honeyeater (*Meliphaga albilineata*) and Streak-breasted Honeyeater (*Meliphaga reticulata*). DNA distances revealed the existence of two further species in this assemblage. The Kimberley Honeyeater (*Meliphaga fordiana*), from the Kimberley region of north-western Australia, is specifically separable from the White-lined Honeyeater, which is now confined to Arnhem Land, in northern Australia. The Graceful Honeyeater is restricted to north-eastern Australia and the Trans-Fly region of New Guinea; those populations in south-eastern New Guinea formerly treated as conspecific with it are now separated as the Elegant Honeyeater (*Meliphaga cinereifrons*). Of particular uncertainty have been the taxon *stevensi*, from the northern watershed of south-eastern New Guinea. On the basis of plumage patterns and proportions, it has been aligned with either the Mimic Honeyeater or the Elegant Honeyeater. The DNA-sequence data reveal that both morphological assessments may have been correct as, in reality, the birds till now labelled as *stevensi* include individuals of both species, and the two species co-occur at least in part of this zone. The Streak-breasted Honeyeater, from Timor, has been difficult to place taxonomically because it has *Lichenostomus*-like dusky rictal stripes and *Meliphaga*-like flared yellow ear-tufts. Other traits, such as broad white-shafted ventral striping and streaked ear-tufts, suggest affinities with *Lichmera* or *Trichodere*. The DNA-sequence data place this species within *Meliphaga*, as sister to the White-lined and Kimberley Honeyeater group, and such an association is consistent with the geographically close proximity of Timor to north-western Australia. Within *Meliphaga*, closely related species occupy disjunct distributions and replace each other geographically or altitudinally, this presumably being a mechanism for minimizing competition between ecologically similar forms. Norman and her colleagues

The 15 species in the genus *Meliphaga* are classic, medium-sized honeyeaters, as befits a genus that gives the family its name. In *Meliphaga*, the bare facial skin that is typical of the family is restricted to a swollen and extended gape line that runs back from the bill to below the eye. The genus is also characterized by a pale ear-covert patch, although many are less extensive and less prominent than that of the **Elegant Honeyeater**. This species is endemic to New Guinea and was formerly considered conspecific with the Graceful Honeyeater (*M. gracilis*).

[*Meliphaga cinereifrons*
cinereifrons,
near Brown River,
SE New Guinea.
Photo: Brian J. Coates]





found that co-distributed lineages tended to be phylogenetically distant and co-existed by segregating vertically within the habitat or through horizontal segregation in the form of habitat differentiation. Consequently, the predominantly allopatric distributions observed among recently evolved *Meliphaga* species suggest that most speciation events have been initiated through physical isolation mechanisms of single habitats, such as mountain uplift, flooding of basins or aridification.

The genus *Lichenostomus* comprises 20 species that have elongated ear and upper-neck plumes and a lined face. They are very homogeneous in terms of body shape and bill shape, and their centre of diversity is the sclerophyll forests of Australia. On the basis of plumage patterns, Christidis and Schodde recognized six species groups, or subgenera: the “*Caligavis* group”, comprising the Black-throated (*Lichenostomus subfrenatus*), Obscure (*Lichenostomus obscurus*), Bridled (*Lichenostomus frenatus*), Eungella (*Lichenostomus hindwoodi*) and Yellow-faced Honeyeaters (*Lichenostomus chrysops*); the “*Gavialis* group”, with the Singing Honeyeater (*Lichenostomus virescens*), the Varied Honeyeater (*Lichenostomus versicolor*) and the Mangrove Honeyeater (*Lichenostomus fasciolaris*); the “*Stomiopetra* group”, with the White-gaped Honeyeater (*Lichenostomus unicolor*) and the Yellow Honeyeater (*Lichenostomus flavus*); the “*Nesoptilotis* group”, containing the White-eared Honeyeater (*Lichenostomus leucotis*) and the Yellow-throated Honeyeater (*Lichenostomus flavicollis*); the “*Lichenostomus* group”, comprising the Yellow-tufted Honeyeater (*Lichenostomus melanops*), the Grey-headed Honeyeater (*Lichenostomus keartlandi*) and the Purple-gaped Honeyeater (*Lichenostomus cratitius*); and the “*Ptilotula* group”, consisting of the Yellow-plumed (*Lichenostomus ornatus*), Grey-fronted (*Lichenostomus plumulus*), Fuscous (*Lichenostomus fuscus*), Yellow-tinted (*Lichenostomus flavescens*) and White-plumed Honeyeaters (*Lichenostomus penicillatus*). Only two of these species, the Black-throated and Obscure Honeyeaters, are endemic to New Guinea, and two others, the Varied and Yellow-tinted Honeyeaters, are shared between Australia and New Guinea. All of the remaining 16 species are restricted to Australia. There has been occasional taxonomic debate on whether the Fuscous and Yellow-tinted Honeyeaters should be treated as a single species, but the current consensus is

that the two do not intergrade where they meet, and they are ecologically and morphologically quite distinct. J. Ford argued that the Varied and Mangrove Honeyeaters should be combined as one species because of introgression where their distributions abut. The presumed area of introgression is, however, limited and patchy, and it appears to consist of transient colonies, and the two are retained as separate species. Populations of the Varied Honeyeater in New Guinea divide into two plumage types: those of the south and south-east resemble the Varied Honeyeater of northern Australia, whereas those of northern New Guinea and the Western Papuan Islands resemble the Singing Honeyeater. Further work on the matter of species relationships and circumscription in this complex is clearly warranted. Although the occasional argument has been put forward for treating the form *cassidix* as a separate species, the “Helmeted Honeyeater”, it is now firmly established as a race of the Yellow-tufted Honeyeater.

Still in New Guinea, the Orange-cheeked Honeyeater (*Oreornis chrysogenys*), found in subalpine regions in the west of the island, has sometimes been placed in *Lichenostomus*. It has a distinctive bicoloured ear patch and yellowish throat, which are suggestive of the patterns displayed by some members of *Lichenostomus*, in particular the Black-throated and Obscure Honeyeaters, with which it has sometimes been linked. The calls of the Orange-cheeked Honeyeater are said to be similar to those of the Black-throated Honeyeater.

DNA-sequence data have strongly indicated that the White-fronted Honeyeater (*Purnella albifrons*) is not a member of the genus *Phylidonyris*, in which it has hitherto always been placed. While it is part of assemblage 2, the other species generally associated with *Phylidonyris* are split between assemblages 4 and 5. The closest affinities of the White-fronted Honeyeater appear to be with *Lichenostomus*, *Manorina* and *Melidectes*. This is an extremely novel arrangement of its relationships. Nevertheless, the presence of a small bare red wattle behind the eye of the White-fronted Honeyeater is reminiscent of the triangular bare skin patches behind the eye of *Manorina*, which are red in the Bell Miner (*Manorina melanophrys*) and yellow in the other three species.

The composition of the genus *Melidectes* is far from resolved. It comprises a heterogeneous assemblage of medium-sized honeyeaters with a long, often stout bill and various degrees of coloured facial skin. Nine species are confined to the mountains of mainland New Guinea, and a tenth occurs in the Bismarck Archipelago. The Bismarck Honeyeater (*Melidectes whitemanensis*) is a moderately large, drab honeyeater with a long, curved bill and a narrow area of bare skin below and behind the eye. Its generic placement has had a chequered history. Salomonsen kept this species in a monotypic genus, *Vosea*, while Wolters placed it in *Melidectes* presumably because of its long bill. Diamond placed the Bismarck Honeyeater in *Melidectes* and suggested that its affinities lay closest to the Sooty Honeyeater (*Melidectes fuscus*). T. Iredale separated the Sooty Honeyeater, the Long-bearded Honeyeater (*Melidectes princeps*) and the Short-bearded Honeyeater (*Melidectes nouhuysi*) as the genus *Melionyx*, a decision based on several aspects of morphology, behaviour and nidification that differed from those of other members of *Melidectes*. Both Wolters and B. J. Coates followed this arrangement, but most other authors have not. Compared with the other members of *Melidectes*, these three species are darker, have a relatively slender bill and have much smaller areas of bare skin. The Long-bearded and Short-bearded Honeyeaters are eastern and western representatives of a superspecies, and some authors have suggested that they could be conspecific. They are the only members of the group that have a throat beard. The next group comprises the Cinnamon-browed Honeyeater (*Melidectes ochromelas*), the Vogelkop Honeyeater (*Melidectes leucostephes*), Belford's Honeyeater (*Melidectes belfordi*), the Yellow-browed Honeyeater (*Melidectes rufocrissalis*) and the Huon Honeyeater (*Melidectes foersteri*). Wolters placed all of these in a genus *Melirrhophetes* and retained *Melidectes* solely for the Ornate Honeyeater (*Melidectes torquatus*). Driskell and Christidis provided DNA-sequence data for three species of *Melidectes*, and their analyses placed the Cinnamon-browed and Belford's Honeyeaters together, followed by the Ornate Honeyeater, in keeping with generally accepted practice. Separate species status for the

The genus *Lichenostomus* contains 20 species, of which the **Grey-fronted Honeyeater** is one of 16 restricted to Australia. The members of this group are all morphologically rather similar, and are characterized most notably by having elongated plumes on the ear-coverts and upper neck, as well as a lined face. While some honeyeater genera have contrastingly coloured panels on the folded wing, among *Lichenostomus* species this is the exception rather than the rule. The bright yellow-olive fringes to the remiges in the Grey-fronted Honeyeater are thus relatively unusual for the genus. This genus is centred on Australia's sclerophyll forests.

[*Lichenostomus plumulus*, Australia.
Photo: Drew Fulton]

Cinnamon-browed Honeyeater is well established, whereas the other four form a superspecies with various degrees of hybridization among the forms. The Vogelkop Honeyeater was recognized as a separate species by Salomonsen, but he incorporated the other three within Belford's Honeyeater, although noting that the Yellow-browed and Huon Honeyeaters could comprise an additional species. At issue is the extent of hybridization between the forms, which is well detailed by Coates, and also by Diamond in his study of the birds of the New Guinean Eastern Highlands. Belford's and Yellow-browed Honeyeaters interbreed readily where they meet, and some of the resultant hybrid populations have even been assigned subspecific names. Pure populations of each species are very distinct. Belford's Honeyeater has a prominent patch of pale blue bare skin above, behind and below the eye, though this is lemon-yellow in the race *schraderensis*, and all have a small white gape wattle. The Yellow-browed Honeyeater likewise has a white gape wattle, but the bare skin around the eye is more extensive and pale greenish in colour, and there are small orange-red wattles on each side of the throat. Whether the two comprise one or two species requires more detailed study. The Huon Honeyeater further complicates the picture in that it has blue facial skin in common with Belford's Honeyeater but orange-red throat wattles as in the Yellow-browed Honeyeater. Most authors align the Huon Honeyeater with the Yellow-browed Honeyeater. Within Belford's Honeyeater, Coates noted that, in south-eastern New Guinea, the subspecies *brassi* and the nominate race occupy the same geographical range but are altitudinally separated, the former living in the middle mountains at up to 2800 m, whereas the nominate race is found in the high mountains from 3000 m to 3800 m. The two apparently do not intergrade but, rather, replace each other abruptly. Whether or not they represent separate species merits further investigation.

Sibley and Monroe, following a suggestion by Schodde, included the San Cristobal Honeyeater (*Meliarchus sclateri*) in *Melidectes*, although most other authors have continued to retain it in the monotypic *Meliarchus*. K. C. Parkes argued for a close affinity between it and the Spiny-cheeked Honeyeater (*Acanthagenys rufogularis*) from Australia on the grounds of apparent similarities between them in bill shape and plumage. Although this suggestion has not been given serious consideration, further DNA-based research on the matter is warranted, given that *Melidectes* and *Acanthagenys* have been identified as being part of the same clade by the DNA study of Driskell and Christidis.

The Australian miners in the genus *Manorina* have been aligned with *Melithreptus* by Schodde and Mason, primarily on account of the pattern of development of the ectethmoid-mandibular articulation of the palate. The DNA-sequence data of Driskell and Christidis, however, clearly placed these two genera in widely separated assemblages, thereby indicating that apparent similarities in this articulation are convergent. *Manorina* appears to be most closely related to New Guinean *Melidectes*. Within the genus *Manorina*, there has been considerable debate as to whether the restricted-range and Endangered Black-eared Miner (*Manorina melanotis*) is merely a subspecies or an ecological colour morph of the more widespread Yellow-throated Miner (*Manorina flavigula*), and the various arguments have been well summarized by Schodde and Mason. Despite extensive hybridization in parts of their ranges, ecological and morphological assessments support the recognition of two discrete species. Moreover, unpublished data from DNA-sequence analysis by Norman and colleagues indicate that the two have diverged from each other as much as they have from the Noisy Miner (*Manorina melanocephala*). The three form a recently diverged group of species which is sister to the more divergent and morphologically distinctive Bell Miner.

The Spiny-cheeked Honeyeater has sometimes been included in the wattlebird genus *Anthochaera*, with which it shares some palatal and cranial features. Its levels of DNA-sequence divergence, however, are consistent with its generic separation, hence its placement in the monotypic *Acanthagenys*. Within the wattlebirds proper, two subgroups have generally been recognized. The first consists of the Little Wattlebird (*Anthochaera chrysoptera*) and the Western Wattlebird (*Anthochaera lunulata*), which lack wattles, have conventionally feathered and streaked

cheeks and utter clanking territorial calls; the second contains the Red Wattlebird (*Anthochaera carunculata*) and the Yellow Wattlebird (*Anthochaera paradoxa*), which are wattled, have cheek patches of scaly whitish feathering and deliver rasping coughed territorial calls. The Regent Honeyeater (*Anthochaera phrygia*) was previously placed in its own genus *Zanthomyza* (sometimes erroneously emended to "*Xanthomyza*"). The DNA-sequence data, however, clearly place it among the wattlebirds, where it is most closely allied to the Red and Yellow Wattlebirds. Although the Regent Honeyeater lacks wattles, it does have bare cheeks and its territorial call is very reminiscent of that of the Red Wattlebird, as is its posture when calling. The similarity in territorial calls was interpreted by P. A. Veerman as being mimicry, but it now appears to be a shared evolutionary feature. The Western Wattlebird has sometimes been treated as a subspecies of the Little Wattlebird, but the DNA-sequencing study of Driskell and Christidis and the morphological-based assessments of Schodde and Mason have indicated that the two are separate species.

Assemblage 3. After the first assemblage, the third is the next-smallest in terms of number of species. It is restricted to Australia, New Guinea and possibly the Solomon Islands, the last depending on the affinities of taxa not yet included in DNA analyses. Three biogeographically coherent groups are apparent. The first contains the genera *Ramsayornis* and *Conopophila* from northern Australia and southern New Guinea, and the second consists of *Timeliopsis*, *Melilestes*, *Melipotes* and *Macgregoria* from New Guinea. The third group contains the Australian genera *Epthianura* and *Ashbyia*, both of which have been treated in a separate family, Epthianuridae, but should be transferred to the present family.

According to Schodde and Mason, the Brown-backed Honeyeater (*Ramsayornis modestus*) and the Bar-breasted Honeyeater (*Ramsayornis fasciatus*) exhibit similarities to *Myzomela* in such features as straight palatines, narrow and reduced ectethmoids and nasal bars. The DNA data of Driskell and Christidis indicate that these characters are convergent. *Ramsayornis* is very closely linked with *Conopophila*, which resembles it in the architecture of the skull and palate, differing primarily in its larger and more elongate temporal fossa. While the circumscription of *Ramsayornis* has been straightforward, this has not been the case with *Conopophila*. Although the Rufous-banded Honeyeater (*Conopophila albogularis*) and the Rufous-throated Honeyeater (*Conopophila rufogularis*) are universally regarded as sister-taxa, their affinities with the Grey Honeyeater

The rise to prominence of DNA-sequencing technology has revolutionized taxonomy. Traditional classification methodologies had resulted in the White-fronted Honeyeater being situated in the genus *Phylidonyris* for decades. Molecular data, however, have revealed such classification to be erroneous, and the species is now placed in its own monotypic genus, *Purnella*.

The White-fronted Honeyeater is a medium-sized meliphagid with a long, slender, decurved bill, and a long, sloping forehead. As is the norm in the family, *Purnella* shows sexual dimorphism, males being larger than females.

[*Purnella albigrons*, Gluepot Reserve, South Australia, Australia. Photo: Cheryl Ridge]



(*Conopophila whitei*) are far less well established. The Grey Honeyeater is a nondescript, poorly known honeyeater that is often placed in a monotypic genus, *Lacustroica*. No DNA data exist for this enigmatic species, and its retention in *Conopophila* is largely a matter of convenience, rather than being based on evidence. The placement of the Painted Honeyeater (*Grantiella picta*) in *Conopophila* by Salomonsen is totally negated by the genetic evidence; there appears to be no close association between the two genera. The affinities of the Painted Honeyeater are discussed below, in the final paragraph of this section.

Before the DNA evidence, a close association between the genera *Timeliopsis*, *Melilestes*, *Melipotes* and *Macgregoria* had not been proposed, as each is morphologically distinct from the others. *Timeliopsis* comprises two nondescript species of honeyeater, the Olive Straightbill (*Timeliopsis fulvigula*) and the Tawny Straightbill (*Timeliopsis griseigula*), the placement of which within Meliphagidae has been questioned. The tongue of *Timeliopsis* is particularly broad and shallowly grooved, with a shortened brush-like tip. Often, the genus has been placed near the start or the end of the systematic sequence, next to the longbill genus *Oedistoma*, which is now known to be a berrypecker belonging in Melanocharitidae. Despite their non-honeyeater superficial appearance, the straightbills are nevertheless clearly nested well within the Meliphagidae. The decision of Schodde and Mason to place the Green-backed Honeyeater (*Glycichaera fallax*) within *Timeliopsis*, on the grounds of apparent similarities in skull profile as well as in the maxillo-palatine process and tongue, is not supported by the DNA data. The Green-backed Honeyeater is, in fact, part of "assemblage 4".

With its exceptionally long, curved bill, *Melilestes* is another New Guinean genus the affinities of which have been the focus of some debate. It is generally thought to comprise a single species, the Long-billed Honeyeater (*Melilestes mearnsi*), but the Bougainville Honeyeater (*Stresemannia bougainvillei*) was included in *Melilestes* by Salomonsen and by Wolters. In other treatments, the latter species has been placed in *Lichmera* and in *Meliphaga*. DNA data are not available for this species and, given the misleading signals provided by superficial appearances, most authors now keep the Bougainville Honeyeater in *Stresemannia*, next to *Melilestes* in sequence. Wolters even included the Bismarck Honeyeater in *Melilestes* but, as discussed above, this is generally included in *Melidectes* or in its own monotypic genus, *Vosea*.



Until recently, three species were known to make up the genus *Melipotes*. These are the Arfak Honeyeater (*Melipotes gymnops*), the Common Smoky Honeyeater (*Melipotes fumigatus*) and the Spangled Honeyeater (*Melipotes ater*). Recently, a fourth species, the Wattled Smoky Honeyeater (*Melipotes carolae*), has been discovered in the Foja Mountains by B. M. Beehler and his colleagues. Earlier, Diamond had mentioned that he had seen the Common Smoky Honeyeater in these same mountains, but it is possible that what he actually recorded was the Wattled Smoky Honeyeater; the possibility that both species occur in the Foja Mountains has been rejected by Beehler. Members of the genus *Melipotes* are mainly berry-eaters, and it is not known if they take nectar. Apparently uniquely among honeyeaters (but see below), they lack any brush-like tip on the tongue, as observed by H. Scharnke, but the tongue does appear to have a rudimentary four-part tip. According to A. L. Rand, this tongue morphology is presumably an adaptation to the largely frugivorous diet. Species of *Melipotes* possess brightly coloured facial wattles, and it is this feature that has generally led to their being allied with the genus *Melidectes*. Most systematic treatments place the two genera next to each other, but the DNA data reveal no close affinities between them; they are nested within quite separate assemblages. Clearly, facial wattles have arisen and been lost several times within the evolution of the honeyeaters. Beehler and colleagues constructed a phylogenetic tree based on morphological characters. According to their analysis, the Common Smoky and Wattled Smoky Honeyeaters are sister-species and they, in turn, are associated with the Arfak Honeyeater. The Spangled Honeyeater is the basal member of the genus.

MacGregor's Honeyeater, from New Guinea, was classified as a bird-of-paradise from the time of its original description, in 1896, although Iredale had suggested that it be removed from that family because it was different from other birds-of-paradise. A sequencing study of mitochondrial DNA by J. Cracraft and J. Feinstein produced very strong evidence that "MacGregor's Bird-of-paradise", as it was until then known, was in fact a honeyeater, most closely related to the New Guinean genus *Melipotes*. Although an early limited cranial study by Bock suggested that it was closest to the cnemophiline birds-of-paradise, the reanalysis of skull and skeletal characters by Cracraft and Feinstein provided better support for honeyeater affinities for MacGregor's Honeyeater. Ironically, DNA-sequencing studies indicate also that cnemophilines are not birds-of-paradise but, instead, represent an early corvid lineage with as yet indeterminate close affinities. Closer examination reveals several features common to MacGregor's Honeyeater and the genus *Melipotes*. They are largely frugivorous honeyeaters that lack the brush-like tip of the tongue, they are similar in bill shape, and they lay eggs that are pinkish with brown spotting, the spots more abundant at the larger end. Both groups possess dark grey or black plumage and coloured facial skin. The yellow facial skin of MacGregor's Honeyeater is a fully developed wattle that is anchored behind the eye. In the Common Smoky, Arfak and Spangled Honeyeaters, the yellow facial skin surrounds the eye, but only beneath it is developed as a wattle; it can also flush red when an individual is excited. The Wattled Smoky Honeyeater has red-orange facial skin, with a wattle that hangs down from each side of the face. In this respect, the fleshy wattle is more akin to that found in MacGregor's Honeyeater than to those of the other members of *Melipotes*. Furthermore, Beehler and colleagues observed some mottling of the facial colour of the Wattled Smoky Honeyeater, although not the change from unflushed to flushed observed for other species of *Melipotes*.

The third and final group in assemblage 3 comprises two genera and five species of Australian chat. These are the White-fronted (*Epthianura albifrons*), Orange (*Epthianura aurifrons*), Yellow (*Epthianura crocea*) and Crimson Chats (*Epthianura tricolor*) and the Gibberbird (*Ashbyia lovensis*), all terrestrial insectivores adapted to arid Australia. Most are gregarious and sexually dichromatic, with differing breeding and non-breeding plumages. They have traditionally been aligned with the Australasian thornbills in Acanthizidae and with the Australo-Papuan fairy-wrens of the family Maluridae, and they are sometimes, as in the current treatment, placed in their own family, Epthianuridae.

The ten species in the genus *Melidectes* are fairly large birds with a long, usually stout bill and coloured facial skin.

The **Yellow-browed Honeyeater** is one of the nine genus members that are endemic to montane New Guinea. This species has an extensive area of bare pale green skin around the eye, as well as a white gape wattle. Unusually among meliphagids, it hybridizes readily with the congeneric Belford's Honeyeater (*M. belfordi*) where their populations overlap. In the past, several hybrid populations were thought to be distinct subspecies.

[*Melidectes rufocrissalis* rufocrissalis, Ubaigubi, EC New Guinea. Photo: William S. Peckover]

The four species in the genus *Manorina* are endemic to Australia. The most morphologically distinctive and genetically distinct is the **Bell Miner** of east and south-east Australia. The smallest member of *Manorina*, this species has a fairly long, square-ended tail, and a short, stout, slightly decurved bill. While its three congeners are largely grey in plumage and have a striking head pattern, the Bell Miner is mostly olive-green and has a comparatively subdued head pattern, comprising a black forehead and malar, a broad yellow loreal patch, and a small area of red-orange skin behind the eye.

[*Manorina melanophrys*,
Brisbane, Queensland,
Australia.
Photo: Raoul Slater]



An examination of tongue morphology by S. A. Parker revealed that Australian chats possess a brush-tipped tongue, although this is less developed in the White-fronted Chat. The Gibberbird has a quadrid tongue without brush-tipping, presumably a secondary simplification. The tongue morphology was strongly suggestive of honeyeater affinities. Parker noted also that the eggs of the Australian chats bear strong similarity to those of some honeyeater genera. On the basis of plumage patterns, the Australian chats, excluding the Gibberbird, have been segregated into three subgenera, which Wolters elevated to genera: *Epthianura* for the White-fronted Chat, *Parepthianura* for the Crimson Chat, and *Aurepthianura* for the Orange and Yellow Chats. The extensive DNA-sequence data of Driskell and Christidis, however, completely contradict this arrangement and identify, instead, two species pairs, one consisting of the Crimson and Yellow Chats and the other the Orange and White-fronted Chats.

The genus *Anthochaera* contains five large, slender, heavily streaked honeyeaters with a fairly long, graduated tail and decurved bill. Two members of the genus have wattles of bare skin whereas the other three, including the **Western Wattlebird**, do not. The congeners are further differentiated by the presence or absence of scaly feathering on the cheeks and by the nature of their territorial calls. Meliphagids have a long, brush-tipped tongue, which helps them gather nectar from flowers. Birds are also capable of thrusting the tongue forwards, a further adaptation for nectarivory.

[*Anthochaera lunulata*,
Glen Forrest,
Western Australia,
Australia.
Photo: Graeme Chapman]

Assemblage 4. The fourth honeyeater assemblage comprises five genera and 40 species, 31 of these being included in a single genus, *Myzomela*, which is distributed from Wallacea eastwards through New Guinea, Australia and into the Pacific. Two monotypic genera, *Sugomel* and *Gliciphila*, are confined to Australia, another monotypic genus, *Glycichaera*, is shared between northern Australia and New Guinea, and the remaining genus, *Ptiloprora*, has six species restricted to New Guinea. As discussed above, the Black Honeyeater, *Sugomel*, has generally been included as one of three species in *Certhionyx*, but recently the three have been shown to constitute three separate genera. The DNA-sequence data of Driskell and Christidis link the Black Honeyeater strongly with *Myzomela*, but the levels of genetic differentiation support separate generic treatments. The finding of a sister relationship between the Black Honeyeater and *Myzomela* is not surprising, as the two are similar in overall shape, having a short squat body with a long decurved bill. According to Schodde and Mason there are apparent differences in tongue furcation between the two genera, but this feature has so far received only cursory investigation.

Koopman divided *Myzomela* into three groups: a small group comprising dull-plumaged species, a larger one consisting of brightly plumaged species, and a third with just one species, the Red-collared *Myzomela* (*Myzomela rosenbergii*). The dull-plumaged "eques-obscura group" contains the Drab *Myzomela* (*Myzomela blasii*), White-chinned *Myzomela* (*Myzomela albigula*), Red-throated *Myzomela* (*Myzomela eques*), Ashy *Myzomela* (*Myzomela cineracea*) and Dusky *Myzomela*

(*Myzomela obscura*). In these species, both sexes have predominantly brownish-grey plumage, with little, if any, metallic red, and the red, if present, is limited to the throat. The species are either sexually monomorphic or only slightly dimorphic. This group is confined to New Guinea, Australia and parts of the Lesser Sundas. The Ashy *Myzomela*, confined to the Bismarck Archipelago, has sometimes been treated as a subspecies of the Red-throated *Myzomela* of New Guinea and the West Papuan Islands, but in appearance it is most similar to the widespread Dusky *Myzomela*, which ranges from the Moluccas east to New Guinea and northern Australia. Although the Drab *Myzomela*, found in the southern Moluccas, and the White-chinned *Myzomela*, living in the Louisiade Archipelago, off south-eastern New Guinea,





are treated as sister-species by many authorities, their widely separate distributional ranges suggest that their relative affinities to the Dusky Myzomela should be investigated. Indeed, W. Rothschild and E. J. O. Hartert regarded the two as conspecific with the Dusky Myzomela. Conversely, Gadow recognized the Moluccan forms of the Dusky Myzomela as constituting a separate species, "*M. simplex*", known as the "Moluccan Myzomela". Another species that was included with the "*eques-obscura* group" by Wolters is the Red Myzomela (*Myzomela cruentata*) from New Guinea, but its overall red or red-tinted male plumage and dullish female plumage make its inclusion in this group somewhat anomalous. Koopman aligned it with the sexually dimorphic "*jugularis-cardinalis* group", but it is probably best treated as a separate, unique lineage within *Myzomela*. Similarly, the Red-collared Myzomela from New Guinea is of indeterminate affinities and was treated as a separate lineage within *Myzomela* by Koopman, Wolters and others. The DNA-sequencing data of Driskell and Christidis aligns it more closely with the monomorphic "*eques-obscura* group" than with the dimorphic "*jugularis-cardinalis* group"; in the DNA study, the monomorphic group was represented by the Dusky Myzomela and the dimorphic group by the Cardinal Myzomela (*Myzomela cardinalis*), the Scarlet Myzomela (*Myzomela sanguinolenta*) and the Red-headed Myzomela (*Myzomela erythrocephala*).

The brightly plumaged "*jugularis-cardinalis* group" is the largest in terms of species and is the most widely distributed. In this group the sexes are distinctly dimorphic. The females are neutral olive-grey and have traces of red on the forehead and throat, whereas the males commonly have large patches of metallic red on the head, rump and breast. The taxonomic circumscription of the Black Myzomela (*Myzomela nigrata*) has proven to be contentious. Its current distribution is in New Guinea and the West Papuan Islands. Koopman included the Ebony Myzomela (*Myzomela pammelaena*) from the Bismarck Archipelago and the Sooty Myzomela (*Myzomela tristrami*) from the eastern Solomon Islands within the Black Myzomela complex. Most other authors, including Salomonsen and Wolters, followed I. C. J. Galbraith and E. H. Galbraith in treating the Sooty Myzomela as a separate species. These authors aligned it more closely with the Scarlet-naped Myzomela (*Myzomela lafargei*) complex. Similarly, although most now treat the Ebony Myzomela as a full species, there is far less consensus on whether it is more closely linked to the Black Myzomela or to the Scarlet-naped Myzomela complex. Little information has been gathered on the affinities of

either the New Ireland Myzomela (*Myzomela pulchella*) or, in New Guinea, the Scarlet-bibbed Myzomela (*Myzomela sclateri*). Similarly, the Orange-breasted Myzomela (*Myzomela jugularis*) of Fiji is another highly distinctive species that may also represent a unique lineage. The song of the Mountain Myzomela (*Myzomela adolphinae*) of New Guinea is very similar to that of the Scarlet-bibbed Myzomela, but in plumage patterns the former is most similar to the Red-headed Myzomela. It is likely, therefore, that the affinities of the Mountain Myzomela may lie with the Red-headed Myzomela complex, although Koopman placed the species next to the Black-bellied Myzomela (*Myzomela erythromelas*) of the Bismarck Archipelago.

There is debate on the taxonomic circumscription of the Red-headed Myzomela. The northern Australian and southern New Guinean populations are universally accepted as comprising the one species, but the taxonomic status of the two forms from the Lesser Sunda Islands, currently treated as full species, the Sumba Myzomela (*Myzomela dammermani*) and the Crimson-hooded Myzomela (*Myzomela kuehni*), is disputed. Koopman included both within the Red-headed Myzomela, whereas Salomonsen, Wolters, C. M. N. White and M. D. Bruce, and others retained the Crimson-hooded Myzomela as a separate species. The Sumba Myzomela is similar to the Red-headed Myzomela in its pattern of sexual dimorphism, but it differs in size and in levels of melanistic pigmentation, and it was treated as a separate species by Sibley and Monroe. The Crimson-hooded Myzomela is sexually monomorphic and differs considerably in plumage patterns from the other two; it is duller in general, and its red head extends to a bandless breast and white belly. Another species that might, according to Koopman, be linked with the Red-headed Myzomela complex is the Red-rumped Myzomela (*Myzomela vulnerata*) from Timor. In most systematic sequences it is placed between the Black-bellied Myzomela and the Red-collared Myzomela, but the latter, as discussed above, is more closely linked to the "*eques-obscura* group".

Still within the "*jugularis-cardinalis* group" of *Myzomela*, the Cardinal Myzomela complex comprises anything from one to eight species. The complex contains four broad species groups with separate distributional centres: one in the Moluccas and Lesser Sundas, the second in Australia and New Caledonia, a further one in Melanesia and Polynesia, and the fourth in Micronesia. Within Wallacea three distinct groups of subspecies are recognizable, and Bruce suggested that all three could be accepted as distinct species, a suggestion which was adopted by Sibley



The two species of Ramsayornis are small, dumpy and short-tailed honeyeaters with a relatively short, slightly decurved bill. Both species are monotypic.

The **Brown-backed Honeyeater** occurs in New Guinea and nearby islands, and in north-eastern and eastern Australia. The species is rather drab in plumage, being mostly brown above and white below, but has a narrow white subocular stripe, bordered below by a thin brown moustachial stripe. As with almost all other meliphagids, the Brown-backed Honeyeater shows sexual dimorphism: males are larger than females, although the sexes are identical in plumage.

[*Ramsayornis modestus*, Julatten, Queensland, Australia.

Photo: David Stowe]

Conopophila honeyeaters are small birds with a slightly decurved bill and short tail. Two of the three species, including the **Grey Honeyeater**, are endemic to Australia.

This species' plumage is nondescript, being brownish-grey above and white below. The only noteworthy plumage features are a thin, partial pale grey eyering, and white tips to the rectrices. In most sexually dimorphic species, one sex is larger than the other in all measurements. This, however, is not the case in the Grey Honeyeater, where males have longer tails and possibly longer wings, but females are probably heavier.

[*Conopophila whitei*, Australia.
Photo: Roland Seitre]

The two straightbills in the genus *Timeliopsis* are medium-sized birds with a short tail and a medium-length, dagger-shaped bill. Both are endemic to New Guinea, with the **Tawny Straightbill** occupying the lowlands and the **Olive Straightbill** (*T. fulvigula*) the higher altitudes. Both are unremarkable in appearance, their English names adequately describing their overall coloration. The Tawny Straightbill, however, strays from the meliphagid norm in terms of iris colour. In most honeyeaters, the iris is dark brown, black or red-brown. In the Tawny Straightbill, however, it is vibrant orange-red.

[*Timeliopsis griseigula fulviventris*, near Brown River, SE New Guinea. Photo: Brian J. Coates]

and Monroe and by Schodde and Mason. The species are defined as the Sulawesi *Myzomela* (*Myzomela chloroptera*) with four or perhaps even five subspecies, the Wakolo *Myzomela* (*Myzomela wakoloensis*), with two subspecies, and the Banda *Myzomela* (*Myzomela boiei*), also with two subspecies. The validity of the various subspecies needs to be tested, as many of the arguments on the according of species rank to the three groups revolve around how best to circumscribe the various forms such that they constitute coherent entities. Furthermore, F. E. Rheindt and R. O. Hutchinson have suggested that the Seram and Buru forms of the Wakolo *Myzomela* could represent two additional species. The Scarlet *Myzomela* of Australia and the New Caledonian *Myzomela* (*Myzomela caledonica*) are commonly treated as a single species, and were included by Salomonsen with the three Wallacean forms to make one widely distributed species. The Australian and New Caledonian group, however, represents a biogeographically coherent entity, separate from the Wallacean group, and it is unlikely that the two groups would form a monophyletic clade in relation to the Micronesian and Polynesian forms of the Cardinal *Myzomela* complex. An unresolved question is whether the Scarlet and New Caledonian *Myzomelas* are separate species. The Cardinal *Myzomela* complex is represented in Micronesia by seven subspecies that were grouped as the Micronesian *Myzomela* (*Myzomela rubratra*) by Pratt and colleagues. While the cohesiveness of this group is not questioned, debate still exists as to whether it is specifically separable from the Cardinal *Myzomela* group centred in Melanesia and Polynesia. Within the latter group, the population on the Fijian island of Rotuma is sometimes separated as a distinct species, the Rotuma *Myzomela* (*Myzomela chermesina*). The other subspecies, distributed throughout the Solomon Islands, Vanuatu, the Loyalty Islands and Samoa are all regarded as forming a monophyletic group known as the Cardinal *Myzomela*.

Currently, up to six species are recognized as representing the Scarlet-naped *Myzomela* complex, which is restricted to the Bismarck Archipelago and the Solomon Islands. As discussed above, the Ebony *Myzomela*, from Bismarck, is sometimes included within the Black *Myzomela*. The other five forms in the complex are the Scarlet-naped *Myzomela*, the Yellow-vented *Myzomela* (*Myzomela eichhorni*), the Black-headed *Myzomela* (*Myzomela melanocephala*), the Red-bellied *Myzomela* (*Myzomela malaitae*) and the Sooty *Myzomela*. Only the Yellow-vented *Myzomela* comprises marginally differentiated sub-



species. A DNA study undertaken by C. E. Smith and Filardi examined differentiation across four of these forms, and the levels of DNA divergence indicated that the Scarlet-naped, Black-headed, Yellow-vented and Red-bellied *Myzomelas* are all valid species. The first two were found to be each other's closest relatives. Interestingly, these four members of the Scarlet-naped *Myzomela* complex did not form a monophyletic assemblage with regard to the Cardinal *Myzomela*, the last-mentioned represented by its Rennell Island subspecies, *sanfordi*. E. Mayr and Diamond had suggested that the Red-bellied *Myzomela* could be more closely allied to the Cardinal *Myzomela* complex; furthermore, they indicated that the Scarlet-naped complex and the Cardinal *Myzomela* complex might in fact be very closely related and represent allopatrically centred radiations. In this respect, the DNA evidence is supportive of these suggestions.

According to the DNA data of Driskell and Christidis, the Green-backed Honeyeater from north-eastern Australia and New Guinea is part of a clade that includes the New Guinean genus *Ptiloprora* and the Tawny-crowned Honeyeater (*Gliciphila melanops*) of Australia. As discussed above, the placement of the Green-backed Honeyeater in *Timeliopsis* by Schodde and Mason is incorrect. Both genera feed primarily by gleaning foliage for insects, which is a rare specialization among honeyeaters. The possession by both groups of a moderately long, straight bill most likely reflects convergence resulting from similar feeding strategies. An association between the Green-backed Honeyeater and *Ptiloprora* had not been suggested before the DNA results, and further investigation is required.

Ptiloprora comprises up to six small to medium-sized honeyeater species with streaked plumage on the head and back, a thin curved bill and a rather long tail. The Olive-streaked Honeyeater (*Ptiloprora meekiana*) has predominantly yellowish plumage, and the Leaden Honeyeater (*Ptiloprora plumbea*) is, as its name suggests, grey, while the remaining four show varying degrees of rufous in the plumage. The Rufous-sided Honeyeater (*Ptiloprora erythroleura*), Black-backed Honeyeater (*Ptiloprora perstriata*), Rufous-backed Honeyeater (*Ptiloprora guisei*) and Mayr's Honeyeater (*Ptiloprora mayri*) form a group of very similar-looking species, and there are suggestions that the first two may hybridize where they meet in western New Guinea. Mayr's Honeyeater was treated as a subspecies of the Rufous-backed Honeyeater by Salomonsen and others, but Diamond suggested that it could also have affinities with the Black-backed Honeyeater and was best treated as a separate species. In their DNA study,

A typical honeyeater bill is strong and fairly long with some degree of decurvature.

As its English and scientific names suggest, the **Long-billed Honeyeater** is at the upper end in terms of bill length. Its bill is very long, heavy and quite strongly decurved. This New Guinea endemic is a medium-large species with drab, predominantly brown plumage. It is generally considered to be the only member of the genus, although, in the past, some authorities have added the Bougainville Honeyeater (*Stresemannia bougainvillei*) to *Melilestes*.

[*Melilestes megarhynchus megarhynchus*, Ubaigubi, EC New Guinea. Photo: William S. Peckover]



Driskell and Christidis examined only the Leaden and Rufous-backed Honeyeaters, and little could therefore be deduced on relationships within the genus.

As discussed previously, the Tawny-crowned Honeyeater has most often been included in the genus *Phylidonyris*. Boles and N. W. Longmore compared adult and juvenile plumage patterns, display-flights, maxillo-palatines and eggs of all the species traditionally included in *Phylidonyris*. They concluded that not only did the Tawny-crowned Honeyeater warrant placement in its own genus, but there was no evidence to suggest that it was closely related to *Phylidonyris*. Their conclusions are fully supported by the DNA data. The affinities of the Tawny-crowned Honeyeater are still poorly resolved. Although DNA analyses place it in a clade with the Green-backed Honeyeater and *Ptiloprora*, there was only moderate statistical support for this grouping.

Assemblage 5. The final assemblage comprises three well-supported clades. Included in this assemblage are the species-rich and wide-ranging genera *Philemon* and *Lichmera*, the primarily New Guinean *Xanthotis*, the mainly Australian *Melithreptus* and *Entomyzon*, the Australian *Cissomela*, *Grantiella*, *Plectorhyncha*, *Trichodere* and *Phylidonyris* (*sensu stricto*), and southern Polynesian *Foulehaio*.

As mentioned above, the Banded Honeyeater, in *Cissomela*, is not related to the Pied and Black Honeyeaters, with which it was formerly included in the genus *Certhionyx*. The DNA-sequence data of Driskell and Christidis suggest that it is part of a clade that includes also *Lichmera*, *Phylidonyris* and *Trichodere*. In skull and palatine configuration *Cissomela* apparently is rather different from the *Lichmera*–*Phylidonyris*–*Trichodere* group, but further detailed comparisons are needed. A close relationship among the three last-mentioned genera has been postulated on several occasions, this based on superficial morphological assessments. *Lichmera* comprises up to eleven species, with the greatest diversity centred in the Moluccas and the Lesser Sunda Islands. The genus is highly heterogeneous in plumage pattern and may, in fact, represent an agglomeration of several different genera, but data on this matter are currently lacking. From a comparison of plumage patterns and bill coloration, several species groups are recognizable. One group comprises dull-plumaged species with a black bill, namely the the Scaly-crowned Honeyeater (*Lichmera lombokia*), Olive Honeyeater (*Lichmera argentauris*), Indonesian Honeyeater (*Lichmera limbata*), Brown Honeyeater (*Lichmera indistincta*) and Dark-brown Honeyeater

(*Lichmera incana*). This widespread group has representatives in the Lesser Sundas and Moluccas, Australia and New Guinea, and New Caledonia and Vanuatu. The Indonesian Honeyeater is often treated as a subspecies of the Brown Honeyeater, and its occurrence through the western Lesser Sundas was interpreted by Schodde and Mason as being the result of secondary invasion. The level of sexual dimorphism in the Indonesian Honeyeater, however, is much more marked than that found in any of the forms of the Brown Honeyeater. The Scaly-breasted Honeyeater (*Lichmera squamata*) of the eastern Lesser Sundas and the Silver-eared Honeyeater (*Lichmera albaauricularis*) of New Guinea exhibit some similarities in breast pattern and may form a species group. The Buru (*Lichmera deningeri*) and Seram Honeyeaters (*Lichmera monticola*) form a third species group, the two being united by the presence of a pale-based bicoloured bill. Two brightly coloured species are the Yellow-eared Honeyeater (*Lichmera flavicans*) from Timor and the Black-necklaced Honeyeater (*Lichmera notabilis*) from nearby Wetar. The two have been suggested as forming a species group, but the patterns of breast-scaling on the Yellow-eared Honeyeater are more reminiscent of those occurring on the Scaly-breasted and Silver-eared Honeyeaters. The plumage patterns of the Black-necklaced Honeyeater are much more similar to patterns found in *Phylidonyris* and *Trichodere*.

There are no DNA data that could help to elucidate the systematic position of the Lesser Streaked (*Myza celebensis*) and Greater Streaked Honeyeaters (*Myza sarasinorum*), both from Sulawesi. E. Stresemann thought that these were related to *Lichmera*, whereas Salomonsen placed them more distantly, near the south-west Pacific *Gymnomyza*, without any obvious justification. The two species bear superficial plumage and morphological resemblances to both *Ptiloprora* and *Lichmera*, although these two genera are unrelated to them according to DNA data. On biogeographical grounds affinities with *Lichmera* are more likely, as this genus has its centre of diversity within Wallacea.

The genus *Phylidonyris* has been circumscribed as comprising species with a slender body and bill, but there has been much debate over whether it constitutes a natural group. The DNA-sequence data of Driskell and Christidis indicated that *Phylidonyris* as previously constituted was polyphyletic; the White-fronted Honeyeater and Tawny-crowned Honeyeater represent unrelated monotypic genera, respectively *Purnella* and *Gliciphila*. DNA-sequence data unite the Crescent Honeyeater (*Phylidonyris pyrrhopterus*), New Holland Honeyeater (*Phylidonyris novaehollandiae*) and White-cheeked Honeyeater (*Phylidonyris niger*) as a monophyletic clade, with the latter two as sister-species. This pattern of relationships is consistent with all other plumage and morphological assessments. Within the White-cheeked Honeyeater, two geographically widely separated subspecies are recognized, the nominate race in central-eastern Australia and *gouldi* in south-western Australia; the two are distinct in bill shape and plumage, and have occasionally been treated as two distinct species. This subject warrants further investigation. Two other species traditionally included in *Phylidonyris* are now placed in the genus *Glycifohia*. These are the Barred Honeyeater (*Glycifohia undulata*), from New Caledonia, and, just to the north-east, the Vanuatu Honeyeater (*Glycifohia notabilis*). As no DNA-sequence data are available on these two species, it is not possible to speculate on their genetic affinities. On the basis of similarities in ventral patterning, however, Schodde and Mason suggested links with the wide-ranging genus *Lichmera*, and on biogeographical grounds this is more likely than are links to Australian-restricted *Phylidonyris*. Boles and Longmore also questioned whether the Barred and Vanuatu Honeyeaters were closely linked to *Phylidonyris*.

The White-streaked Honeyeater (*Trichodere cockerelli*) of north-eastern Australia has often been associated with the genera *Lichmera* and *Phylidonyris*, and some authors, for example Salomonsen and Wolters, have even chosen to include it within the former. DNA-sequence data, however, support its placement in a monospecific genus and align it most closely with *Phylidonyris*.

A second well-supported clade identified by DNA-sequencing comprises the south Polynesian *Foulehaio* together with *Melithreptus* and *Entomyzon*, which are largely restricted to Aus-

The genus *Glycifohia* contains two medium-sized species, each with a long, slender and markedly decurved bill. One species is endemic to Vanuatu and the other to New Caledonia. The latter is the **Barred Honeyeater**. The species' English name is apposite, as its plumage is scalloped with black and white, creating a strongly barred effect. In common with many family members, the shape and structure of its bill broadly reflects the main component of its diet. In this case, the bill's slenderness and decurvature facilitate nectarivory, for example on Geissois and Grevillea.

[*Glycifohia undulata*, Mont Koghis, near Noumea, New Caledonia. Photo: Phil Gregory]



The four species of honeyeater grouped in the genus *Melipotés* are endemic to the mountains of New Guinea. They are medium-sized or large meliphagids with a short tail and a short, stocky bill, the culmen of which is only very slightly decurved. All *Melipotés* have a large facial wattle, which is bright yellow in the case of the **Spangled Honeyeater**, flushing red when the bird is agitated. This species is the largest of the four, being more than twice the weight of the other species. It is considered to be the basal member of the genus, with the remaining three species forming a superspecies.

[*Melipotés ater*,
Huon Peninsula,
New Guinea.

Photo: William S. Peckover]



tralia. An association between the last two genera has often been postulated, but there has never been any suggestion that they were related to *Foulehaio*, which has, in fact, often been included in or associated with *Meliphaga*. The Wattled Honeyeater (*Foulehaio carunculatus*) comprises three subspecies, two in Fiji and the other distributed across Fiji, Tonga and Samoa; whether any of these merits treatment as a separate species requires examination. The Kadavu Honeyeater (*Xanthotis provocator*), also from Fiji, was included in *Foulehaio* by both Salomonsen and Wolters. Given that the remaining species of *Xanthotis* occur in Australia and New Guinea, a reappraisal of the generic affinities of the Kadavu Honeyeater is warranted.

Whilst almost all meliphagids have been known for many decades, one species eluded ornithologists until as recently as November 2005. On an expedition to the Foja Mountains in north-west New Guinea, researchers discovered a new taxon in the genus *Melipotés*, formally describing it two years later as the **Wattled Smoky Honeyeater**. Remarkable as this may be, the age of meliphagid discovery in New Guinea may not be over. Intriguing observations of unidentified *Melipotés* in the Fakfak Mountains hint that further new taxa may exist, as yet undescribed by scientists.

[*Melipotés carolae*,
Foja Mts, New Guinea.
Photo: Bruce Beehler]



Three large aberrant-looking honeyeaters from the Pacific are often included in the genus *Gymnomyza*. These are the Giant Honeyeater (*Gymnomyza viridis*), from the mountains and lowlands of Fiji, the Mao (*Gymnomyza samoensis*), from the mountains of Samoa, and the Crow Honeyeater (*Gymnomyza aubryana*), from the mountains of New Caledonia. The first two were placed together in a genus *Amoromyza* by Wolters. The Crow Honeyeater, with its distinctive black plumage, certainly stands apart from the others in general appearance, but it is not clear whether the three comprise a natural assemblage, nor is there any better understanding of their affinities with other meliphagids. Wolters placed them next to the Wattled and Kadavu Honeyeaters, presumably as all are centred in the Pacific.

Sibley and Ahlquist, from information derived from DNA-DNA hybridization, identified a sister relationship between *Entomyzon* and *Melithreptus*, and G. M. Storr even combined the two as a single genus. The members of both genera possess a well-marked white or cream nape-band. *Melithreptus* honeyeaters possess a coloured crescent of bare skin above the eye, while *Entomyzon* has a large patch of coloured facial skin covering the whole area around the eye. Schodde and Mason focused on apparent similarities in skull and palate features, vocalizations and communal behaviour between *Entomyzon* and the miners in *Manorina*, and instead argued that *Entomyzon* formed a separate lineage in a complex that included both *Manorina* and *Melithreptus*. The DNA-sequence data of Driskell and Christidis clearly support a sister relationship between *Entomyzon* and *Melithreptus*, but not between these two and *Manorina*. In considering the levels of morphological and sequence divergence, *Entomyzon* and *Melithreptus* are most appropriately retained as separate genera.

Six or seven species make up the genus *Melithreptus*. Schodde and Mason recognized two species groups. The first includes the Black-chinned Honeyeater (*Melithreptus gularis*), Strong-billed Honeyeater (*Melithreptus validirostris*) and Brown-headed Honeyeater (*Melithreptus brevirostris*). These share several plumage features, such as a broad white nape-band, along with short, stout feet, and they feed largely by probing twigs, bark and branches. A. Keast separated the Brown-headed Honeyeater as a discrete lineage, as did Wolters. The northern Australian subspecies *laetior* of the Black-chinned Honeyeater has often been separated as a distinct species, the "Golden-backed Honeyeater". Ford noted several ecological and morphological differences that could justify such treatment, but was equivocal on the issue. The ap-

parent zones of intergradation suggested by Schodde and Mason are based on very patchy distributional material. Clearly, more work is required on this. The other group contains the White-throated (*Melithreptus albogularis*), White-naped (*Melithreptus lunatus*) and Black-headed Honeyeaters (*Melithreptus affinis*). The first two species have a white nape-band that is narrowed at the extremities behind the eye, while the Black-headed Honeyeater lacks the nape-band altogether. All three species have slender feet, and feed by gleaning from foliage and twigs. The White-naped Honeyeater, on mainland Australia, and the Black-headed Honeyeater, on Tasmania, appear to be allopecies, but the affinities of the White-throated Honeyeater are less apparent. The south-western subspecies of the White-naped Honeyeater, *chloropsis*, was treated as a full species, the "Western White-naped Honeyeater", by both Storr and R. E. Johnstone. It is readily distinguishable from the eastern race in size, in bill shape and in the colour of the bare skin around the eye, although the differences are less than those that distinguish the two subspecies of the Black-chinned Honeyeater.

The three subspecies of the Blue-faced Honeyeater (*Entomyzon cyanotis*) divide into two groups based on the colour of the facial skin and the wing patch. The race *albibennis*, in north-western Australia, has greenish facial skin and large white patches on both surfaces of the wing. The nominate race and *griseigularis*, from eastern Australia and southern New Guinea, have bluish facial skin and smaller, buffish patches largely restricted to the underside of the wing. The two morphological groups appear not to come into contact, and they were treated as separate species in the late nineteenth century. DNA data may shed further light on their taxonomic status.

According to the DNA data of Driskell and Christidis, the friarbirds in the genus *Philemon* form a group with *Xanthotis*, *Plectorhyncha* and *Grantiella*. The White-streaked Friarbird (*Melitograis gilolensis*) of the northern Moluccas was included in *Philemon*, along with the other friarbirds, by both Salomonsen and Wolters. Nevertheless, its distinctive brownish-black plumage with fine white shaft streaking and the bare skin around the eyes and on the nape set it apart from all other friarbirds and, as a consequence, many modern treatments retain it in a monotypic genus. The remaining friarbirds comprise a relatively homogeneous group of plain grey-brown, medium-sized to large honeyeaters with areas of blackish skin on the face and head.

Many of the species have a variably developed casque on the bill which can vary among subspecies, too. Mayr identified four species groups among the friarbirds. The most speciose assemblage he termed the "moluccensis group", and this coincides with the subgenus "*Philemon*". According to Schodde and Mason, this subgenus comprises eight species. The Dusky Friarbird (*Philemon fuscicapillus*) of the northern Moluccas, the Seram Friarbird (*Philemon subcorniculatus*) from Seram, and the Black-faced Friarbird (*Philemon moluccensis*) from Buru are generally regarded as allopecies; the first two have a slight protuberance at the base of the bill, the Black-faced Friarbird lacking this. Rheindt and Hutchinson treated the Tanimbar and Kai populations, formerly considered a subspecies of the Black-faced Friarbird, as a separate species, the Tanimbar Friarbird (*Philemon plumigenis*), which seems a logical step. They argued that the Tanimbar and Buru taxa are as morphologically distinct from each other as they are from the Seram Friarbird. Furthermore, in terms of biogeography, Buru is generally linked to Seram, while Tanimbar is more closely linked to Kai and the Banda Sea Islands.

The taxonomic circumscription of the Helmeted Friarbird (*Philemon buceroides*), which occurs in the Lesser Sunda Islands, New Guinea and northern Australia, is far from resolved. At issue is the question of whether the Lesser Sunda and central northern Australian races constitute one species, and the New Guinean, north-east Queensland and Torres Strait subspecies another. Both Salomonsen and Mayr recognized the "New Guinea Friarbird" as a species, "*P. novaeguineae*", although Mayr also included the New Britain Friarbird (*Philemon cockerelli*) within it; all recent treatments have retained the New Britain Friarbird as a separate species. Most, though not all, forms of the Helmeted and New Guinea Friarbirds have a well-developed casque, and the patterns of variation make it difficult to define species boundaries. Schodde and Mason argued that, if the "New Guinea Friarbird" is recognized as a species, the population of north-eastern Queensland, subspecies *yorki*, should likewise be elevated to species level, suggesting that it could even be more closely linked to the Silver-crowned Friarbird (*Philemon argenticeps*). This suggestion is contradicted by the available DNA data (see below). Parker demonstrated the existence of two forms of Helmeted Friarbird in the Northern Territory of Australia: *gordoni* on Melville Island and the coastal areas of the adjacent mainland, and the nominate race on the sandstone ridges of the Arnhem



Macgregor's Honeyeater clearly confused early taxonomists since it was described at the end of the nineteenth century as a bird-of-paradise (*Paradisaeidae*). DNA sequencing has subsequently confirmed the placement of the monotypic genus *Macgregoria* in *Meliphagidae*, while careful morphological scrutiny has revealed a close relationship with the genus *Melipotes*, which is similarly endemic to montane New Guinea. The two genera share features such as a prominent, brightly coloured facial wattle, a short bill, and dark grey or black plumage. Moreover, both genera lack the distinctive brush-tipped tongue common to almost all honeyeaters.

[*Macgregoria pulchra*, Mt Scratchley, SE New Guinea. Photo: William S. Peckover]

The most speciose meliphagid genus, *Myzomela*, also contains the smallest family members. The genus ranges widely, from Wallacea in the west, through New Guinea and Australasia to the south-west Pacific. Its 31 members include the **Red-collared *Myzomela***, the male of which is typical of *Myzomela* in having a large area of bright crimson in the plumage, a colour not exhibited by any other meliphagid genus. The female differs substantially, having scarlet only on the rump and uppertail-coverts. Such sexual dichromatism is more prevalent in *Myzomela* than any other meliphagid genus.

[*Myzomela rosenbergii*
rosenbergii,
 Tomba Pass,
 Enga Province,
 Papua New Guinea.
 Photo: Tim Laman]



Land escarpment. He considered *gordoni* to represent a separate species, the "Melville Island Friarbird". Although the latter has not been accepted as a species by subsequent taxonomists, the Arnhem Land escarpment population has been separated as a subspecies under the name *ammitophilus* and is sometimes referred to as the "Sandstone Friarbird". Resolution of the taxonomy within the Helmeted Friarbird complex will require extensive sampling of populations by means of DNA-sequence analyses.

Confined to the Admiralty Islands, the White-naped Friarbird (*Philemon albitorques*) is distinctive among its congeners in that it has a whitish collar and underparts, which contrast dramatically with the brown head and upperparts. It has a small knob at the base of the bill, whereas the two other Bismarck endemics, the New Britain and New Ireland Friarbirds (*Philemon eichhorni*), lack such a knob. The Silver-crowned Friarbird is generally treated last in the taxonomic sequence, and Salomonsen did not include it in the "*moluccensis* group". This northern Australian endemic is sympatric with the Helmeted Friarbird, including the New Guinea populations; all other members of the "*moluccensis* group" are allopatric. Were it not for sympatry, Mayr would have included the Silver-crowned Friarbird within either the Helmeted Friarbird or the "New Guinea Friarbird" on the grounds of morphological resemblances. The DNA-sequence study of Driskell and Christidis examined species-level relationships of five of the friarbirds, including the Silver-crowned Friarbird, the north-east Queensland race *yorki* of the Helmeted Friarbird and the Noisy Friarbird (*Philemon corniculatus*). These three formed a clade, but the Silver-crowned and Noisy Friarbirds were identified as more closely related to each other compared with the Helmeted Friarbird. The DNA data therefore support Salomonsen in not including the Silver-crowned Friarbird within the "*moluccensis* group", and also indicate that similarities between it and the *yorki* form of the Helmeted Friarbird are convergent. Mayr and others have treated the Noisy Friarbird and the New Caledonian Friarbird (*Philemon diemenensis*) as constituting a species group in the subgenus "*Tropidorhynchus*". These two have a knobbed bill and distinct bare black skin on the head. Further analyses are needed in order to determine whether the Silver-crowned Friarbird should also be included in this group.

The third group recognized by Mayr, and corresponding to the subgenus "*Microphilemon*", comprises species with a fairly straight bill and a more fully feathered head. Three species are

generally recognized, these being the Timor Friarbird (*Philemon inornatus*), Brass's Friarbird (*Philemon brassi*), from New Guinea, and the widespread Little Friarbird (*Philemon citreogularis*), ranging from the Lesser Sundas east to New Guinea and north and east Australia. The Lesser Sunda form, however, was regarded by Sibley and Monroe as a separate species, the Grey Friarbird (*Philemon kisserensis*). Indeed, retention of the Grey Friarbird as a subspecies of the Little Friarbird is anomalous if one considers the biogeography: the islands of Kisar, Leti and Moa, where the Grey Friarbird occurs, are just north of Timor, and consequently the Grey Friarbird's affinities more plausibly lie with the Timor Friarbird than they do with the Australian-New Guinean Little Friarbird. Plumage and morphological differences are subtle, which complicates matters, but a prudent approach is to keep the Grey Friarbird as a separate species; DNA analysis could help to resolve this matter. Mayr, along with Schodde and Mason, has argued that Meyer's Friarbird (*Philemon meyeri*) represents the most divergent member of the genus, and it is placed in the subgenus "*Philemonopsis*". This New Guinean species was included in the DNA study of Driskell and Christidis. Instead of being identified as a basal lineage, it formed a clade with the Little Friarbird, the other clade comprising the Helmeted, Noisy and Silver-crowned Friarbirds. These two clades would be predicted on the basis of morphological similarity: the three species with a knobbed bill and with distinct, bare black skin on the head in one clade, and the two straight-billed, more fully feathered species in another. It is generally held that Meyer's Friarbird represents the "primitive" friarbird because of perceived links between it and the honeyeater genus *Pycnopygius*. Not only is such an argument incorrect in a phylogenetic framework, but the DNA data clearly negate any close association between *Pycnopygius* and the friarbirds. Infrageneric relationships within the friarbirds need to be reassessed.

The genus *Xanthotis* has generally been associated with *Meliphaga* and *Lichenostomus*. Indeed, Salomonsen combined all three as a single genus. As discussed previously, however, DNA studies have indicated that the three genera are unrelated. Whether the Kadavu Honeyeater is best retained in *Xanthotis*, placed in *Foulehaio* or segregated in its own genus, *Meliphactor*, is far from resolved. The protein-allozyme study of Christidis and Schodde identified a close sister-group relationship between Macleay's Honeyeater (*Xanthotis macleayanus*) and the Tawny-breasted



The eleven species of *Lichmera* honeyeater are distributed from Bali east to the south-west Pacific. They are medium-small meliphagids with a fairly long, slim, decurved bill, and all have a distinctive triangular ear-tuft, a feature that is otherwise very rare among the Meliphagidae. Otherwise, all but two *Lichmera* are nondescript in plumage, and the **Indonesian Honeyeater** is no exception. Its plumage is predominantly grey-olive, offset by a brighter yellow-olive panel on the folded wing. Some taxonomists treat this taxon as the Wallacean subspecies of Brown Honeyeater (*L. indistincta*).

[*Lichmera limbata*,
Bali, Indonesia.
Photo: Morten Strange]

Honeyeater. The Spotted Honeyeater (*Xanthotis polygrammus*), while still clearly part of the genus, was further diverged. Within the Tawny-breasted Honeyeater. Schodde and Mason recognized five principal groups, four of which intergrade where they abut in New Guinea. The five groups are: the nominate and *fusciventris*, two virescent subspecies from the West Papuan Islands and north-western New Guinea; plain dusky grey *meyeri*, *madaraszii* and *philemon*, in northern New Guinea and adjacent islands; rufescent *visi*, in far eastern New Guinea; white-faced and ventrally spotted *spilogaster*, in the Trobriand Islands, off south-east New Guinea; and bare-faced and fawn-breasted *saturator* and *filiger*, from southern New Guinea, the Aru Islands and north-eastern Australia. Whether some of these groups constitute separate species awaits further investigation.

Finally, the DNA-sequence data of Driskell and Christidis identify a well-supported sister relationship between the Striped Honeyeater (*Plectorhyncha lanceolata*) and the Painted Honeyeater. These species are morphologically disparate and, before the DNA findings, a close relationship between them had never been suspected. Schodde and Mason noted resemblances between the Striped Honeyeater and the friarbirds in tail form and in the spicate breast feathering. The Painted Honeyeater, currently in the monotypic genus *Grantiella*, was included within *Conopophila* by Salomonsen, who also, interestingly, placed the Striped Honeyeater next to this genus. Most other authors have generally aligned the Painted Honeyeater with *Phylidonyris* and *Trichodere*, a relationship refuted by the DNA evidence. Despite the lack of any obvious morphological resemblances between the Striped and Painted Honeyeaters, the nests of the two species are apparently similar in structure. Moreover, the Painted Honeyeater specializes in feeding on mistletoe (Loranthaceae), and it has been reported that the Striped Honeyeater, too, likes to feed on mistletoe.

Morphological Aspects

Honeyeaters are generalized ten-primaried passerines, but they have a specialized brush-tipped tongue and internal structural modifications to the bill adapted to a nectarivorous diet. Although they are difficult to characterize, the physical appearance of most honeyeaters readily distinguishes them. They are typically rather slim, with a slender head, a low sloping forehead and crown, a variably long and decurved bill, almost straight in some species, and moderately long legs and tail; they present a varying

horizontal to upright stance that is often somewhat watchful and almost pugnacious. Honeyeaters use a wide range of habitats and ecological niches, and, while many are adapted to feeding on nectar, others have a diet consisting largely or mainly of fruit, insects or lerp, honeydew or manna (see Food and Feeding). Consequently, they show a diversity of sizes and shapes, and vary particularly in the shape and length of the bill.

Meliphagids are typically medium-sized, most species having a total length lying within the range of about 15 cm to 25 cm, but the family's members range in size from being tiny to being quite large. The smallest species are in the genus *Myzomela*, the largest genus in terms of number of species, consisting of 31 tiny to medium-small honeyeaters distributed from Wallacea in the west eastwards to New Guinea and Australia and throughout the south-western Pacific. The smallest appears to be the Mountain *Myzomela* of montane New Guinea, only 9 cm in length and with a mean weight of 7.4 g; one of its alternative English names, "Elfin Honeyeater", is very apt. In Australia, the Scarlet *Myzomela* is about 10 cm in length and has a mean weight of 8 g, and the Black-bellied *Myzomela* of lowland New Britain is likewise only 9–10 cm long. The Black and Banded Honeyeaters, two monotypic genera of Australia, are also small, each being 12 cm in length and weighing 9.5 g. Other genera of mainly small to medium-small species include: the two *Acanthorhynchus* spinebills of south-west and east Australia, some 14–15 cm in length and weighing 10–11 g; the six *Melithreptus* species, one of which extends to southern New Guinea, ranging in length from 10.5 cm to 16.5 cm and with mean weights of 10–20 g; and the eleven *Lichmera* species, distributed from Bali and the Lesser Sunda east to the south-west Pacific.

At the opposite extreme, the largest species are the wattletbird genus *Anthochaera* of Australia, *Macgregoria* of alpine New Guinea, *Gymnomyza* of the south-western Pacific, and the widely distributed friarbirds in the genus *Philemon*. The Yellow Wattletbird of Tasmania is the longest, but not the heaviest, honeyeater, males having a total length of 44–50 cm and weighing 135–260 g, and females being slightly smaller, at 37–43 cm and 104–190 g. MacGregor's Honeyeater, until recently considered a bird-of-paradise (see Systematics), is probably the heaviest meliphagid; males are 40 cm long and weigh 242–357 g, with a mean of 266 g, while females are 35–40 cm and 190–230 g, with an average weight of 206 g. Other large species include the Red Wattletbird, with males 33–37 cm in length and 90–140 g in weight, and females 35 cm and 82–133 g, and the Crow Honey-

eater of New Caledonia, which has a total length of 35–41 cm; while weights of the latter are very poorly known, one male weighed 248 g. Of the friarbirds, the “*P. moluccensis* super-species” consists of eight large species, all 30 cm or more in length: the Dusky Friarbird, at 30 cm, the Seram Friarbird, at 35 cm, the Black-faced and Tanimbar Friarbirds, each 31–37 cm long, the New Britain Friarbird, at 33–35 cm, the New Ireland Friarbird, measuring 32 cm, the White-naped Friarbird, at 34–37 cm, and the widespread Helmeted Friarbird of tropical northern Australia, New Guinea and the Lesser Sundas, which is some 32–36 cm in length and weighs 90–177 g.

A number of other genera or species are fairly large, including the remaining two wattlebirds. The Little Wattlebird has a total length of 27–35 cm, and a mean weight of 75 g for males and of 60 g for females; Western Wattlebird males are 29–33 cm long and weigh 71 g, the corresponding details for females being 27–30 cm and 54 g. Most of the *Melidectes* honeyeaters of montane New Guinea also are large, Belford's Honeyeater, for example, being 26–29 cm in length and the males having a mean weight of 74.7 g and the females about 60 g. Similarly, the Blue-faced Honeyeater is large, with an overall length of 26–33 cm and mean weight in adult males of 112 g and in adult females of 98 g. The Australian miners in the genus *Manorina* are medium-large to large and, unlike most other honeyeaters, rather stockily built; they range in size from the Bell Miner, some 19 cm in length and 25–35 g in weight, to the Noisy Miner, about 26 cm long and weighing 70–80 g.

The genera *Lichenostomus* and *Meliphaga*, together comprising 35 species, are morphologically similar, medium-sized and classic honeyeaters. They range in length from 14.5 cm, as in the case of the Grey-headed and Yellow-tinted Honeyeaters, to 22 cm, as in the Varied and Yellow-throated Honeyeaters, with mean weights ranging from the 12.5 g of the Yellow-tinted to the 31–33.5 g of the Yellow-throated and Varied Honeyeaters, although the weights of many species are poorly known. Other genera of medium-sized species are *Phylidonyris*, *Myza*, *Pycnopygius* and *Timeliopsis*, and a number of monotypic genera, including *Purnella*, *Oreornis*, *Glyciphila* and *Trichodere*.

Sexual dimorphism in size is the norm throughout the Meliphagidae, with males larger than females in nearly all species, although, unfortunately, sufficient data are lacking for many of the species, especially from New Guinea, Wallacea and the Pacific islands. The summaries of measurements and weights published in the *Handbook of Australian, New Zealand and Antarctic Birds* reveal that, for all 70 of the Australian and New Zealand species, the males are larger than the females in at least one measure or weight; there are no species for which females were found to be significantly larger than males. A few members of the family exhibit quite marked sexual dimorphism in size, as illustrated by the medium-small Crescent Honeyeater. Males of the nominate race have a mean wing length 7.4–8.1 mm greater, a mean tail length 7.9–9.2 mm greater and a weight 1.9–3.6 g greater than the corresponding figures for the females. The San Cristobal Honeyeater also appears strongly dimorphic: average wing length, tail length and weight of adult males are 135.9 mm, 114.3 mm and 80.4 g, respectively, while the figures for adult females are 118 mm, 100.2 mm and 54.7 g.

Only in one species are the trends not so clear-cut. In the Grey Honeyeater, males have a significantly longer tail than females and they tend to have longer wings, although the difference is not significant, but females weigh more, although, again, not significantly. The sample sizes for this species, however, are not large, and these trends may not hold if more data were to become available. Dimorphism in size typically occurs with most or all measures within a species, but this is not always the case. For example, males of the Pied Honeyeater have significantly longer wings, at 86.5 mm, than those of females, which measure 83.1 mm, but tail lengths of the two do not differ significantly, despite similar sample sizes. When closely related bird species with similar diets and foraging methods are found to co-exist in the same habitat at the same altitude, they often differ in weight by a factor of about two. This difference in size allows the two species to co-exist in part because the smaller species can forage on finer twigs and foliage and so on, but also because the two

species differ in the size of food that they can catch and handle. On Bougainville, there is broad altitudinal overlap between the Scarlet-naped Myzomela, which ranges from sea-level up to 1800 m and more, and the larger Bougainville Honeyeater, which occurs from 700 m to at least 1950 m; the former, 12–13 cm in total length, weighs some 10–14 g, which was estimated to be about one-half to one-third as much as the weight of the Bougainville Honeyeater, 17–18 cm in length but of unknown weight.

There can be much variation within species, too. While such variation often delimits subspecies, intraspecific variation is sometimes clinal and follows general ecogeographical trends described by Bergmann's, Allen's or Gloger's Rules. For example, the nominate race of the Silver-crowned Friarbird exhibits clinal variation in both size and colour following Gloger's and Bergmann's Rules: birds from more humid areas appear darker than those from more arid areas, and individuals of northern populations are slightly smaller in size than those of more southern populations. Two formerly recognized subspecies of this species, incidentally, are now known to represent clinal variation within the nominate race. The Striped Honeyeater likewise shows clinal variation in size consistent with Bergmann's Rule, with northern populations smaller than those in the south. Island forms can also be larger than their conspecifics on the mainland, as typified by, for example the Tui of the Chatham Islands, individuals of which are considerably larger and heavier than those from the main islands of New Zealand. Similarly, off south-western Australia, Singing Honeyeaters from some islands off the edge of the species' mainland range, such as Rottnest Island and Garden Island, are larger, and also darker, than their mainland conspecifics.

As with most species, weights can vary, sometimes considerably, on a daily or seasonal basis or from year to year. For example, an individual Yellow Wattlebird of the nominate race weighed 170 g in September and 203 g when recaptured in the following August, whereas another individual weighed 200 g in May and 183 g when recaptured in July. In the Chatham Islands, a male Tui weighed 160 g when first captured, on 11th January, but when it was retrapped, on 3rd August, its weight had shot up to 238 g. On the New England Tableland of east Australia, both male and female Eastern Spinebills were heavier in winter than in autumn, with males about 2 g heavier than females throughout this period; weights of both sexes declined after periods when overnight temperatures dropped below –4°C and nectar supplies had prob-

As currently constituted, the genus *Phylidonyris* comprises three species endemic to Australia. At other times, up to four additional species have been ascribed to it. *Phylidonyris* are medium-sized honeyeaters with a long, robust, decurved bill. The three are strikingly patterned in black and white, and have contrasting yellow panels in the folded wings and tail, formed by bright fringes to the remiges and rectrices respectively. The **New Holland Honeyeater** differs from its congeners in its bearded appearance, which is formed by the elongated white malar feathers, throat bristles and neck plume.

[*Phylidonyris novaehollandiae canescens*, Melaleuca, Port Davey, South West Wilderness, Tasmania.

Photo: Dave Watts]



ably declined. At this site, New Holland Honeyeaters were significantly heavier in late autumn and winter than in early autumn and summer but, conversely, Yellow-faced Honeyeaters showed no significant changes in weight over the course of the year.

Morphologically, a key characteristic of the family is the specialized, long and protrusible tongue, and associated tongue musculature. The tip of the tongue is modified into a brush, which allows extraction of nectar from flowers. This brush tip of the Meliphagidae is very different from the bifid tongue tip of the nectarivorous sunbirds and hummingbirds (Trochilidae). The basal and central parts of the honeyeater tongue are curled upwards and inwards on both sides, forming a single open channel, or trough, along the upper surface of the tongue, and the tip is deeply cleft into four primary segments, although there may be two, four or eight segments, each of which is covered by many fine bristles, or filaments, that arise from the lateral edges or the tip, or both, of the segments. The bristles themselves are moderately flexible, often slightly concave and grooved, the grooves running back and converging to join the trough. Within this basic structure there is, however, much variation from species to species. For example, in the Tui, the brush at the tip of the tongue is composed of four subequal, acicular and apparently movable segments, each of which gives off finer bristles over much of the length of the segment. In comparison, the brush of the New Zealand Bellbird is deeper than that of the Tui, and the finer bristles are at the ends of the segments. The tongue of both of these species is caniculate for its whole length, deeply so in the Tui, and less so in the bellbird. In a detailed analysis of the tongues of nectar-feeding birds, D. C. Paton and B. G. Collins found that, for 36 species of honeyeater, the length of the brush tip of the tongue was correlated with both body weight and the total length of the tongue, and ranged in length from 5 mm, in the Eastern Spinebill, to 17 mm, in the Long-billed Honeyeater. They also found much variation in the number of bristles, the averages ranging from about 120 in the Red Wattlebird to 40 in the Brown Honeyeater, this number again correlated with body weight. The arrangement of bristles again varied: some genera, such as *Acanthorhynchus*, had 40–60 bristles at the tip of the tongue and up to 70 shorter bristles down each side of the tongue, whereas others, such as *Melithreptus*, *Phylidonyris* and *Lichenostomus*, had few or no bristles along the sides.

That the tongue is protrusible is also important in that it enables it to reach some otherwise inaccessible nectar sources. For

example, the tongue of the large and rather heavy-billed Red Wattlebird extends far enough beyond the tip of the bill to be able to probe and collect nectar of many tubular flowers: the mean length of the bill, to the feathering, is 23.5 mm, but the mean length of bill and extended tongue is 44 mm. During the process of feeding on nectar, the tongue is rapidly extruded and withdrawn, with mean rates of 6.3–12.4 “licks” per second recorded for a range of meliphagids, and, for the Singing and Brown Honeyeaters, mean rates of 8–10 licks per second. When the tongue is protruded, nectar and other liquids are drawn into the brush by capillary attraction and, as the tongue is withdrawn and the bill closed, the brush is pressed against the palate and liquid forced into the channel of the tongue and then into the throat. Bird-pollinated plants in Australia and New Guinea show much diversity in floral structure, size, arrangement and pattern of nectar presentation, and the brush-tipped tongue provides an advantage in that it takes nectar spread thinly over a large surface area, as found in flowers of some foodplants, such as at least some eucalypts (*Eucalyptus*) and *Banksia*. Further, honeydew, another important energy source (see Food and Feeding), can likewise be spread thinly over the surfaces of leaves and bark and in tiny fissures on these surfaces, and the brush-tipped tongue can cover this surface area and simultaneously penetrate the small cracks that hold honeydew.

While all honeyeaters have a brush-tipped tongue, a significant adaptation to a nectarivorous diet, the family has evolved a diverse array of feeding methods and strategies and use of a wide range of resources. Although most, if not all, meliphagid species probably consume at least some nectar, many have diets primarily of fruit, insects or manna, lerp and honeydew, or combinations of these (see Food and Feeding). In such species the brush tip can be reduced. For example, in the genus *Melipotes* of New Guinea, all four members of which are of medium size and have a short, almost stubby bill, and at least three of the four a largely frugivorous diet of berries, the brush tip is obsolete; the structure of the tongue of the newly described species from the Foja Mountains, the Wattled Smoky Honeyeater, has not been investigated. Interestingly, the brush tip is nearly vestigial also in the insectivorous Australian chats, currently placed in the family Epthianuridae but central to the honeyeater assemblage (see Systematics).

In general terms, the bills of honeyeaters are typically strong, moderately long to long, from roughly 11 mm to 44 mm, and



The six *Melithreptus* honeyeaters are small or moderately small species with a short, slightly decurved bill. All occur in Australia, with one species reaching southern New Guinea. All congeners have a crescent-shaped, bright-coloured patch of bare skin above the eye, and five have a pale band on the nape. The latter feature is enshrined in the English name of the **White-naped Honeyeater**. This attractive species has a black cap, predominantly olive-green upperparts, and white underparts with a grey wash. Its two subspecies differ in the colour of their bare eye-patch.

[*Melithreptus lunatus lunatus*,
You Yangs, Victoria,
Australia.
Photo: Peter Fuller]

Friarbirds of the genus *Philemon* are medium-sized or large honeyeaters that are remarkably similar in appearance, having grey-brown plumage, a deep-based, decurved bill and an extensive area of black facial skin. Most species have a protruding casque at the base of the bill and many have both a nuchal crest and a gorget of elongated breast feathers. The **Silver-crowned Friarbird**, endemic to northern Australia, possesses all three characteristics. With the relative homogeneity of the genus, infrageneric relationships and species limits are keenly debated, and at least two taxa currently treated as subspecies have claims to be elevated to the level of full species.

[*Philemon argenticeps kemp*, Mt Isa, Queensland, Australia. Photo: Drew Fulton]

varyingly decurved, with slit-like operculate nostrils, all adaptations, along with the brush-tipped tongue, to their diet and foraging behaviour. There is, however, much variation in length, depth, width and curvature of the bill. For example, the bill of *Acanthorhynchus* is long, slender and fairly gently decurved, that of *Melilestes* is long but heavy and fairly strongly decurved, while that of the friarbirds, the wattlebills and many *Melidectes* is moderately long and decurved but heavy, and the bill of the genera *Plectorhyncha*, *Timeliopsis* and *Melipotes* is fairly short and straight or almost straight and almost conical. To some extent, bill morphology, as well as other aspects of morphology, reflects the feeding habits of a species, although correlations between bill dimensions and diet are less than clear-cut, possibly in large part because of the range of foods eaten by each species. Honeyeaters range from being predominantly nectarivorous to being predominantly insectivorous, with a few species largely frugivorous, but few are wholly specialized on one or other of these diets, and many also consume other resources, such as manna, honeydew and lerp, to some degree. Thus, bills are utilized also to probe or glean for insects and other non-nectar foods, and from substrates other than flowers. Moreover, the flowers themselves that are exploited by honeyeaters vary greatly in morphology, from being, for example, open and cup-shaped to being long and tubular, while others grow in large and complex inflorescences.

Given this diversity, it is no surprise that there are no absolute relationships between bill morphology and diet. Nevertheless, general trends are evident within the family, and bill shape can be loosely consistent with diet: smaller species with a long bill that *tend* to feed more on nectar than on insects; small to medium-sized species with a short bill that *tend* to feed more on insects and other non-nectar foods; and medium-sized to larger species with a short bill that often include much fruit in the diet. In some apparently specialized nectar-feeders, the bill is proportionately long, slender and varyingly curved. In Australia, the *Acanthorhynchus* spinebills are small, with a long, slender and noticeably decurved bill. The *Myzomela* species are among the smallest honeyeaters and have bills varying from moderately decurved to strongly decurved, and all are predominantly nectarivorous. The Black, Banded and Pied Honeyeaters, all now placed in monospecific genera, are similarly small to medium-small, with a fairly long and decurved bill, and a diet predominantly of nectar.

Perhaps the longest bill, proportionately, is that of the medium-sized and aptly named Long-billed Honeyeater of New Guinea and the West Papuan and Aru Islands. This species' bill is long but also strong and heavy, and appears to be used for probing crevices, curled leaves and fruit, and gleaning from trunks and branches, foliage and rotten timber, as well as for probing flowers for nectar. The largely New Guinean *Melidectes* also have a proportionately long bill, most notably in the "*Melionyx* subgroup" of the Long-bearded, Short-bearded and Sooty Honeyeaters (see Systematics) and the Bismarck Honeyeater. The large friarbirds and wattlebills, too, possess a long bill, although the proportional length of this is not so great as in some other meliphagids. Conversely, a number of species have a noticeably short and rather straight bill. The Green-backed Honeyeater has a moderately long but straight and pointed bill and is primarily an insectivore, although it does supplement its diet with small fruits and it forages among eucalypt flowers, taking either nectar or insects.

The enigmatic and nondescript Grey Honeyeater of inland Australia has a short and only gently decurved bill, and its diet, while not well known, consists predominantly of insects, as well as some nectar and fruit. In New Guinea, the two aptly named straightbills in the genus *Timeliopsis* are medium-small or medium-sized honeyeaters, each with a moderately long, rather straight and dagger-like bill having only a slight decurve of the upper mandible; both appear to be largely insectivorous. The genus *Melithreptus*, which is almost confined to Australia, a single species extending to southern New Guinea, possesses a short, almost straight bill and a strongly insect-based diet. All four species of *Melipotes* have what is, for birds of their size, a quite short, almost stubby bill and lack a brush-like tip of the tongue, which appear to be adaptations to a largely frugivorous diet of berries. It will be interesting to find out the details of the tongue and diet of the newly described *Melipotes* of the Foja Mountains.



The long and decurved bill of most honeyeaters appears to provide advantages for the birds' mode of foraging at flowers. Honeyeaters typically perch while probing flowers for nectar, although some, particularly some smaller species, sally-hover briefly. It is usually not possible for the birds to perch directly in front of an inflorescence, in contrast to species that hover, which can often position themselves in front of an inflorescence and insert the bill. Perched honeyeaters therefore have to reach towards the flower, sometimes hanging to do so, to place the tip of the bill at the flower's opening, before it can be inserted to reach the nectar. A decurved bill is better suited to this than a straight or upturned bill, whereas a straight bill can be inserted as effectively as a decurved bill when directly in front of a flower, as during hovering. Honeyeaters also reach out to flowers, partly insert the bill, and then drag the flower towards them before inserting the bill fully. Generally, in nectarivorous species, longer bills are more effective than short bills at reaching nectar at the base of long tubular flowers.

As with other measurements and weights, in which males are larger than females, the bill of males tends also to be longer than that of the females and, where sufficient data exist, the differences are statistically significant. Such differences, however, appear to be proportional to overall body size. There is also geographical variation in bill morphology within species. Of course, bill dimensions can vary intraspecifically to the extent that they characterize subspecies. Taking as an example the Red Wattletail, the subspecies *clelandi* of Kangaroo Island is similar in size to the nominate race of coastal and subcoastal eastern mainland Australia, but the bill of *clelandi*, at least in males, is significantly longer than that of the nominate race, although the tarsus is shorter. Geographical variation can also be clinal, as described in Allen's Rule, whereby the bill and feet of a species are larger at lower latitudes than they are at higher latitudes. Not all variation in bill dimensions, however, follows these rules. Lewin's Honeyeater exhibits no clinal variation in bill length, or in any other measure, over its latitudinal range, which extends across 24.5° from north-eastern to south-eastern Australia. Further, individuals of the Eastern Spinebill from Kangaroo Island have significantly longer



bills in both sexes, and significantly shorter wings and lower body weight in males, than do those from adjacent mainland populations, contrary to what one would expect according to Allen's and Bergmann's Rules. There is a single instance within the honeyeaters in which the length of an individual's bill appears to vary seasonally. In mid-eastern Australia, the total head length of individual Eastern Spinebills was found to vary by 2–3 mm over the course of a year, being greatest in winter and shortest in summer, and it was suggested that these differences were due to changes in bill length as a result of differential rates of wear in different seasons.

All honeyeaters are primarily arboreal, and their legs are typically of moderate length but robust, and the feet and claws are strong, with scutellate, bilamini-plantar tarsi. The Australian chats, herein in the family Epthianuridae, are really meliphagids adapted for a terrestrial habit (see Systematics). In Australia, three of the *Manorina* miners, the Noisy, Yellow-throated and Black-eared Miners, commonly forage on the ground, as does the Tawny-crowned Honeyeater. Several meliphagid species in montane New Guinea appear to forage much on the ground, although all are poorly known and the proportion of time spent on the ground compared with that on other foraging sites is not known. In the Snow Mountains of Papua, there are many reports of the Orange-cheeked Honeyeater foraging on the ground in subalpine and alpine meadows, while the Short-bearded Honeyeater is thought to forage mainly in shrubs and on the ground. Whether this behaviour has manifested itself in modifications to the legs, feet or claws awaits study. Some other species also spend much time clambering on vertical trunks and branches when foraging. The behaviour of the Long-billed Honeyeater is distinctive, involving much time spent in ascending tree trunks in the manner of an Australasian treecreeper (Climacteridae). Again, it is not known whether the leg and foot structures of this species differ considerably from those of other honeyeaters.

Nearly all members of the family have some coloured bare skin on the head, particularly around the eyes or ears, around the base of the bill or on the chin, although such bare skin can be highly inconspicuous. In many cases, the area of bare skin is small, merely swollen or extended gape stripes or lines, as in many *Meliphaga* and *Lichenostomus* species, or narrow to broad orbital rings or eye-patches, as those of, for instance, *Lichenostomus* and *Lichmera*. The Pied Honeyeater has a small pale blue crescent of bare skin below the eye. All six members of

the genus *Melithreptus* have a conspicuous, semi-circular bare eye wattle on and above the upper eye. This wattle is light blue to medium blue in south-eastern populations of the Black-chinned Honeyeater and pale green to straw-yellow in northern populations, light blue to pale green in the Strong-billed Honeyeater, cream to very pale greenish-white or bluish-white in the Black-headed and White-throated Honeyeaters, and orange-red in eastern populations of the White-naped Honeyeater but pale greenish-white or white in the latter's western populations; in the Brown-headed Honeyeater, it is developed into a complete, broad, creamy orbital wattle. In contrast, many genera display large and colourful patches of bare facial skin. These are perhaps most developed in MacGregor's Honeyeater, which sports a large, hemicircular yellow fleshy wattle around the eye that covers much of the side of the head. The Blue-faced Honeyeater, as could be expected from its name, has an extensive area of iridescent blue skin around the eye and over much of the side of the head; in juveniles and immatures, however, the facial skin is yellow, the adult colour gradually developing over the first twelve or more months. All four members of the closely related genus *Melipotes* exhibit a large bare patch of yellow, orange or red skin surrounding the eye, the lower edges of which are variously developed into wattles, which can change colour when the bird is stimulated. For example, the facial skin of the Common Smoky Honeyeater is normally bright yellow, but when the bird is stimulated, as when fighting, or even when hanging upside-down while foraging, the facial skin becomes brilliant red; this coloration fades rapidly when the stimulus is removed, diminishing first from around eye. Probably all four species are able to change the wattle colour in this way.

All of the *Melidectes* species have some bare facial skin. That of the Long-bearded, Short-bearded and Sooty Honeyeaters, the "*Melionyx* subgroup", is a small but conspicuous area of pale skin behind and below the eye, some having a second, smaller and red postocular patch. In the remaining *Melidectes* species, the area of bare skin around the eye is much larger, and variously pale blue, green or yellow, or combinations of these. For example, the Yellow-browed Honeyeater has a large area of pale greenish-yellow skin around and behind the eye, a large pale yellow gape wattle and a small pinkish-red throat wattle, and the Ornate Honeyeater has a large patch of pale yellow skin around and behind the eye, combined with a small pinkish gape wattle and an orange-red throat wattle or bare malar area. In Australia, the Regent Honeyeater, in the genus *Anthochaera*, also has a large patch of normally dirty yellow, warty bare skin covering the lores and broadly around the eyes. Two of its congeners, the Red and Yellow Wattlebirds, have pendulous wattles, red and yellow respectively, hanging from the side of the head. At its most extreme, though least colourful, the area of bare black or blackish skin of many species of friarbird extends over almost the entire head.

Many species of friarbird have, in addition, a knob, or casque, at the base of the bill. This is developed to a varying degree, from large and prominent in the Noisy and Helmeted Friarbirds to little more than a subtle raised swelling in others, such as the Dusky Friarbird. Some others, such as the Little, New Britain and New Ireland Friarbirds, have no casque. Young friarbirds, both juveniles and young immatures, can also lack the knob of the adults.

For the most part, the eyes, bill, legs and feet of the honeyeaters are fairly drab. In most cases the bill is blackish-brown to dark grey or black, and the irides are dark brown, red-brown or black. The colours of the legs and feet vary, but are generally dull, being pale to dark grey, blue-grey, pinkish-brown or yellow-brown, grey-brown or black. There are, however, many exceptions to these norms. A number of species have a brightly coloured bill. On Taveuni and Vanua Levu, in Fiji, the nominate race of the Giant Honeyeater has a bright yellow bill. In Australia, all of the miners have a bright yellow bill combined with a small patch of bare yellow or red skin behind the eye, and the Painted Honeyeater has a bright coral-red bill. In New Guinea, the Yellow-browed Honeyeater's bill is very pale greyish or greyish-yellow, and that of the Ornate Honeyeater is pale blue-grey. A number of meliphagids have a bicoloured bill. That of the Crow Honeyeater is largely black to grey-black, with a yellowish to orange base of the lower mandible and gape, and the Bridled

The genus *Xanthotis* comprises four species, which further divide into a two sister taxa, a more divergent species and a species whose generic status is less clear. The last of these is the *Kadavu Honeyeater*, which many authors have placed in *Foulehaio* alongside the *Wattled Honeyeater* (*F. carunculatus*), some with *Ptiloprora*, and yet others in its own monotypic genus, *Meliphacator*. Wherever its generic home, the *Kadavu Honeyeater* is a subtly attractive creature, its grey plumage suffused with pale streaks and offset by a broad yellow surround to the eye.

[*Xanthotis provocator*, Fiji.]

Photo: Roland Seitre]

The **Striped Honeyeater** is the only member of its genus and is endemic to mainland Australia.

Plectorhyncha is one of four meliphagid genera to have heavily streaked plumage, the others being *Anthochaera*, *Phylidonyris* and *Ptiloprora*. DNA-sequencing has revealed the closest relative of this medium-large, long-tailed honeyeater to be the Painted Honeyeater (*Grantiella picta*), another monotypic genus endemic to Australia. The Striped Honeyeater is a good example of Bergmann's Rule, which states that populations of a species closer to the Equator are smaller than those at higher latitudes.

[*Plectorhyncha lanceolata*, Round Hill, New South Wales, Australia.

Photo: Graeme Chapman]

Honeyeater has a yellow base on its otherwise black bill. The Spiny-cheeked Honeyeater has a bright pink bill with a black tip.

There are few examples of seasonal changes in bare parts, though they are seen within the genus *Lichenostomus* in Australia. In the Fuscous Honeyeater, the bare parts change between the breeding season and the non-breeding season, although the plumage does not. The breeding adults have the bill, nares and gape all black, but in non-breeding adults the bill and tomia are black distally and orange-yellow or yellow on the basal half, the nares are orange-yellow or yellow, and the gape is yellow to pale yellow; the orbital ring, too, changes colour, from black when breeding to yellow when not breeding. During the transitional stages, the intensity of yellow of the orbital ring, bill and gape varies, and it appears to change from non-breeding to breeding in winter and from breeding to non-breeding in mid- to late summer. Similarly, breeding White-plumed Honeyeaters have the bill, cere and gape entirely black, but non-breeding adults have an orange-yellow or orange-brown base on both mandibles or just the lower mandible, and the gape is yellow. In Victoria, most White-plumed Honeyeaters caught in the period from late summer to early winter have non-breeding bare parts, whereas most of those captured in spring have breeding bare parts, with transition from non-breeding to breeding apparently in winter to early spring and transition to non-breeding in summer. As a further example, adult Yellow-plumed Honeyeaters have a black bill, gape and orbital ring when breeding, whereas non-breeding adults have a pale yellow to yellow-orange base on the otherwise black bill and a yellow or orange-yellow gape and orbital ring. Slight differences in bare-part coloration in at least some individuals have been reported for the Yellow-tufted and Purple-gaped Honeyeaters; in the case of the latter, the purple gape and fleshy continuation of the gape may sometimes become more intensely purple in the breeding season. It is possible that more detailed studies, particularly of non-Australian species, will reveal further examples of seasonal changes in bare parts, both among *Lichenostomus* species and in other genera.

In most honeyeaters, the iris is dark brown to red-brown or blackish. Some species, however, have the irides bright and contrasting. Those of the two spinebills are bright red, and those of the Tawny Straightbill and Long-billed Honeyeater are bright orange-red. Several species of *Ptiloprora*, but not the Olive-streaked and Leaden Honeyeaters, have green irides, whereas those of the Blue-faced Honeyeater are cream-coloured and those of the New Holland Honeyeater are white. Green-backed Honeyeaters have silvery-white to blue-cream eyes, and the Spiny-cheeked Honeyeater and a number of *Lichenostomus* and *Meliphaga* species, including, for example, the Mangrove, Bridled and some Lewin's Honeyeaters, have blue or blue-grey irides. The large and bright orange to orange-red iris of the Long-billed Honeyeater combines with a plain and "open" face to give a rather strongly staring appearance.

A few meliphagids have brightly coloured legs. In Fiji, whereas the legs of the Viti Levu subspecies *brunneirostris* of the Giant Honeyeater are olive-brown, those of the nominate race on Taveuni and Vanua Levu are bright yellow, as also are the legs of the Orange-cheeked Honeyeater of central montane New Guinea and the Bell Miner of south-eastern Australia. The remaining three Australian miners also have fairly strongly brownish-yellow legs, as does the Yellow Honeyeater. Unlike the diversity of colouring and patterning exhibited by the bare skin on the head and neck and, to a lesser extent, by the bill and irides, however, the legs and feet of the Meliphagidae in general are fairly dull. The function of these characters has not been studied, but many or all are no doubt involved in communication.

Plumages of honeyeaters are not wildly colourful, and the ground colours are typically sombre, mostly grey, green or olive-green to olive-brown and black, or combinations of these. Nevertheless, many of the species combine these rather subdued colours to produce subtly elaborate and attractive plumages, particularly in concert with the patches of bare skin, described above, and also with varyingly bright yellowish or yellowish-olive markings on the head, neck, wing or tail. The exception to this general picture is the genus *Myzomela*, many members of which, uniquely among the Meliphagidae, have brilliant glossy red, crimson or



scarlet in the plumage. Wing markings in particular are found widely throughout the family, often as distinct olive-toned to yellow outer edges or fringes, or a more diffuse wash in these areas, on the primaries or secondaries, or both, although such margins are usually absent or only fine on the outermost or outer two primaries, even in well-marked species. These markings often contrast strongly with the rest of the plumage of the upperparts and can combine to form large and conspicuous panels on the folded wings, and they are a prominent feature of many genera, including *Phylidonyris*, *Grantiella*, *Conopophila* with the exception of the Grey Honeyeater, *Purnella*, *Trichodere* and *Manorina*, and also of the larger species in *Melidectes*. For example, an alternative name for the New Holland Honeyeater is the "Yellow-winged Honeyeater", and in this species the broad golden-yellow outer edges of the remiges combine to form a bright panel on the folded wing, contrasting boldly with the otherwise black-and-white plumage; this species' congeners, the White-cheeked and Crescent Honeyeaters, display similarly strong and contrasting yellow panels in their wings. In the case of the Regent Honeyeater, the upper surface of the folded wing is black, with pale yellow scaling on the wing-coverts and three bold yellow panels, one on the greater primary coverts, one on the secondaries and one on the outer primaries. Unusually, in the largely black MacGregor's Honeyeater, the edges of the primaries, and the resulting wingpanel, are chestnut, but are bold and conspicuous against the black of the rest of the wing, both when the bird is perched and when it is in flight. Many other species have the edging and fringing well marked, but the colours of these margins and the rest of the feathering do not differ nearly so greatly, and the plumage lacks the obviously contrasting panels. Such a pattern is widespread, for example in the genera *Lichenostomus* and *Meliphaga*, many species of which have the dorsal plumage varyingly olive-green to olive-brown and the margins of the remiges contrasting only slightly or not at all, so that the folded wing and the dorsum appear generally olive. The edges of the remiges of the Blue-faced Honeyeater are the same in colour as the dorsum and most of the upperwing-coverts, so that the entire upperparts of the bird, including the folded wing, appear almost uniformly olive-green. In the Long-billed Honeyeater, the upperparts are largely dark brown to dark olive-brown, but with fine, faint buff-olive outer edges of the remiges, most obviously on the secondaries, which contrast only slightly with the rest and do not form a panel. Typically, those species with bright panels on the wings also have



Most species of honeyeater are noisy and active. Many are also at least seasonally gregarious, moving around their environment in small family groups. Miners (*Manorina*) are particularly sociable and flock all year round. The **Yellow-throated Miner** is usually seen in small gatherings of 5–10 birds, but neighbouring groups may join forces to create flocks of up to 50 or even 100 individuals, particularly outside the breeding period. Miners also engage in “corroborees”, where members of a tightly packed group flutter their wings and call agitatedly. Such displays may promote bonding and deter predators.

[*Manorina flavigula*
flavigula,
Eromanga, Queensland,
Australia.
Photo: Graeme Chapman]

similarly strong edgings on the rectrices, although they are often not so neatly delimited as are the margins of the remiges and are, in any case, normally far less conspicuous. Again, the New Holland Honeyeater is something of an exception in that its tail is edged with bright yellow that matches the yellow of the upperwing.

Little plumage ornamentation, as opposed to simple coloration, is evident in the Meliphagidae, and what is to be found is not elaborate. Possibly the most distinctive ornamentation is seen in the adult Tui, which is largely glossy black to black-brown with a strong dark blue, green-violet or even golden iridescence and with a unique and conspicuous pair of white ball-like tufts on each side of the throat, which often appear as a single larger tuft; the Tui also has a white, lacy hindneck-collar that extends to the sides of the neck and the upper mantle. A few species have elongated feathers on the chin, throat or breast. For example, both the Long-bearded and the Short-bearded Honeyeaters have a well-developed “beard” consisting of elongated white feathers along the sides of the throat. The New Holland Honeyeater is strongly pied and also has a bearded appearance, with a broad white malar plume formed by wispy and moderately long feathers, a prominent white neck-plume that arises below and behind the ear-coverts and fans on to the sides of the neck, and elongated white hair-like bristles over the black lower throat.

Many of the friarbirds in the genus *Philemon* have long, lanceolate feathers on the throat and upper breast that form a distinctive, somewhat layered and often streaked gorget, in some cases combined with nuchal tufts of slightly elongated and erect feathers, these often standing out against the bare skin. The Helmeted Friarbird, for instance, has a short tuft of upcurled feathering on the upper hindneck, and the Silver-crowned Friarbird has a similar short and upcurled tuft on the hindneck and sides of neck, these tufts in both cases having a distinctly combed appearance. The much smaller White-streaked Honeyeater also has a gorget of lanceolate feathers on the chin, throat and upper breast. The Spiny-cheeked Honeyeater has a bold white cheekstripe that continues as a stripe down the side of neck; it is formed by feathers with thick shafts but reduced barbs, giving a spiny appearance. Perhaps the most common forms of ornamentation in the family are simple neck plumes and ear-tufts. Neck plumes usually consist of slightly elongated and differently coloured plumes

running across the upper sides of the neck, behind the ear-coverts; in several species they appear bicoloured, although the second colour is often not part of the elongated plume but merely a coloured band of plumage next to it. Such neck plumes are characteristic of *Lichenostomus*, and are prominent in the Yellow-plumed, Grey-fronted, Fuscous, Yellow-tinted and White-plumed Honeyeaters. They are perhaps best developed in the Yellow-plumed Honeyeater, on which a long, bright yellow plume extends from the side of the throat backwards around the rear edge of the ear-coverts and ends in a pointed tuft near the nape; at the rear of the ear-coverts, which are greyish-olive, is a diffuse black band bordering the plume.

Ear-tufts are formed by elongated feathers of the ear-coverts, usually the rear coverts, that protrude slightly to strongly beyond the surrounding plumage. As with neck plumes, they are characteristic of the genus *Lichenostomus*, and they are perhaps best developed in the Yellow-tufted Honeyeater, the elongated bright yellow rear ear-coverts of which form a distinct pointed tuft contrasting boldly with the species’ black facial mask. Ear-tufts are a prominent feature also of the Purple-gaped, Grey-headed and Black-throated Honeyeaters. The genus *Meliphaga* is similarly characterized by the possession of white to pale yellow ear-tufts. In contrast to those of *Lichenostomus*, however, the tufts are rounded, not pointed, and typically not raised, appearing as simple patches of colour, although it would appear that all of these species can erect these tufts to some extent. Ear-tufts are present on a few other meliphagids in other genera, notably in all eleven *Lichmera* species, as well as the Spotted Honeyeater and to some extent its three congeners in *Xanthotis*, and the White-streaked Honeyeater in the monotypic *Trichodere*. At least some of these species are able to raise the ear-tufts and make them more prominent, as demonstrated by, for example, the Eungella Honeyeater.

None of the honeyeaters is truly crested, although the subspecies *cassidix* of the Yellow-tufted Honeyeater, sometimes known as the “Helmeted Honeyeater”, has elongated and erect yellow feathers on the forehead forming a distinctive frontal crest, usually more than 4 mm long. All species can probably raise the feathers of the forehead and crown to some extent, giving an impression of a steeper forehead and slightly raised crown, but they do not appear crested. Such behaviour is usually only brief, for instance when alarmed or threatened or in agonistic situations.

Friarbirds (*Philemon*) are among the most sociable members of the Meliphagidae and frequently occur in small groups or larger loose flocks. The **Noisy**

Friarbird is typical in this respect, often foraging in congregations of up to 30 birds, sometimes more in fruiting or flowering trees.

Groups of friarbirds and other honeyeaters also investigate non-food resources such as pools of water, and often drink communally. Groups of Noisy Friarbirds can live up to the species' English name, being highly vocal, and at high volume, when gathering in large numbers.

[*Philemon corniculatus*
corniculatus,
near Charters Towers,
N Queensland, Australia.
Photo: Clifford &
Dawn Frith]



Beyond this plumage ornamentation and the elaborate bare parts, meliphagids are fairly subdued in appearance, but they can nevertheless combine the features of the plumage in attractive fashion. One example is provided by the largely black-and-white *Phylidonyris* species with their yellow wingpanels and tail sides, and another is seen in the beauty of the chestnut, black and grey of the two spinebills. A few species are essentially monochromatic, or largely so, in black, brown, olive or, in the case of *Myzomela* alone, red. All three species of *Gymnomyza* of the Pacific islands are monochromatic, ranging from wholly drab olive to sooty black or olive-black or glossy black. MacGregor's Honeyeater is uniformly black, apart from its striking chestnut wingpanels and bare parts, and the Long-bearded, Short-bearded and Sooty Honeyeaters in *Melidectes* are largely sooty black or blackish-brown. A group of *Myzomela* honeyeaters of New Guinea and its associated islands, the Bismarck Archipelago and the Solomon Islands presents an entirely glossy black or duller sooty-black appearance, in some cases with paler axillaries and underwings. These are the Ebony, Ashy, Sooty and Black Myzomelas.

Members of a few genera, such as *Anthochaera*, *Phylidonyris* and *Ptiloprora*, are heavily streaked, and the Striped Honeyeater, in the monotypic *Plectorhyncha*, is diagnostically and coarsely streaked black and white on the top and sides of the head and neck, and otherwise mostly brownish-grey above, with bold dark streaking on the "saddle", and white with diffuse, fine dark streaking below. Many members of the family, especially some *Xanthotis* and *Melidectes*, are scaly below, whereas others are much more subtly scaled paler, as seen in some of the "*Melionyx* subgroup" of *Melidectes*. All six *Melithreptus*, which are small to medium-small, have a black or brown head and neck, and in all except the Black-headed Honeyeater this is combined with a white nape-collar and bare semi-circular wattles over the eye. Interestingly, the much larger Blue-faced Honeyeater in the monotypic genus *Entomyzon*, which has been shown to be close to *Melithreptus* (see Systematics), combines a dark head and neck with a white nape-collar and a large, bright blue bare facial patch. The Yellow-throated Honeyeater has a large patch of yellow on the chin and throat. One genus that stands apart from all the others in the family is *Myzomela*, most of which have glossy or iridescent red plumage, typically combined with black, brown or

olive, although the Red *Myzomela* is entirely bright red. Although often tiny, the myzomelas are among the most spectacular and beautiful of the Meliphagidae. Some are entirely black, such as the Black *Myzomela*, while others are drab brown or olive, such as the Dusky and Drab *Myzomelas*, but most have varying amounts of red, scarlet or crimson in the plumage. Although variation is extensive, such red is often found as a hood, or down the centre of the upperside of the body, often including the centre of the mantle and back and extending to the rump and uppertail-coverts, or sometimes restricted to the rump and uppertail-coverts, or on the chin and throat. For example, adult male Cardinal *Myzomelas* appear mostly black, with a deep red or scarlet hood and central upperbody, the latter strikingly conspicuous in flight, whereas the adult male Red-collared *Myzomela* is glossy jet-black with a complete and broad, brilliant scarlet collar covering all of the hindneck, the side of the neck, and the throat and upper breast, continuous with the scarlet of the mantle, back, rump and uppertail-coverts.

Whereas the sexes differ significantly in size, there is usually no difference between them in plumage or bare parts. Unlike most other honeyeaters, however, the myzomelas do show marked sexual dimorphism in plumage. Of the 31 species in the genus *Myzomela* as recognized in the present treatment, as many as 25, about 80%, exhibit some sexual dimorphism, although in ten of these the differences are considered slight. In the rest, the sexes differ strikingly in plumage, with the males often brilliantly coloured and the females duller and less strongly marked. The adult males of the Cardinal and Red-collared *Myzomelas*, as described above, are essentially red and black. The adult female of the former, however, is largely dull olive-brown above, with a smaller and duller red hood, and usually with scattered small patches of red on the central upperbody, while the female Red-collared *Myzomela* is very different from the male, being grey-brown above with a reddish wash on the ear-coverts, hindneck, side of the neck and mantle and back, and red on the rump and uppertail-coverts, and pale brown to buff below, with a red crescent-shaped patch on the breast. Marked sexual dimorphism is evident in a few other species. The Black and Pied Honeyeaters, in the respective monotypic genera *Sugomel* and *Certhionyx*, exhibit significant variation between males and females, the adult males of both being strongly pied and the females much duller,

predominantly brown and white. Likewise, the sexes of the Western Spinebill differ markedly from each other, with females much duller than males and lacking the latter's distinctive markings. In a number of other meliphagids, the females are like duller or more washed-out versions of the male or lack some brighter signal markings. For example, female Eastern Spinebills are much like males, from which they are distinguished only by having a duller, dark grey cap that contrasts with the black mask, and the female Rufous-throated Honeyeater differs from the male only in its paler and less uniform throat patch. The adult female Crescent Honeyeater is like a duller, washed-out version of the male, with paler and browner upperparts, duller yellow panels in the wing and tail, a narrow and buff supercilium, rather than a bold and white one, and a duller olive-brown, not black, crescent on the side of the breast; in addition, it lacks the male's prominent white markings on the outer tail feathers. Females of the Painted Honeyeater, the Regent Honeyeater and the New Zealand Bellbird are similar to but duller than the respective males. In a few cases, such as in the nominate race of the Brown Honeyeater, the sexes differ only subtly, and in some, such as the Red Wattlebird, the differences are very slight and distinguishable only in the hand.

Many sexually dimorphic species of *Myzomela* appear to show a distinctly biased sex ratio, with males frequently seen much more often than females and, if such a plumage exists, much more often than female-like immatures. While many anecdotal reports of such a bias exist in the literature, there are also some hard data to support it. In a ringing study of the Scarlet *Myzomela* in south-eastern Queensland, in eastern Australia, the sex ratio of 482 individuals caught in mist-nets was found to be skewed in favour of males by a factor of 1.5:1, neither sex appearing to be more susceptible to trapping. Similarly, an examination of 162 museum specimens revealed the ratio of males to females to be as high as 9.9:1, although the magnitude of that ratio is no doubt at least partly a result of a collecting bias, since males are much more conspicuous than females both in appearance and in behaviour. Comparable biases in the sex ratios in collections are found for most *Myzomela* honeyeaters. For the Orange-breasted *Myzomela*, for example, Mayr reported a ratio of males to females of 4.7:1 in the large series which he had, and similar biases in the other *Myzomela* species are reported.

The moult cycles and strategies of the Meliphagidae are fairly simple. So far as is known, adults of all except a couple of species undergo a single complete post-breeding, or pre-basic, moult

annually, usually after the end of breeding. The primaries are moulted outwards, or ascendantly, typically starting at the innermost primary, and the rectrices are moulted from the central feathers outwards and usually symmetrically. The secondaries are replaced in an inward sequence, typically starting at the outermost, although the tertials are often replaced in irregular sequence. The timing and sequences of moult are reasonably well known for many species occurring in Australia and New Zealand, detailed analyses having been undertaken for the *Handbook of Australian, New Zealand and Antarctic Birds*. For other parts of the family's range, however, these details are very poorly known, with published data typically limited to comments on moult for small numbers of specimens that may have been collected. These few data certainly reveal no obvious patterns in the timing of moult on a regional scale, and much work needs to be done on the timing of moult in relation to breeding and seasonal climate, which itself requires detailed observations in order to ascertain the temporal limits of the breeding season of the species in question. All of this awaits further study.

Only two meliphagid species are known to undergo two moults annually, performing both a complete post-breeding moult and a partial pre-breeding, or pre-alternate, moult. As a point of interest, a partial pre-breeding moult is undertaken also by two of the Australian chats in the family Ephianuridae, which is now considered to be part of the Meliphagidae (see Systematics). In each annual cycle, adult Banded Honeyeaters perform a partial pre-breeding moult, involving the feathers of the body only, and a complete post-breeding moult, these producing alternating breeding and non-breeding plumages, the latter differing from the breeding plumage in the varyingly brown mantle, back and scapulars, which are wholly black in breeding plumage, although some other parts of the plumage also are replaced. With this tropical species, the timing of the post-breeding moult appears to be broadly seasonal, occurring mainly in the late dry season during July–October, but it seems not to be at all synchronized within the population; for example, some individuals start to shed the primaries in June and others not until September. Signs of breeding plumage are evident in December–January, and complete breeding plumage is acquired by February. The only other species thought to perform a partial pre-breeding moult annually, though in this case with no seasonal change in appearance, is the Black-chinned Honeyeater. Its subspecies *laetior*, sometimes treated as a separate species under the name of “Golden-backed Honeyeater”, seems to moult the body plum-



Honeyeaters tend to be active to the point of being boisterous. Aggressive behaviour is very common, particularly when there is a mate or food resource to defend. Such interactions may escalate into full-blown fights, during which opponents grapple using the feet and/or the bill. Feet are used to trap the opponent's legs or to strike at the body. When attacking with the bill, the target is the opponent's bill. These **White-plumed Honeyeaters** may be squabbling over access to a small pool of water. Such disputes are a normal part of life for a species that is generally gregarious, and may even be colonial.

[*Lichenostomus penicillatus penicillatus*, Leopold, Victoria, Australia.
Photo: Peter Fuller]

Bathing is as essential a part of the meliphagid daily routine as it is for all birds. Aside from its role in feather and body care, purposes that require light moistening and complete soaking respectively, bathing may also assist body cooling in hot climates. A good bathing spot should have an adequate and reliable supply of water, be sufficiently secluded so as to not attract the attention of predators, and have a good access point such as a low-lying branch. These **Fuscous Honeyeaters** have found such a location, and the adult (left) is standing in the water, using its wings and tail to flick water over its body. It is accompanied by a juvenile (right), which can be aged by its swollen yellow gape and less distinct yellow neck plume.

[*Lichenostomus fuscus fuscus*,
Brisbane, Queensland,
Australia.

Photo: Raoul Slater]

age in winter–spring, and there is a possibility that some individuals of the nominate race also may do so. Whether such cryptic moults exist for other species beyond Australia is not yet known. In temperate Australia and New Zealand, moult usually occurs in the austral spring and summer. In tropical northern Australia, it appears that, at least in some species, the primaries are replaced during the dry season. One would expect the timing of moult in lowland New Guinea and the tropical Pacific to reflect that in tropical Australia. The timing in montane New Guinea is not properly known. For MacGregor's Honeyeater, unspecified moult was recorded in July–November for eleven of 35 specimens and in February for one, during the breeding season of this high-altitude species.

The moults of a number of species from temperate Australia have been studied in detail. For example, in southern Australia, New Holland Honeyeaters replace their primaries in spring–summer, from early October to late April, the average duration of this moult of the primaries being just over 100 days. In one study, the timing of the primary moult differed slightly between sexes, females starting on average about two weeks later than males, and the timing differed also between two study sites. Individuals would have 1–8 primaries growing simultaneously in both wings. New Holland Honeyeaters begin the moult of the secondaries and tail towards the end of the primary moult, and finish it slightly after the replacement of the primaries is complete. With Noisy Miners, the duration of the moult of the primaries was about 128 days for individuals, and up to 174 days for the entire local population. Two medium-small honeyeaters from arid inland Australia were found to moult over some 100–140 days.

Juvenile plumage develops during the nestling period and, so far as is known, all young meliphagids leave the nest in full or almost full juvenile plumage. The extent of the subsequent post-juvenile, or first pre-basic, moult varies. Most species undergo a partial post-juvenile moult, often into an essentially adult-like first immature, or first basic, plumage, and do not acquire full adult plumage until the first complete moult, when the individual is one year old. For some species, however, the post-juvenile moult can be either partial or complete, usually resulting in adult plumage if complete, the extent of this moult being related to the hatching date of the young. Among New Holland Honeyeaters, individuals that hatched in the spring underwent a partial post-juvenile moult during the summer–autumn period, when 2–6 months old, whereas those that hatched in autumn had a complete post-juvenile moult in the following spring, when they were 4–7 months old; no juveniles started moult between April and mid-September. Partial post-juvenile moults involve the replacement of all or most of the body plumage, but usually all juvenile remiges and rectrices and a varying number of wing-coverts are retained. For example, the post-juvenile moult of the Bell Miner involves the replacing of all or most body feathers, from none to a few rectrices and tertials, all or some marginal and median wing-coverts, none to a few greater secondary coverts, and none to a few inner secondaries; the young usually retain the alula, most outer secondaries, some rectrices and the primaries, although, rarely, even the primaries can be moulted, possibly by individuals that hatch early in the season. These retained juvenile feathers are kept through the first year of life, and can often be distinguished from adult feathering as they are softer and wear more rapidly than the equivalent tracts of adults. This can be particularly noticeable in species that spend a lot of time thrashing through the understorey vegetation while foraging and chasing conspecifics and other birds; the tip of the juvenile tail, in particular, can become a rather ragged mess.

Some relevant details of the juvenile plumage are generally visible only when the individual is captured. Compared with the adult, the longest feather of the juvenile's alula can be broader and is often more rounded at the tip, and the tips of the outer primaries are more rounded, but the rectrices are narrower and more pointed at the tip than those of the adult. In addition, the rectrices, and sometimes other feather tracts, can exhibit growth-bars, narrow bands of contrasting diffraction that run roughly perpendicular to the shaft and which vary with rates of growth and other factors, or fault-bars, narrow translucent bands caused by faulty formation of barbules and occurring only occasionally.



Both growth-bars and fault-bars are usually most obvious on the rectrices, and can be indicative of juvenile plumage.

Interspecific hybrids are apparently rare in Meliphagidae, but they have been widely reported in the genus *Melidectes*, between Belford's Honeyeater and the Yellow-browed Honeyeater. The former occurs generally at higher altitudes than those preferred by the Yellow-browed Honeyeater, but the two species hybridize freely where they come into contact; hybrid "swarms" contain individuals very like Belford's Honeyeater, others close to Yellow-browed, and a complete range of intermediates. At higher altitudes, above about 2400 m, hybrid populations gradually merge with typical individuals of Belford's Honeyeater. Hybrids have a paler bill than that of "pure" Belford's Honeyeaters and display a varying range of other Yellow-browed Honeyeater characters. While some interbreeding probably occurs naturally in undisturbed habitats in a narrow altitudinal band where the two species overlap, it has been suggested that large-scale hybridization is a result of extensive habitat disturbance, caused initially by native agriculture and, in more recent times, possibly by other human activities. Such habitat disturbance brings the two species into contact over broader areas and permits extensive and accelerated hybridization to take place. In north-eastern Australia, limited hybridization between the Varied and Mangrove Honeyeaters apparently occurs in a narrow zone between Cardwell and Townsville, in east Queensland, where the two overlap in range.

Apparent artificially induced hybridization has been reported between two mallee-dwelling miners, where human modifications of the mallee habitat of the endangered Black-eared Miner has resulted in extensive interbreeding with the far commoner Yellow-throated Miner. Another, recent example of hybridization is found on San Cristobal, in the south-eastern Solomon Islands. The Cardinal Myzomela is widespread in the south-western Pacific Ocean, including some of the south-easternmost Solomons, whereas the Sooty Myzomela is confined to San Cristobal. The latter species occupies the whole of the island and nearly all habitats, whereas the Cardinal Myzomela, thought to be a recent invader from small islands of the south-east Solomons, is restricted to the northern coast. The Cardinal Myzomela is predominantly scarlet and the Sooty Myzomela is black, but early specimens of the Sooty Myzomela, from 1908, have patches of red in the plumage, suggesting hybridization with Cardinal Myzomelas. The frequency of such hybrids in collections de-



Meliphagids use a variety of waterbodies for the purpose of bathing. Natural sources such as springs, streams and rock pools are commonly utilized, and honeyeaters are not hesitant about abluting in artificial constructions. Species that tolerate human presence may make use of garden birdbaths, as is the case with this **Little Wattlebird**. Honeyeaters usually employ one of two bathing methods: they may stand in the water and use their wings to flick water over themselves; or they may hover over the water and plunge-bathe—the bird drops into the water, submerging partly or fully, before flying to a perch in order to preen.

[*Anthochaera chrysoptera chrysoptera*, Pomona, Queensland, Australia.
Photo: Raoul Slater]

creases from that time, suggesting that the rate of interbreeding may have been declining over time. The decrease in levels of hybridization may be due to the fact that contemporary populations of Cardinal Myzomelas are sufficiently established that individuals easily find conspecific mates, whereas early colonists experienced greater difficulty in doing so.

While not a characteristic of the honeyeaters themselves, one of the more interesting aspects of the family is the widespread visual and vocal mimicry of members of the friarbird genus *Philemon* by orioles of the genus *Oriolus*. This was first observed by A. R. Wallace on the islands of Seram and Buru. Species of friarbird within the "*P. moluccensis* superspecies", which are among the largest of all meliphagids, are variously mimicked by orioles of the "*O. boursiensis* superspecies" on islands of Wallacea, in the West Papuan Islands, and in New Guinea and northern Australia. The co-existing friarbirds and orioles are as follows: the Seram Friarbird and the Grey-collared Oriole (*Oriolus forsteri*) on Seram; the Dusky Friarbird and the Dusky-brown Oriole (*Oriolus phaeochromas*) on Halmahera; the Black-faced Friarbird of the nominate race and the nominate race of the Black-eared Oriole (*Oriolus boursiensis*) on Buru; the subspecies *plumigenis* of the Black-faced Friarbird and the race *decipiens* of the Black-eared Oriole on Tanimbar; the nominate race of the Helmeted Friarbird and the subspecies *finschi* of the Olive-brown Oriole (*Oriolus melanotis*) on Wetar; the nominate race of the Helmeted Friarbird and the nominate race of the Olive-brown Oriole on Timor; the Helmeted Friarbird subspecies *jobiensis* and *novaeaguinae* and the Brown Oriole in New Guinea; and the Helmeted Friarbird races *gordoni*, *ammitophilus* and *yorki* and the Green (*Oriolus flavocinctus*) and Olive-backed Orioles (*Oriolus sagittatus*) in Australia. In most of these pairs or groups, the species are similar in plumage, postures, movements and flight, and in at least some cases also in vocalizations, and confusion in the field, even by experts, is common. Within the first four of these pairs, the friarbird and the oriole are very similar to each other; the representatives of pairs on Wetar, on Timor and in New Guinea are quite similar in female plumages, but the males are considered, respectively, somewhat similar, dissimilar and quite similar; and the friarbirds and orioles of Australia are not alike. Moreover, in New Guinea, the Streak-headed Honeyeater is quite

similar to the Brown Oriole and the Helmeted Friarbird. For example, the Helmeted Friarbird in New Guinea is mimicked vocally and visually by the Brown Oriole, and to a lesser extent by the Streak-headed Honeyeater, and the three species forage and vocalize together; it is possible that interspecific duetting occurs. Helmeted Friarbirds and Brown Orioles have been reported also as nesting in the same tree. A number of reasons have been put forward for this mimicry. It seems, however, that the oriole mimics largely escape attack by the larger and pugnacious species that are their models, and which would otherwise drive them off from foraging sites. Earlier, Wallace had suggested that the mimicry, and the close association of the two species, may have helped the orioles to avoid predation.

Habitat

The Meliphagidae are predominantly Australasian, or Australo-Papuan, and the greatest number of genera and species are found in Australia and New Guinea, the largest landmasses within the range of the family and the centre of its origin, evolution and diversification. Meliphagidae is the largest family of birds in Australia, with 69 species, approached in diversity only by the cockatoos and parrots (Psittaciformes) and, among the passerines, the thornbills and allies. It is also the largest family, with 73 species, in New Guinea and its associated islands, excluding the Bismarck and Louisiade Archipelagos and the Solomon Islands; only the parrots (Psittacidae) and the pigeons and doves (Columbidae) come close in numbers of species in New Guinea. Australia and New Guinea share only 15 species. In total, 127 of the 175 species of honeyeater, some 73%, are found in Australia and New Guinea, although not all are restricted to these regions, some species occurring also in Wallacea or the south-western Pacific.

From Australia and New Guinea, the family has spread west throughout Wallacea, to the north and north-east through the Bismarck Archipelago to Micronesia, as far as the Northern Mariana Islands, and to the east through the island groups of the south-western Pacific Ocean to Samoa, Tonga and New Zealand. The origin of species on the various outlying islands, however, varies considerably. In Vanuatu, for example, the three species of

meliphagid, the Dark-brown Honeyeater, Vanuatu Honeyeater and Cardinal Myzomela, are thought to have originated in Australia and to have arrived via New Caledonia, rather than having spread east from New Guinea through the Melanesian islands. Only a single species, the Indonesian Honeyeater, has crossed Wallace's Line, and then only just, with a tiny footprint in the Oriental Region on the island of Bali. Similarly, only a single species, the Micronesian Myzomela, occurs in the far north of the family's distribution, in Micronesia. Three species, the Cardinal Myzomela, the Wattled Honeyeater and the Mao, extend to the easternmost limit of the family in Samoa, although the Wattled Honeyeater is the only meliphagid found in Tonga.

Myzomela is by far the largest and most geographically widespread genus in the family. With 31 species, it extends from Sulawesi in the west, eastwards throughout New Guinea, northern and eastern Australia, and the Micronesian and Melanesian islands to as far as Fiji and Samoa. The genus includes a number of "supertramp" species, the Scarlet-bibbed Myzomela being a good example: a species of high dispersal ability, reproductive potential and ecological amplitude but low competitive ability, confined to small species-poor islands where population turnover is high and competitors few, and to recently defaunated volcanoes which it can recolonize ahead of competitors. Two other geographically widespread genera are *Lichmera* and *Philemon*, with 11 and 15 species respectively. Both are found in Australia and New Guinea and have radiated in Wallacea, *Lichmera* extending to Bali, the westernmost extent of the family, and both have representatives in the south-western Pacific. The closely related *Meliphaga*, with 15 species, and *Lichenostomus*, with 20, are two of the most speciose genera and occur in Australia and New Guinea, with a single representative of *Meliphaga*, the Streak-breasted Honeyeater, confined to Wallacea. *Meliphaga* is, however, predominantly Papuan, with nine species restricted to New Guinea, four to Australia and one species shared between the two, whereas *Lichenostomus* is found predominantly in Australia, to which 17 of its members are restricted, two others being confined to New Guinea and one present in both regions. Other, smaller genera with representatives in both Australia and New Guinea are *Ramsayornis*, *Conopophila*, *Glychichaera*, *Melithrepus*, *Entomyzon* and *Xanthotis*.

The radiation of the honeyeaters has resulted also in a number of small or monotypic and endemic genera. Thus, Sulawesi has the genus *Myza*, with two species, and monotypic *Melitograis* is

confined to the northern Moluccas. New Zealand has two endemic species of honeyeater, in the monotypic genera *Prosthemadera* and *Anthornis*, and elsewhere in the south-western Pacific six genera are confined to various islands or island groups. These six are *Guadalcanaria*, *Meliarchus*, *Stresemannia*, *Glycifolia*, *Foulehaio* and *Gymnomyza*.

Finally, New Guinea holds eight endemic genera, three of them monotypic, and Australia has 13 endemic genera, of which nine are monotypic. One of the eight New Guinean genera, *Melidectes*, contains ten species, one of which reaches the Bismarck Archipelago.

As could be expected with such a large and widespread family, representatives are found in all, or nearly all, habitats within its distributional range, and it would in many ways be easier to list those habitats where honeyeaters do not occur. The habitats used by the Meliphagidae, however, vary greatly over the range of the family, and they largely reflect availability of niches. The ecological niches found in Australia are very different from those found in New Guinea or in the huge numbers of islands of Wallacea or the south-western Pacific. Meliphagids occupy virtually all wooded habitats in Australia and New Guinea. In Australia, data from the *Atlas of Australian Birds*, from 1998 to 2003, indicate that at least one species of honeyeater has been recorded from each 1-degree block in Australia. The greatest diversity is in eastern and south-eastern Australia, from Cape York, in north Queensland, south to Victoria and west to south-eastern South Australia, with high diversity also in the Kimberley and Top End of northern Australia and in south-western Australia. In east and south-east Australia, most 1-degree blocks have more than 19 honeyeater species and more than 30 species have been recorded in many of them. While the relatively small number of species, fewer than ten per block, in much of central Australia in part reflects the scarcity of observers there, it also reflects the known distribution of these honeyeater species. Within the broad habitat types recognized in Australia, the honeyeaters are present in all except five. These five are: pure grasslands, such as the Mitchell grass (*Astrelba*) habitat of the Barkly Tableland and the arid-land *Triodia* spinifex hummock grasslands; semi-succulent chenopod shrublands; alpine herbland and meadowland; buttongrass (*Gymnoschoenus*) sedgeland, found in west Tasmania; bare stony gibber plains; and unvegetated marine and aquatic habitats, such as beaches and intertidal zones. Even so, honeyeaters can be found at the ecotone between these and other habitats, such as where acacia (*Acacia*) or eucalypt wood-



As well as bathing in terrestrial water sources, meliphagids readily take showers. This **Brown Honeyeater** is rain-bathing, deliberately exposing its feathers to falling raindrops while perched. Given that the coverage afforded by intermittent rain is less than that of a static water body, the honeyeater may have to contort its body into unusual positions in order to moisten all areas. Many species have also been recorded foliage-bathing, particularly after rain. Here the bird flies into wet foliage and uses its body to shake the vegetation so that water droplets fall onto its feathers.

[*Lichmera indistincta*
ocularis,
Seaforth, Queensland,
Australia.
Photo: Don Hadden]

lands about chenopod shrublands or spinifex grassland, and they occur also where scattered trees or shrubs are distributed through such habitats. Further, the Australian chats, here separated in the family Ephianuridae but now considered meliphagids (see Systematics), do occupy the grassland and chenopod-shrubland niche: for example, the Gibberbird inhabits undulating gibber plains sparsely vegetated with tussock grasses or low chenopod shrubs, the White-fronted and Orange Chats are often found in low chenopod shrublands, and several species of chat are occasionally found in grasslands with patches of chenopods.

Australia presents little altitudinal relief. The highest points on the mainland are along the Great Divide, which stretches from the far north-east southwards along the eastern seaboard to Victoria, where it swings west into mid-central Victoria. The Southern Highlands of the south-east are the highest points on the Australian mainland, and the only extensive alpine habitats, with widespread snow cover in the winter months, this usually melting in spring but with small snowdrifts persisting until late summer or through the year in small high and protected sites. Mount Kosciuszko, at 2228 m, is the highest point anywhere in Australia or Tasmania; elsewhere in the Southern Highlands are extensive ranges and peaks of over 2000 m, but even much of these highlands are between 1500 m and 2000 m. North of the Southern Highlands, high tablelands, above 1000 m, are found along the Great Divide, such as at Barrington Tops and the New England Tableland in the central-east, and the Atherton Tableland in the north-east, where Mount Bartle Frere is Queensland's highest peak, at 1622 m. The Central Plateau of Tasmania is also high and cold, with extensive alpine and subalpine habitats; the highest peak is Mount Ossa, rising to 1617 m.

As in Australia, honeyeaters are found throughout New Guinea and in nearly all habitats, although, unfortunately, there is no quantitative analysis of the number of species per unit area. An atlasing project for New Guinea would be a valuable, if ambitious, project for the future. The habitat exceptions listed above for Australia are relevant also to New Guinea, although, at high altitude in New Guinea, honeyeaters make some use of alpine grasslands. Unlike Australia, however, New Guinea is dominated by the high cordillera of the Central Range, which extends in an unbroken and complex series of ranges from the isthmus of the Vogelkop, in the north-west, to Milne Bay, at the tip of the south-eastern peninsula. The Snow Mountains in the west and

the mountains of the south-east also have peaks of more than 4000 m, and high, flat valleys are dispersed through the central cordillera. The highest peak is Puncak Jaya, known earlier as Mount Carstensz or Carstensz Pyramid or Massif, in the west of the island, which, at 5030 m, is well over twice as high as Australia's tallest peak; Mount Wilhelm, in the Eastern Highlands, rising to 4509 m, is the highest in eastern New Guinea, and also twice as high as Australia's Mount Kosciuszko. In addition, there are a number of outlying ranges, notable among these being the Tamrau and Arfak Mountains of the Vogelkop and the Kumawa and Fakfak Mountains of the Bomberai Peninsula, and, to the north of the Central Range, the Wandammen, Van Rees, Foja and Cyclops Mountains, the North Coastal Range, which includes the Bewani, Torricelli and Prince Alexander Mountains, and, in the north-east, the Adelbert Ranges and the mountains of the Huon Peninsula. The Central Range is surrounded by extensive lowland regions, such as the broad humid floodplains of the Rouffaer-Ikenburg-Mamberamo Rivers in the north-west and the Sepik River in the north-east, and the Eilanden-Digul Rivers and Fly River in the south. There are four large lowland areas of low rainfall: the Trans-Fly region, the area around Port Moresby, the northern coast of the south-eastern peninsula, and the upper Markham-Ramu Valley.

Many of the islands of Wallacea and the south-western Pacific Ocean are mountainous, with only small areas of coastal lowlands. For example, Sulawesi, the largest island in Wallacea, rises rapidly from the coast through a narrow belt of hills to the high dissected central ranges, with most of the land area above 500 m and about 20% above 2000 m; the highest peak, at 3440 m, is in south-central Sulawesi. Seram, in the Moluccas, likewise has a largely narrow area of coastal lowlands that rises to a central peak. Similarly, in the Pacific, the Fijian island of Viti Levu is dominated by a central mountain chain, the peaks of which are above 1300 m, with broken highlands and steep escarpments surrounded by coastal lowlands. Conversely, many islands are lower and lack high mountain ranges. In Wallacea, for example, the Tanimbar Islands, in the eastern Lesser Sundas, are a group of some 60 low islands, of which Yamdena is the largest and consists of a low hilly plain reaching maximum elevations of 100–200 m. While it is not possible to characterize in a simple way all the islands of Wallacea and the south-western Pacific, the vegetation of these regions exhibits many similarities to that of Australia and New Guinea, particularly large swathes of lowland and montane rainforest and secondary forest, mangroves and, less widely, lowland monsoon forests, including semi-evergreen and mixed deciduous monsoon forest, as well as eucalypt savanna woodlands and *Melaleuca leucadendra* woodlands. The distribution of these vegetation types varies greatly from one island to another, reflecting differences in rainfall, geology and soils.

Rainforest is the dominant vegetation over much of the range of the Meliphagidae, the exception being the large areas of Australia dominated by open sclerophyllous habitats. Much of New Guinea is covered with rainforest, as are many of the islands of Wallacea and of the south-western Pacific Ocean. The rainforests of New Guinea are extensive and continuous, varying in structure, floristics and species diversity with altitude, from the closed humid forests of the lowlands to the stunted forests that grow to the tree-line of the highest ranges. Most ornithological studies have divided the rainforests of New Guinea into several broad classes which merge into one another and the altitudinal limits of which vary from site to site. Lowland rainforests are tall, structurally complex and highly floristically diverse, with a canopy to 40 m and more, and they merge into the hill forests, which are often as diverse as the lowland forests. From 750 m to 1500 m, the hill forests give way to the montane forests, which at their lower altitudes, the lower montane forest, have high densities of epiphytes and are typically heavily moss-laden but are less diverse than the lower forests; above about 2700 m, the upper montane forests are less tall, far less floristically diverse and heavily moss-covered and extend to the tree-line at 3700–4200 m.

Forest edge and secondary growth are complex but varying forest habitats. They are formed as a result of natural events such as treefalls and cyclones, or as a result of human activities, in-

Avian bathing activity tends to vary in relation to certain environmental factors. Sunshine is known to stimulate bathing, whereas overcast skies and falling temperatures appear to suppress it. The most likely reason for this relationship is that birds need to dry out after bathing. Warmth and sun help them do so more efficiently which, in turn, reduces bathing's incursion into foraging time or parental responsibilities. This **Red Wattlebird** is sunbathing to dry itself. Stretching its neck and drooping its wing increases the surface area of feathers exposed to the air, thereby expediting the drying process.

[*Anthochaera carunculata* woodwardi, Two People's Bay, Western Australia, Australia. Photo: Don Hadden]



It is essential for birds to keep their flight-feathers in excellent condition. This **Yellow-throated Miner** is deftly passing individual primary feathers through its bill with a nibbling action. In doing so, the bird may be restoring the structure of barbs and barbules, removing dust and other foreign particles, or massaging new uropygial preening oil into the feather structure.

[*Manorina flavigula obscura*,

Shoreline Caravan Park,
Port Augusta,
South Australia, Australia.
Photos: Andy & Gill Swash]



cluding road-building, logging, and clearing for agricultural production, such as plantations, crops and gardens, or they grow naturally, such as along waterways. Such habitats are typically successional, depending on the effects of any ongoing disturbance. The secondary growth ranges from dense shrubby or woodland regrowth to tall forest.

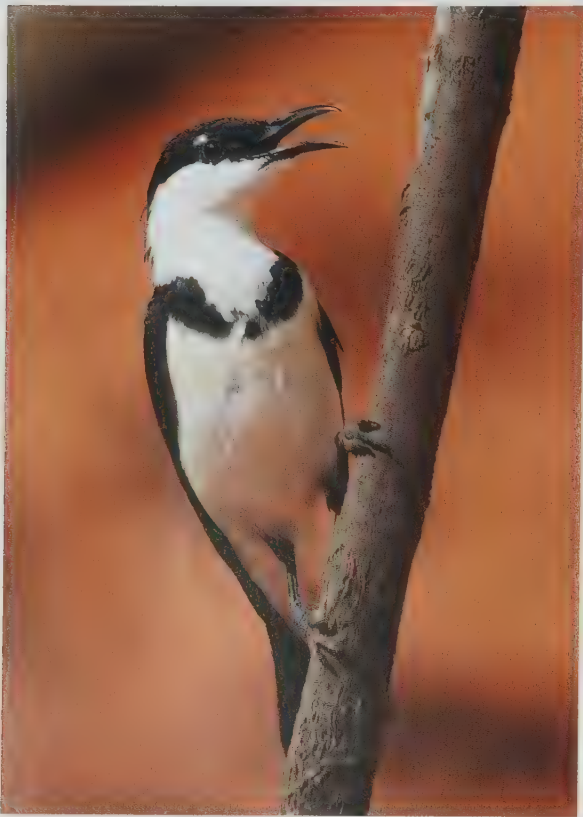
Given the extent of rainforest in New Guinea, it is little surprise to find that many species are primarily rainforest-dwellers. The two species of *Timeliopsis*, endemic in New Guinea, are both forest inhabitants: the Olive Straightbill is found mainly in mid-montane forest and forest edge between about 1100 m and 2450 m, whereas the Tawny Straightbill lives mainly in lowland and foothill primary rainforest, but also in forest edge and tall secondary growth, from sea-level to 800 m. The Long-billed Honeyeater is another forest species, found mainly in forest and secondary growth in lowlands, foothills and lower mountains to 1500 m, and the genera *Ptiloprora*, with six species, and *Melipotes*, with four, are also primarily denizens of montane forest. *Melidectes* consists of ten species, many of which are forest-dwellers but several of which occur in forest-edge habitats. Three of them, the Sooty, Long-bearded and Short-bearded Honeyeaters, are all high-altitude species, living above 3000 m in high montane and subalpine forest, woodland and shrubland; the closely related Bismarck Honeyeater of New Britain, the only *Melidectes* not confined to the main islands of New Guinea, is similarly restricted to primary montane forest, though at lower altitudes than those at which the preceding three species are found. The remaining members of the genus occur throughout New Guinea in forest and forest edge, although the Yellow-browed Honeyeater appears to show some preference for forest edge, secondary growth and other disturbed habitats. MacGregor's Honeyeater is a high-altitude and specialized meliphagid found mainly at 3200–3500 m, but sometimes down to 2700 m and as high as 4000 m. It is largely confined to subalpine woodland and forest, including patches within alpine grassland, dominated by two gymnosperm trees, the podocarp *Dacrycarpus compactus*, which is an important foodplant, and the conifer *Libocedrus papuanus*; its overall range is apparently limited by the distribution of *Dacrycarpus*. The Orange-cheeked Honeyeater is another high-altitude species, inhabiting subalpine forest and shrubland bordering alpine grassland.

There are also many species that are primarily forest-dwellers although such preferences are not universal within the genus, as

illustrated by various species of *Myzomela*. The Red-throated *Myzomela* is found in lowland and hill forest, mainly to about 500 m; the Red *Myzomela* lives principally in montane rainforest at 600–1500 m; and the Red-collared *Myzomela* occurs primarily in montane forest and forest edge and subalpine shrubland, mainly from 1500 m to 4000 m. Many of the *Meliphaga* species, too, are forest species, found in lowland, hill and lower montane forests.

Many of the larger islands of Wallacea, such as Sulawesi and Halmahera, and of the south-western Pacific, such as Vanuatu, Fiji and Samoa, are similar to New Guinea in their rainforest communities, with humid forest varying continuously from diverse lowland forests through hill forests to montane forests, although, in Wallacea, only Sulawesi and Lombok have elevations high enough to support alpine grasslands similar to those of the highest peaks of New Guinea. In Wallacea, several species of honeyeater are characteristic of montane rainforest; these include, on Sulawesi, the two species of *Myza*, namely the Lesser Streaked and Greater Streaked Honeyeaters, and, in the Moluccas, the Seram and Buru Honeyeaters and the Dusky Friarbird. Others are lowland or hill-forest species, such as the White-streaked Friarbird, which inhabits lowland and lower montane forest, although this species is characteristic also of forest edge or secondary growth. Many other Wallacean meliphagids inhabit rainforest, as well as exploiting a varying range of other habitats. For example, the Black-faced Friarbird occupies all wooded habitats, including primary forest, and the Streak-breasted Honeyeater inhabits primary and secondary rainforest and monsoon forest, degraded forest, scrub, semi-cultivated areas, gardens and, occasionally, mangroves.

Likewise, many species of the islands of the south-western Pacific are characteristic of rainforest. The three *Gymnomyza* honeyeaters all appear to require large, continuous areas of mature forest. Thus, the Giant Honeyeater lives mainly in mature primary hill, montane and stunted mossy rainforest, and less often at forest edge or in degraded forest; the globally threatened Mao is found mainly in foothill and montane forests, with its greatest densities at high altitude in the least disturbed forest; and the globally threatened Crow Honeyeater is largely restricted to dense, humid, primary rainforest, although it is recorded also in dry forest. Three monotypic Pacific genera are also primarily rainforest species: the Guadalcanal Honeyeater of the Solomon Islands is confined to montane forest, particularly high moss for-



est, the San Cristobal Honeyeater is found mainly in primary forest and less often in tall secondary forest and forest edge, and the Bougainville Honeyeater is restricted to montane forest.

In Australia, rainforest is confined to the north and east of the country. In eastern Australia, rainforest is discontinuously distributed on and east of the Great Divide, which extends from north-easternmost Queensland south to Victoria, essentially running parallel with the eastern coast. Monsoon rainforest is also present in isolated patches scattered across the northern tropics. Extensive stands of tropical rainforest are confined to the eastern Cape York Peninsula and the wet tropics of north-eastern Australia, and it is here that a number of honeyeaters shared with the rainforests of New Guinea occur: both the Graceful Honeyeater and the Tawny-breasted Honeyeater are mainly confined to lowland tropical rainforest in Australia and New Guinea, although they occupy other habitats, too, in both countries. Several members of the family, however, are endemic in north-eastern Australia, predominantly in or adjacent to rainforest, examples being the Bridled, Yellow-spotted and Macleay's Honeyeaters. Field studies revealed that the meliphagid community of upland rainforest and regrowth rainforest 20–30 years old in the wet tropics of north-eastern Australia consisted of seven species, namely Lewin's, Graceful, Macleay's, Yellow-faced and Bridled Honeyeaters, the Dusky Myzomela and the Eastern Spinebill, although several of these were recorded only rarely. Surprisingly, the community of one lowland rainforest site consisted of only four honeyeaters: these were the Dusky Myzomela and Macleay's, Graceful and Yellow-spotted Honeyeaters. Extending south from north-eastern Australia, there are other areas of tropical rainforest, for example in the Clarke Range, inland from Mackay. The Eungella Honeyeater is restricted to the higher-altitude rainforests of the Clarke Range. In south-eastern Queensland and north-eastern New South Wales lie the remnants of once extensive subtropical rainforest. While no honeyeaters are confined to this area, species such as Lewin's Honeyeater are abundant in these habitats. Farther south again, cool temperate rainforest dominated by southern beech (*Nothofagus*) is scattered along the Great Divide to Victoria and in Tasmania, in extensive stands in some places. These temperate rainforests are not major habitats for honeyeaters but, again, such meliphagids as Lewin's Honeyeater can be commonly found in them.

Scattered across northern Australia, from the Kimberley in the north-west to Cape York Peninsula in the east, are patches of tropical monsoon rainforest. These patches are typically small, and found in coastal areas, in sites protected from fire by their topography, and with fairly high levels of moisture throughout the year. They are also typically surrounded by large expanses of open savanna-like *Eucalyptus* woodlands and forests. Few honeyeaters are confined to these habitats, but they are used by a diversity of honeyeaters, especially when fruits or flowers are available. Species more often encountered in such habitats include the White-lined, Kimberley, White-gaped, Bar-breasted, Brown-backed and Rufous-banded Honeyeaters and the Dusky and Red-headed Myzomelas. In a detailed study of the monsoon rainforests of Kakadu National Park, in the Northern Territory, 13 species of honeyeater were recorded in patches of such forest, four of them only rarely so. None of these was restricted to monsoon rainforest or even considered a specialist of these habitats, although six were more abundant in monsoon rainforest than in other habitats. The use of different classes of these monsoon rainforests also varied. For example, the Rufous-banded Honeyeater was more abundant in subcoastal patches, whereas Dusky Myzomelas were more numerous in sandstone spring rainforest patches and White-lined Honeyeaters most common in sandstone spring and escarpment rainforest patches. Conversely, the Brown Honeyeater was widely distributed and used all types of patch equally. Further, the White-lined Honeyeater was significantly more abundant in patches larger than 2 ha in size than in small ones.

Whereas rainforest is a restricted habitat in Australia, in relation to overall land area, but is dominant in New Guinea, the reverse is true of sclerophyll forests and woodlands. These are the dominant vegetation of much of Australia, but in New Guinea, while still covering some extensive areas, they are confined to several discrete low-rainfall, lowland areas. Savanna woodland is estimated to comprise some 7% of New Guinea's vegetation. The islands of Wallacea and the south-western Pacific Ocean lack large areas of woodland or savanna, although such habitats do exist on some of the larger islands and are utilized by honeyeaters. The open forests and woodlands of Australia and New Guinea are dominated by one group of trees, the eucalypts. They have conventionally been placed within a single genus, *Eucalyptus*, but more recently have been split into nine separate subgenera or genera, which may have ecological significance to birds; while this "split" has yet to be widely accepted in its entirety, recognition of the genus *Corymbia* for the bloodwood eucalypts seems to have gained general acceptance. These eucalypt-dominated, sclerophyllous forests and woodlands are found through much of Australia except in the drier semi-arid and arid zones, and even there riparian eucalypt forests or woodlands traverse the otherwise non-eucalypt vegetation associations that surround them. Most species of *Lichenostomus* and *Meliphreptus* inhabit eucalypt forests and woodlands, as does a range of other species in diverse genera.

The eucalypt savanna woodlands of northern Australia are the tropical representatives of the open forests and woodlands of temperate, semi-arid and arid zones of that country. The Rufous-banded Honeyeater of northern Australia and New Guinea is commonly found in open, grassy, tropical eucalypt woodlands, such as those dominated by silver box (*Eucalyptus pruinosa*) with an open ground layer of spear-grass (*Stipa*), or woodland dominated by Darwin woollybutt (*Eucalyptus miniata*) and Darwin stringybark (*Eucalyptus tetradonta*) with a grassy ground cover of *Themeda* and *Sorghum* or spinifex (*Triodia*). The Banded Honeyeater, confined to the northern Australian tropics from the Kimberley eastwards to northern Queensland, is found mainly in open eucalypt forests and woodlands, usually with a tall grassy understorey of species such as *Sorghum*, *Heteropogon*, *Alloteropsis* and *Themeda* or a ground cover of spinifex. The tropical lowland eucalypt savanna of the Trans-Fly region of New Guinea is the other significant habitat shared with northern Australia, and this is again reflected in the fact that this habitat holds a few species that are present in both countries. Other large areas of lower rainfall and savanna woodland and forest are found around Port Moresby, on the northern coast of the south-eastern

With the large number of genera in Meliphagidae, it is hardly surprising that there is considerable variation in vocalizations. Even a single species may have a wide-ranging repertoire. The Banded Honeyeater gives a buzzing call almost constantly. On occasion, it may switch to a high-pitched double whistle or to a single loud whistle, which is sometimes given as a series. Its song is relatively melodious within the context of the family. It is short, clear and tinkling, and may be given while the songster is perched or in song flight. Pairs also engage in antiphonal duets.

[*Cissomela pectoralis*, Gibb River Road, Kimberley, Western Australia, Australia.
Photo: Don Hadden]

peninsula and in the upper Markham–Ramu Valley. The White-throated, Brown, Brown-backed and Rufous-banded Honeyeaters are a few of the species shared between northern Australia and New Guinea that utilize these habitats.

Riparian sclerophyll forests and woodlands provide a further distinctive habitat, one preferred by a number of species. For example, in north-eastern Australia, the Yellow Honeyeater is found primarily in open riparian *Eucalyptus* forests and woodlands surrounding a variety of wetlands, although it occurs also in riparian associations dominated by paperbarks (*Melaleuca*) and *Lophostemon*, including those with a dense understorey of palms. Also in the northern Australian tropics, the Rufous-banded Honeyeater inhabits mostly open, riparian paperbark forests surrounding wetlands, as well as mangroves, and the Brown-backed Honeyeater is found mainly in riparian paperbark thickets or woodlands around ephemeral wetlands, as well as in adjacent forest or open woodland dominated by eucalypts or paperbarks, typically along watercourses. Such habitats are, of course, used also by other honeyeaters at times, even if not as their main habitats.

The bird assemblages of the riparian vegetation of the Northern Territory have been the subject of detailed study, providing an indication of the relationships between honeyeaters and riparian and non-riparian vegetation. The relatively permanent waters of the large rivers that dissect the northern tropics support narrow bands of vegetation surrounded by very different open savanna forests and woodlands. This riparian vegetation is floristically diverse and characterized by *Melaleuca*, *Lophostemon*, *Eucalyptus*, the bamboo *Bambusa arnhemica* and the palm-like *Pandanus*. During investigation of the avifauna of the riparian vegetation and the surrounding savanna, a number of honeyeater species, including the Dusky Myzomela and the Bar-breasted, Rufous-banded, White-throated, Yellow-tinted and White-gaped Honeyeaters, were recorded in riparian vegetation significantly more often than they were in non-riparian vegetation; conversely, several, including the Banded Honeyeater, Yellow-throated Miner and the Silver-crowned Friarbird, were in non-riparian vegetation significantly more often. A number of species exhibited no significant preference for either, as demonstrated by the Brown, Rufous-throated, Black-chinned and Blue-faced Honeyeaters and the Little Friarbird. The riparian zones, however, also varied, and different species used different classes of riparian vegetation. For example, White-throated Honeyeaters, Dusky Myzomelas and

White-gaped Honeyeaters were in riparian vegetation in relatively high-rainfall areas, with abundant *Melaleuca* and bamboo, close to the river source and with flood heights well above the sampled area, whereas Rufous-banded Honeyeaters were found in riparian zones with a low canopy, around wide rivers and lagoons, that rarely flooded high into the vegetation and were the most northerly and highest-rainfall sites. Throughout arid and semi-arid Australia, sparse riparian woodlands or forests, typically dominated by *Eucalyptus*, such as the widespread river red gum (*Eucalyptus camaldulensis*), black box (*Eucalyptus largiflorens*) or coolabah (*Eucalyptus microtheca*), are surrounded by much drier and sparser vegetation, including grasslands, acacia shrublands or savanna woodlands. Some widespread meliphagids extend into such riparian habitats in the drier parts of their range. The wide-ranging White-plumed Honeyeater, for example, is seen predominantly in open, riparian river red gum forests and woodlands, but occurs also in a wider range of open forests and woodlands. In inland northern Australia, the Grey-fronted Honeyeater is found in low riparian growth, often beneath taller riverine vegetation. South of the tropics, the subhumid savanna woodlands and forests give way to open, dry eucalypt forests and woodlands and, in eastern and south-western Australia, tall wet sclerophyll forests, also dominated by eucalypts.

The tallest open forests in Australia, the wet sclerophyll forests of eastern and south-eastern parts, including Tasmania, and a small area of south-western Australia, develop on moist rich soils, and are dominated by tall eucalypts such as mountain ash (*Eucalyptus regnans*) and alpine ash (*Eucalyptus delegatensis*) in eastern Australia, and karri (*Eucalyptus diversicolor*) in the south-west. They are generally within 200 km of the coast. The understorey varies with rainfall, and with fire history, from rainforest or rainforest elements, including tree-ferns, in moist sites to small trees such as acacias and sapling overstorey trees, mainly eucalypts, and low sclerophyllous shrubs in drier sites. Many members of the Meliphagidae use wet sclerophyll forests, mainly the canopy level and especially when eucalypts are in flower, although there appear to be no species restricted to such habitats. The Strong-billed Honeyeater of Tasmania is found predominantly in mature wet sclerophyll forests dominated by mountain ash or alpine ash, including old regrowth forest, but it is common also in dry sclerophyll forests and sometimes in cool temperate rainforest. Other species of *Melithreptus*, such as the White-naped

Studies have been carried out on the vocal repertoires of several species of meliphagid from Australia and New Zealand, including the **Noisy Miner**.

This species is indeed noisy and has twelve different vocalizations, in addition to a song. Its calls can be quite different in tone and nature, varying from strident and whistling to scolding and chuckling. While many birds have an alarm call that signals the approach of a predator, the Noisy Miner uses different vocalizations to communicate whether the threat is aerial or terrestrial.

[*Manorina melanocephala melanocephala*, near Melbourne, Victoria, Australia.

Photo: Cheryl Ridge]





Honeyeater, are often found in wet sclerophyll, as are a number of species in other genera, including the Yellow-throated Honeyeater of Tasmania and the Bell Miner and Yellow-faced Honeyeater of eastern Australia. The Scarlet Myzomela is another species that also regularly uses wet sclerophyll forest, especially when it is in flower.

Dry, open eucalypt-dominated forests and woodlands are widely distributed in temperate, semi-arid and arid zones of Australia and are the habitat of a wide range of honeyeater species, including the Near-threatened Painted Honeyeater and the Endangered Regent Honeyeater. Many species of the dominant meliphagid genera are found in such habitats, including, as examples, the White-eared and Fuscous Honeyeaters, in *Lichenostomus*, the Brown-headed, White-naped and White-throated Honeyeaters, in *Melithreptus*, the Little, Western and Red Wattlebirds, in *Anthochaera*, the Yellow-throated and Noisy Miners, in *Manorina*, and the Noisy and Little Friarbirds, in *Philemon*. These wooded habitats, however, vary greatly, from tall, dry forests with a grassy or varyingly dense understorey of tall shrubs or small trees and saplings, to the widespread open grassy woodlands of the temperate inland plains, and to coastal woodlands with a dense understorey of shrubs, including heath, and alpine woodlands with a grassy or shrubby understorey. For example, on the New England Tableland of northern New South Wales, in open eucalypt forest with an understorey primarily of *Banksia* species and a ground layer of grasses and ferns, seven meliphagid species were recorded commonly: the Eastern Spinebill, the New Holland and White-cheeked Honeyeaters, the Red Wattlebird, and Lewin's, Yellow-faced and White-naped Honeyeaters. Species recorded less commonly were the Scarlet Myzomela, the White-eared and Brown-headed Honeyeaters, the Noisy Friarbird and the Regent Honeyeater. Thus, twelve species were recorded in the study area, although the composition of the honeyeater community varied over the year. A similar community, of ten species, was recorded in open forest near Sydney, in south-eastern Australia, where the Eastern Spinebill, Little and Red Wattlebirds, New Holland, White-cheeked, White-eared, Tawny-crowned, Yellow-faced and Lewin's Honeyeaters and Noisy Friarbird exploited the same habitat. In a study of tall open forest in south-western Australia, the honeyeater community consisted of Red Wattlebirds, White-naped, Brown and New Holland Honeyeaters

and Western Spinebills. Also in south-western Australia, but in semi-arid eucalypt woodland about 8 m tall with an understorey consisting largely of *Eremophila*, *Melaleuca*, *Dodonea*, *Acacia* and *Santalum*, the bird species most often seen consisted of nine species of honeyeater, although not all were in the area at the same time, with 5–8 species recorded per month, and only four were recorded in all months. Here, Yellow-throated Miners, Red Wattlebirds and White-eared and Brown-headed Honeyeaters were observed throughout the year; the other species recorded were the Singing, Yellow-plumed, Spiny-cheeked, White-fronted and Brown Honeyeaters. As can be seen, the honeyeater assemblage here is similar in generic and species composition to the communities of eastern Australia.

Parts of semi-arid or arid southern Australia are vegetated with a unique structural form of low eucalypt woodland, shrubland or, in places, heathland, the habitat being known as mallee. Mallee eucalypts are characterized by the fact that they possess multiple and often narrow stems that grow from a subterranean rhizome, and are typically less than 10 m tall, and mallee is the vegetation association consisting of such eucalypts. Unfortunately, much mallee habitat in Australia has been destroyed, degraded or fragmented, particularly for agricultural development, and many mallee specialists are threatened. What is perhaps Australia's most critically endangered species, the Black-eared Miner (see Status and Conservation), is a mallee specialist restricted to long-unburnt and mature mallee woodland in temperate semi-arid south-eastern Australia. A number of other honeyeaters are confined, or virtually confined, to mallee, examples being the Purple-gaped Honeyeater, found mainly in mallee heathland, shrubland and woodland, and the Yellow-plumed Honeyeater, living primarily in tall mallee woodlands with a sparse understorey of shrubs and ground cover of chenopods. Many other species use mallee as part of a wider range of habitats. Examples include the Grey-fronted Honeyeater, which occurs chiefly in mallee in the south of its range, though occupying a wider range of habitats elsewhere, and the White-eared Honeyeater, which is a common inhabitant of mallee but is found also in many other eucalypt forests and woodlands. The White-fronted Honeyeater is found mainly in mallee woodland, shrubland or heathland, but it is present also in one of the other major sclerophyllous habitats of inland Australia, *Acacia* shrubland.

A range of other dry sclerophyllous forests and woodlands is exploited by honeyeaters. Perhaps the most important among these are the *Acacia* woodlands and shrublands that replace eucalypt communities in much of the drier parts of Australia. It is estimated that approximately 60% of the Australian continent receives less than 500 mm of rain annually, and these regions are vegetated predominantly with shrubland or low woodland, or grassland. A large proportion of these semi-arid and arid habitats are dominated by acacias, often mulga (*Acacia aneura*) and closely related species, and are frequently used by honeyeaters of inland Australia. These mulga lands extend throughout western Queensland and New South Wales, South Australia, the Northern Territory and Western Australia, and they occupy some 20% of the land area of Australia. Such communities can hold a diversity of honeyeaters; one area of flowering mulga in south-west Queensland, for example, had Spiny-cheeked, Singing, White-fronted, Black and Pied Honeyeaters and Yellow-throated Miners. Other more restricted habitats of Australia include forests or woodlands dominated by casuarina (*Casuarinaceae*) or cypress pine (*Callitris*), or by combinations of the two, which are utilized by a variety of species, such as the Yellow-plumed Honeyeater, even though no meliphagid species appear to be confined to, or even to prefer, such habitats. For example, the bird assemblage of remnant buloke (*Allocasuarina luehmannii*) woodland in south-eastern Australia included Singing, White-eared, Spiny-cheeked and White-fronted Honeyeaters. On islands, coastal strand forest or littoral woodland or forest can also be dominated by casuarinas; in the Moluccas, the Olive Honeyeater frequents coastal casuarinas, as well as coconut palms (*Cocos nucifera*) and scrub.

In New Caledonia, niaouli (*Melaleuca leucadendra*) savanna woodland is a fire-maintained habitat, found mainly on plains where indigenous forest has been burnt. It is used by Barred

Belford's Honeyeater is a characteristic contributor to the sounds commonly heard in the montane forests of New Guinea. This species often leads the dawn chorus, starting to vocalize well before daylight arrives, and it continues its renditions throughout the day. Even rain showers do not seem to deter it from communicating its presence. The species' varied vocalizations tend to be loud but rather unmusical. Calls range from rasping or cackling to staccato and gurgling. Belford's Honeyeater also gives a whistling alarm call, which alerts conspecifics to potential danger.

[*Melidectes belfordi*
kinneari,
Lake Habbema,
New Guinea.
Photo: Morten Strange]

Friarbirds (*Philemon*) have a loud and harsh repertoire that suits their pugnacious nature. Not surprisingly for a species with ten races distributed from the Lesser Sundas through New Guinea to Australia, the characteristics and timing of **Helmeted Friarbird** vocalizations differ geographically. In New Guinea, the species calls all day and even at night. In Australia, however, it tends to call in the early morning or after rain. Some subspecies give antiphonal duets and others duet in unison, while yet others do not duet. The species is also mimicked vocally, as well as visually, by two species of oriole (*Oriolus*).

[*Philemon buceroides ammitophilus*, Kakadu National Park, Northern Territory, Australia.
Photo: Marie Read]



Honeyeaters, Dark-brown Honeyeaters and New Caledonian Myzomelas, among a wider range of habitats exploited by all species. The globally threatened Crow Honeyeater, while preferentially inhabiting dense, humid primary rainforest, has been recorded in dry forest, which may refer to niaouli savanna or to the highly threatened sclerophyll forest, which currently covers less than 3% of New Caledonia's land area.

Heathlands are widely scattered throughout Australia, in discrete areas and varying zones. They are present in coastal and subcoastal areas of eastern, southern and south-western Australia, on the ranges of the Great Divide of eastern Australia, above the tree-line in alpine areas of south-eastern mainland Australia and Tasmania, and on deep sandy soils in the mallee of eastern and southern Australia. The floristic diversity of heathlands is generally high, and they typically contain an abundance of nectar-producing plants, especially species of the Proteaceae, Myrtaceae and Epacridaceae, notably the genera *Banksia*, *Hakea*, *Grevillea*, *Kunzea*, *Darwinia*, *Lambertia*, *Verticordia*, *Styphelia*, *Epacris* and, in Western Australia, *Dryandra*. A number of meliphagids are characteristic of heathland, the Tawny-crowned Honeyeater being a good example of a species found in dense heathland throughout its range, but other species already mentioned as occupying other habitats, such as the New Holland and White-cheeked Honeyeaters and the Eastern Spinebill, are frequently found also in heath. The diversity and density of honeyeaters in this habitat can be high. In heathland communities around Sydney, up to ten species co-occur, including the New Holland, White-cheeked, Tawny-crowned, White-eared, Yellow-tufted and Yellow-faced Honeyeaters, the Eastern Spinebill, the Little Wattlebird and the Noisy Friarbird, although the presence and abundance of species would vary over a year; further, several of these species, such as the White-eared and Yellow-tufted Honeyeaters, use heathland only where it abuts woodland or where eucalypts are scattered through heath.

Tropical heathlands, of limited extent, are found in parts of northern Australia, and are dominated by such plant species as *Grevillea pteridifolia* and species of *Austromyrtus*, *Calytrix*, *Acacia* and *Triodia*. On islands of Arnhem Land in the Northern Territory, meliphagids recorded as using these tropical heaths include the Brown and White-throated Honeyeaters, the Silver-crowned Friarbird and the Red-headed and Dusky Myzomelas. In Wallacea,

the Seram Honeyeater inhabits both montane forest and high-altitude heath.

In New Caledonia, maquis, or "maquis miniers", is a unique, heath-like sclerophyllous, evergreen shrubland growing to 2 m tall and found mainly on ultrabasic soils, in places with a scattered emergent layer of *Araucaria* or *Agathis*. It is one of a range of habitats utilized by Barred Honeyeaters and Dark-brown Honeyeaters, and the rare Crow Honeyeater, while inhabiting primarily dense, humid, primary rainforest, has been observed also in isolated stands of stunted forest within maquis.

Large areas of mangrove forest and woodland exist in Australia and New Guinea, and on many islands of Wallacea and the south-west Pacific. In New Guinea, mangroves are found in disjunct parts of the northern coast, such as the eastern side of Cenderawasih Bay and the mouths of the Sepik and Ramu Rivers, and in long deep stretches on the southern coast of the island, especially at the mouths of the Purari, Kikori, Fly, Northwest and Otakwa Rivers, Bintuni Bay, and the southern Vogelkop. Indeed, the southern coast of eastern New Guinea has the highest diversity of mangroves in the world. Such habitats can often cover extensive areas, and exhibit a definite zonation of structure and floristics from seaward to landward edges of the mangals. A number of species are considered mangrove specialists. In New Guinea, the Red-headed Myzomela is virtually confined to extensive mangrove thickets, woodlands and forests, although, in Australia, it is often seen also in fringing vegetation on the landward edge of mangrove associations, such as stands of paperbarks. The Varied Honeyeater of coastal New Guinea and north-eastern Australia is commonly found in mangrove associations, but it, too, occurs also in other coastal vegetation adjacent to mangroves and it is often seen in the sea-front vegetation of towns and cities and is occasionally found in other associations. In mid-eastern Australia, the Mangrove Honeyeater is largely restricted to coastal and riverine mangrove woodlands; as with the Varied Honeyeater and Red-headed Myzomela, however, it is occasionally encountered in coastal scrub or woodland bordering mangroves, and it will visit flowering trees and shrubs in gardens and parks within towns with mangroves nearby. Both Singing and Brown Honeyeaters regularly exploit mangroves in parts of their ranges.

As well as such specialists, a number of species use mangroves regularly but are not confined to them. For example, the



The New Zealand Bellbird is a renowned songster. While its basic call note is simple, resembling a bell tolling, the song's use, form, length and variation are complex. The species' "dawn song" comprises up to six clear bell-like notes and is repeated for long periods throughout the day. In full song, the New Zealand Bellbird intersperses the bell-like notes with harsh, jarring calls. Both male and female sing, and pairs may duet, sometimes counter-singing against neighbouring rivals.

[*Anthornis melanura melanura*, Pounaw, Tiritiri Matangi Island, Hauraki Gulf, NW North Island, New Zealand. Photo: Don Hadden]

Rufous-banded Honeyeater of northern Australia and New Guinea is commonly found in mangroves, as well as in paperbark forests, and the Brown Honeyeater, a habitat generalist, is often seen in mangroves. Many other meliphagids occasionally enter mangroves, especially when these trees are flowering and nectar is abundant, and even species not normally associated with lowlands are attracted to them. For example, the Vanuatu Honeyeater is predominantly a montane species, but it is sometimes found in the lowlands and one was trapped in mangroves.

In a detailed study of the use of mangroves by birds in Darwin Harbour, in northern Australia, R. Noske recorded a total of 50 bird species, seven of these honeyeaters, as using the mangrove forest, which consisted of several distinct zones that varied with distance from the tidal creek running through the forest. Red-headed Myzomelas and Brown Honeyeaters were two of the most common species in these mangroves, having mean densities per hectare of, respectively, 5.5 and 2.3 individuals. Both were found throughout the mangal zones, from the zone of stilt-rooted mangrove (*Rhizophora stylosa*) beside the tidal channels of the creek, through the zone dominated by the rib-fruited mangrove (*Bruguiera exaristata*) and the wide zone of *Ceriops tagal*, which was divided into inner and outer zones by bare sandy saltflats, with the outer zone of taller mangroves; both were recorded also in a narrow zone of *Lumnitzera racemosa* fringed by paperbarks that lay farthest from the creek. Both meliphagids were observed and trapped significantly more often in the *Bruguiera* zone than in the other zones, although the use of different zones varied much over the course of the year. The five other members of the family using the mangroves were the Silver-crowned, Helmeted and Little Friarbirds, the Dusky Myzomela and, rarely, the Rufous-banded Honeyeater. In Darwin Harbour, Red-headed Myzomelas and Brown Honeyeaters exhibited significant seasonal variation in densities in the mangrove forests. For example, the density of Red-headed Myzomelas reached a peak in July–November, which coincided with breeding and the dispersal of young, and density was significantly lower in March–April than in other bimonthly periods except January–February. The Brown Honeyeater showed a similar, though less marked, pattern.

Throughout the range of the family, many species have adapted to exploit modified landscapes and habitats, especially where abundant sources of nectar are available. Honeyeaters are found in cities, towns and villages, in orchards, agro-gardens and cane fields, and in plantations of coconut palms. Throughout inland

Australia, they can be found around isolated homesteads, mine sites and other buildings where water and food may be available, and in New Zealand the Tui is a common inhabitant of urban gardens. In Australia, although honeyeaters are found in all cities and towns and around other human settlements, in many urban areas it is often the larger species that tend to dominate the honeyeater communities. Along the eastern coast, for example, species such as the Noisy Miner, the Little and Red Wattlebirds and the Blue-faced Honeyeater are common and widespread in most cities and towns. Nevertheless, a range of other meliphagids has adapted well to urban areas, among them the White-plumed Honeyeater, which is a common urban bird of Sydney, Melbourne and Adelaide, and New Holland Honeyeaters are common in many cities and towns of south-eastern and southern Australia wherever nectar-producing shrubs and trees are abundant.

The increasing use of native plants in gardens and parks of urban areas has probably done much to increase the numbers of honeyeaters, and other native birds, although it may not always have promoted improvements in species diversity. In studies of birds inhabiting urban areas of Sydney, the Noisy Miner is commonly found to be one of the dominant and common species, along with a range of other medium-sized and smaller species, including Eastern Spinebills, Red and Little Wattlebirds and New Holland Honeyeaters. Eastern Spinebills were found to be more common in gardens consisting mainly of native plants and in gardens with greater tree cover, and were negatively associated with greater extent of lawn and the presence of Noisy Miners. New Holland Honeyeaters, however, showed no associations with garden habitat variables but were negatively associated with Noisy Miners. Noisy Miners were negatively associated with all small bird species, honeyeater or not, but showed no association with habitat variables. Otherwise, a great many species occur at the fringes of cities and towns, or are found in large remnants of a diverse range of native vegetation in parks, gardens or reserves. In all the major capital cities of Australia, for example, the main botanical gardens provide a diversity of habitats and plant and food resources for a wide range of honeyeaters and other birds.

On many islands within the family's range, meliphagids frequently exploit plantations or groves of coconut palms whenever they are in flower, which can be for all or most of the year. Throughout its wide range in the south-western Pacific, the Cardinal Myzomela is commonly observed to forage on flowering coconut palms, as is the Silver-eared Honeyeater in Vanuatu, where the coconut flowers are present all year. The latter species

is common also in suburban gardens, often utilizing flowers of such plants as hibiscus, ornamental ginger, bananas and lantana. Other species appear to be more abundant in modified habitats. In Fiji, the Orange-breasted Myzomela is more common in disturbed habitats than in mature forest and is common in suburban gardens. While some island species are forest specialists, especially on the larger islands, many are found across a broad range of habitats. For example, the Wattled Honeyeater is present on many islands of western Polynesia, but with considerable and little-understood variation in its distribution and abundance in different habitats on different islands; overall it occupies a wide range of habitats, from montane forest and secondary growth to mangroves, but it is abundant in suburban gardens and large plantations of coconut palms. As has been seen, many species use forest edge or secondary growth, habitats that are increasing in extent at an unfortunate rate in some of the world's rainforest areas. The use of such areas may, however, be dependent on the persistence of unmodified habitat nearby, and without this the survival of such species could be in jeopardy. Further, in Australia, few habitats have not been modified, and this is particularly true of the woodlands and forests, which have long been altered, and continue to be, by clearing, thinning and grazing (see Status and Conservation).

In New Guinea and the islands of Wallacea and the south-west Pacific, elevation is one of the more important ecological sorting mechanisms, and a major influence on the adaptive radiations and speciation of birds. Diamond and others consider altitude to be the most important such mechanism in the New Guinea avifauna as a whole. In New Guinea and on other species-rich, mountainous islands, many bird species are known to be segregated along elevational gradients, and there are examples of pairs and triplets, and occasional quartets, of congeneric species that replace each other with altitude, with the transition abrupt and not coincident with change in vegetation. There are numerous instances of altitudinal segregation of closely related species, and this obviously affects the habitats that a species occupies. As described by Norman and her colleagues, in line with the work and suggestions of Diamond, spatial sorting mechanisms can be used as a means of explaining the distributions of the species of *Meliphaga*. Combining information from geographical, altitudinal and vertical distributions, Norman and co-workers found that nearly all *Meliphaga* species could be partitioned on these parameters alone. In all cases, closely related species occupy discrete distributions and replace each other geographically or altitudinally, thereby minimizing competition between ecologically similar forms. Conversely, species that co-occur tend to be phylogenetically distant and co-exist by segregating vertically within the habitat, as is the case with, for example, the Puff-backed, Mimic and Yellow-gaped Honeyeaters. Exceptions are provided by the Scrub, Graceful and Elegant Honeyeaters, which minimize overlap with other species through horizontal segregation, habitat differentiation or restricted altitudinal range, or combinations of these; for example, the Scrub Honeyeater is restricted to forest edge and rarely ventures into the forest interior, thus avoiding contact with Puff-backed, Mimic and Yellow-gaped Honeyeaters in the lowlands, and with Spot-breasted, Forest and Hill-forest Honeyeaters in the highlands. Other examples include the lowland Rufous-backed Honeyeater and the upland Black-backed Honeyeater. Where these two species are sympatric they have a mutually exclusive altitudinal range; thus, where the two occur together, in the Central Range in eastern New Guinea, the Black-backed Honeyeater is found from 2700 m to 3650 m and its congener from 1500 m to 2700 m, their altitudinal ranges mutually exclusive; but in western New Guinea, where the Black-backed occurs alone, it is found from about 1500 m to 3650 m, and in the Huon Peninsula, where the Rufous-backed Honeyeater occurs alone, it ranges from 1500 m to at least 3200 m. Within the Meliphagidae, other examples of altitudinal segregation in New Guinea include the pair of endemic *Lichenostomus* species, the Obscure and Black-throated Honeyeaters, the former primarily a lowland-foothill species and the latter a montane species. In Sulawesi, the two species of *Myza*, the Lesser Streaked and Greater Streaked Honeyeaters, replace

each other altitudinally. The latter is an upper montane species found throughout all except the south of the island, occurring at 1700–2800 m over much of its range, but not going below 2200 m in southern-central Sulawesi and 2000 m in south-eastern Sulawesi, where its range overlaps with that of its congener; the Lesser Streaked Honeyeater is montane, occurring from 900 m, though mainly from 1500 m, to 1800 m in north and north-central Sulawesi, to 2200 m in southern-central Sulawesi, to 2000 m in south-east Sulawesi and, in the absence of the Greater Streaked Honeyeater in southern Sulawesi, to 2500 m.

Populations of the Red Myzomela in New Britain and New Ireland provide a further interesting example of altitudinal segregation. The Red Myzomela is found in the lowlands of four islands of the Bismarck Archipelago, namely New Hanover, Tabar, Djaul and New Ireland, but on New Britain it is excluded from the lowlands and confined to elevations above 900 m by the presence of another small *Myzomela*, the New Britain endemic Black-bellied Myzomela. The converse is true on New Ireland, where the endemic New Ireland Myzomela occupies the mountains, with the Red Myzomela restricted to lowlands and hills up to about 900 m, and mainly below the range of the New Ireland Myzomela.

Competitive interactions with unrelated species can influence altitudinal distributions and use of habitat. In the Moluccas of Wallacea, the New Guinea region and northern Melanesia, the niche of small nectarivorous and insect-gleaning specialists on flowers is normally filled by *Myzomela* honeyeaters in forested habitats and by the Olive-backed Sunbird (*Cinnyris jugularis*) or Black Sunbird (*Leptocoma sericea*) in open habitats, the myzomelas and sunbirds often interacting aggressively when they meet. In the absence of sunbirds, however, Cardinal Myzomelas in Vanuatu, Samoa, the eastern Solomons and the Santa Cruz Group, Micronesian Myzomelas in Micronesia and Orange-breasted Myzomelas in Fiji are common in open habitats as well as forested ones, and the converse applies on some islands where *Myzomela* does not occur but sunbirds do. The Scarlet-bibbed Myzomela is confined to small species-poor islands of the Bismarck Archipelago and Karkar Island, off north-eastern New Guinea, and is not recorded on the nearby large islands of the Bismarcks or New Guinea. On most of these islands, it occurs at all altitudes from sea-level to mountain summits. In contrast, on Karkar, it is largely confined to altitudes above 1000–1200 m owing to competition with the two aforementioned species of sunbird, which occupy the lowlands, although it was also suggested that they use the mountains because the nectar and insect

Although most meliphagids sing while perched, some engage in song flights as a means of mate attraction or territory defence. This is particularly true in the more open habitats of Australia and New Zealand as opposed to the closed-canopy forest of New Guinea. The **Pied Honeyeater** of Australia sings both when perched and in display flight. It also sometimes accompanies its perched song with a wing-fluttering display. The song is a plaintive piping, often repeated. Singing peaks shortly after birds arrive at a breeding site, and largely ceases once breeding has commenced.

[*Certhionyx variegatus*, Carnarvon, Western Australia, Australia.

Photo: Graeme Chapman]





All meliphagids probably consume nectar. The **Eastern Spinebill** certainly spends much time feeding at flowers—roughly three-quarters of its day, judging from two ecological studies. This species uses a wide variety of flowers, with its chosen genera depending on habitat and location. In Tasmania's temperate rainforests, nectar sources are few, so it feeds mainly on leatherwood (*Eucryphia lucida*) and Tasmanian laurel (*Anopterus glandulosa*). In the New South Wales rainforests, mistletoes (*Amyema*) are a favourite, as are proteaceous shrubs such as *Banksia* in the highlands of that state.

[*Acanthorhynchus tenuirostris cairnsensis*, Atherton Tableland, N Queensland, Australia. Photo: Marie Read]

resources are exploited by few bird species at high elevations on Karkar. Interestingly, in the western Torres Strait, the Dusky Myzomela is found only on islands where the Brown Honeyeater is absent.

Other forms of spatial segregation are also apparent among New Guinean honeyeaters, and these obviously influence habitat choice. In montane regions, there is frequently a change in sex ratio and age structure with altitude. In the case of the Long-billed Honeyeater at Karimui, for example, females predominate at lower altitudes and males at higher altitudes. The Rufous-backed Honeyeater at Karimui provides a more detailed example of the influence of altitude on population structure. At lower elevations within its altitudinal range, from 1340 m to 1900 m, only females and a few immature males were netted, and no songs were heard; from 1900 m, near the elevation at which its preferred habitat with heavy moss covering began, songs were heard often and the sex ratio suddenly approached unity, and the testes of all except one male were enlarged; singing and an equal sex ratio continued to the upper limit of the species' range here, at 2490 m, but above about 2150 m the proportion of male Rufous-backed Honeyeaters with enlarged testes decreased to about 50%, indicating an increase in the numbers of immature males towards the top of the altitudinal range. Such changes have been observed for other species of honeyeater, including the Red-collared Myzomela and the Common Smoky Honeyeater.

Within Australia, there are a number of species that occupy a wide latitudinal range, and the habitats used by such species can vary over that range. For example, Lewin's Honeyeater is found along almost the entire east coast. In the far north of its range, the subspecies *amphochlora* of the McIlwraith Ranges, in the eastern Cape York Peninsula, is largely confined to upland rainforest; a little to the south, the subspecies *mab* is likewise largely confined to upland tropical rainforest in the northern portion of its range. Farther south, however, *mab* and the nominate race, while still occurring widely in a variety of rainforest types, occupy an increasing range of habitats, including wet and dry eucalypt forests and woodland, littoral woodland dominated by *Banksia*, brigalow-softwood scrub, heathland, edges of mangroves and paperbark thickets, and are widely found in parks and gardens of urban areas. In the far south, the nominate race is largely restricted to temperate rainforest dominated by lilly pilly (*Acmena smithii*),

and to wet sclerophyll forest, with some records in other forest associations.

General Habits

Honeyeaters are a highly conspicuous and characteristic element of the avifauna of Australia, New Guinea and the islands of Wallacea and the south-western Pacific. They are diurnal, and overwhelmingly arboreal. Only the Australian chats are primarily terrestrial, but they are currently treated as constituting a separate family, the Epthianuridae. Most honeyeaters are also bold, conspicuous and noisy. As well as comprising a major component of the dawn chorus, honeyeaters tend to vocalize much throughout the day (see Voice), often singing or calling from conspicuous perches or in song flights. A few species, however, are shy and wary. The Mao of Samoa is wary and inconspicuous, and is heard more often than it is seen, as is the Crow Honeyeater.

Most meliphagids are typically seen singly or in twos, which are often probably paired individuals, or in small family parties. Many sedentary species remain in permanent all-purpose territories throughout the year, although others can be dispersed in loose colonies, and the co-operatively breeding miners and Yellow-tufted Honeyeaters maintain large and stable colonies throughout the year. Other species maintain breeding territories only during the breeding season, the area defended varying from an all-purpose territory to a smaller nesting territory. While many species of honeyeater will defend food resources, during both the breeding and the non-breeding periods, they may also congregate in numbers at abundant resources, such as in flowering trees or, occasionally, to exploit insect resources, such as swarms of ants (Formicidae) or termites (Isoptera). Honeyeaters often associate with other nectarivores, such as lorikeets (Psittacidae), when foraging at sources of abundant nectar. Such congregations can often involve much intraspecific and interspecific agonistic behaviour, as birds attempt to defend part or all of the resource (see Food and Feeding).

Some species are regularly seen in flocks or groups throughout the year, this being characteristic of the miners, whereas others may associate or move about in loose flocks during non-breeding periods. Many of the large friarbirds and the tiny

Nectarivory is not always straightforward for meliphagids. Short-billed species such as the **White-gaped Honeyeater** of north Australia may have problems with flowers that have a long anther. This honeyeater has two options. It can insert its bill deep into the flower to reach the nectar source or can move to the flowers of a more accessible species. The White-gaped Honeyeater typically forages in dense vegetation, particularly on trunks and branches, but readily emerges into the open when visiting flowering trees or shrubs. This species regularly forages singly, in pairs or in small groups.

[*Lichenostomus unicolor*, Darwin, Northern Territory, Australia.

Photo: Peter Fuller]



myzomelas are commonly seen in loose flocks. In Australia, migratory Yellow-faced and White-naped Honeyeaters may gather into large flocks, although flocks are more usually fairly small. During both the autumn–winter northern passage and the winter–spring return to south-eastern Australia, Yellow-faced Honeyeaters are seen mainly in flocks, typically of up to about 100 individuals, occasionally more and exceptionally as many as 1000, although the average size of flocks in the Australian Capital Territory on northern passage was of 23.3 individuals, and the average flock size in Brisbane during southern passage was of 35 birds. These migratory flocks of Yellow-faced Honeyeaters are loose units that merge with other flocks, and individuals or small groups leave or join them. Yellow-faced Honeyeaters often migrate in mixed flocks with White-naped Honeyeaters, which themselves form flocks of hundreds, and sometimes even thousands, of individuals on northward migration, but are usually in smaller and more dispersed flocks on southern passage. In Australia, many species of honeyeater are occasional members of mixed-species foraging flocks, and others are more regularly in such flocks. For example, the Rufous-banded Honeyeater is often found in mixed flocks, particularly with its congener the Rufous-throated Honeyeater. In north-east Australia, B. Sage reported on mixed-species foraging flocks of honeyeaters at two sites. At one site, the flock consisted of 40–45 honeyeaters of six species, in six genera, with Banded Honeyeaters the most numerous, with about 25 individuals, and other species including Yellow-tinted, Brown, Black-chinned and Rufous-throated Honeyeaters and the Little Friarbird. The flock moved rapidly through the woodland, appearing to feed mainly on invertebrates.

In New Guinea, both species of *Timeliopsis* straightbill occur in mixed flocks. Tawny Straightbills are often in foraging flocks in which either the Rusty Pitohui (*Pitohui ferrugineus*) alone or Rusty Pitohuis and New Guinea Babblers (*Pomatostomus isidorei*) are nuclear species, other common flock-members including New Guinea Cuckoo-shrikes (*Coracina melas*), Spangled Drongos (*Dicrurus bracteatus*) and Sooty Thicket-fantail (*Rhipidura threnothorax*); such flocks had an average of 1.8 straightbills. When these straightbills forage with New Guinea Babblers, they are an integral part of the flock and behave more like a babbler than like a honeyeater. On Sulawesi, both species of the endemic genus *Myza* occasionally join or forage at the edge of mixed-

species flocks of Sulawesi Leaf-warblers (*Phylloscopus sarasinorum*), Citrine Canary-flycatchers (*Culicicapa helianthea*), whistlers (*Pachycephala*), white-eyes of the genera *Zosterops* and *Lophozosterops*, and fantails. New Zealand Bellbirds, too, are often found in mixed feeding flocks, and on Little Barrier Island, off the North Island, female bellbirds often associate with mixed-species feeding flocks of insectivores, which are often dominated by Whiteheads (*Mohoua albigilla*). Bellbirds often associate also with Tuis and Stitchbirds when foraging.

Most species respond to playback of their vocalizations, and often respond well to human imitation of their calls, or to “squeaking” or “pishing” sounds that somewhat resemble scolding alarm calls. On Karkar Island, off New Guinea, for example, the Scarlet-bibbed Myzomela always responded to squeaking and pishing, and at sites above 1350 m six or so individuals of this species invariably approached, followed, and flew from perch to perch around observers.

With a few notable exceptions, the displays of honeyeaters have not been methodically studied and described. K. Immelmann discussed the social and breeding behaviour of several Australian honeyeaters, but his study was of short duration and contains many generalizations. Nevertheless, the repertoire of displays of many species appears to be fairly simple. One exception is that of the colonially and co-operatively breeding miners, which exhibit a complex array of agonistic, submissive and sexual behaviour, as could be expected in their complex social systems. For example, in his examination of displays of the Noisy Miner, D. D. Dow described three flight displays, eleven postural displays and three “facial displays”, two of which involve the open bill and, in one case, the tongue, and “eye displays”, which involve a change in apparent size of the yellow facial patch behind the eye. Many of these displays indicate threat, dominance or submissiveness. New Holland Honeyeaters, which can similarly show complex social interactions in both breeding and non-breeding seasons, also have a wide range of displays, including threat and submissive postures.

Song flights are a conspicuous aspect of the behaviour of a diverse range of meliphagid genera and species, including, among others, some *Lichenostomus*, such as the Grey-fronted Honeyeater, *Phylidonyris*, and six species in monotypic genera, namely the Tawny-crowned Honeyeater, the Spiny-cheeked Honeyeater,

the Black Honeyeater, the Pied Honeyeater, the Striped Honeyeater, and the Painted Honeyeater. The song flights of the three *Phylidonyris* species, particularly those of the White-cheeked and New Holland Honeyeaters of eastern and southern Australia, are among the better known. During the breeding season, male White-cheeked Honeyeaters fly high above their nest-sites, giving full flight song near the apex of the flight, and then descend rapidly, with wings held closed, before spreading the wings when close to the ground and gliding to the top of a shrub or tree; the bird may also give a few chirps and whistles as it ascends. These song flights are thought more likely to be sexual advertising displays than to be territorial displays. The frequency of song flights varies both with the stage of breeding and individually; in north-east New South Wales in May, the birds performed 37 song flights per hour, and the rate did not alter significantly with time of day. Tawny-crowned Honeyeaters, in the genus *Gliciphila* but formerly placed in *Phylidonyris* (see Systematics), perform similar aerial displays during the breeding season, when they fly almost vertically while calling strongly and then, when 10–30 m above the ground, descend in a swift glide, at first steep and then flattening out, before alighting on a prominent perch; the descent has been described also as slow and spiralling, unlike that of *Phylidonyris*, the song flight of which the Tawny-crowned Honeyeater's otherwise resembles.

Song flights seem to be less common in New Guinea than in Australia and New Zealand. This difference appears to be real, and is possibly related to the densely forested habitats that predominate in New Guinea, although it is possible that it may, rather, reflect the number of observers and the range of studies conducted there. Nevertheless, the Streak-headed Honeyeater is known to have a song flight in which the bird rises above the forest canopy and descends, singing throughout, to a prominent exposed perch, behaviour which was noted as unusual in the region. This species, however, is known to sing in flight and from high exposed perches.

Corroborees are a complex type of social behaviour, seen best in the miners and in the *Phylidonyris* and some *Lichenostomus* honeyeaters. The word "corroboree" is taken from the Aboriginal term for a festive gathering or ceremonial dance. In corroborees, up to twelve or more birds gather in a tight group, with much calling and wing-fluttering. The possible functions of this behaviour include defence against predators and conspecific

intruders, or it may even represent a show of togetherness by members of a group. Among New Holland Honeyeaters, corroborees are usually initiated by a submissive individual in the presence of a more dominant one, and these are typically joined by others, all usually males; the birds perch closely together, repeatedly giving a special call while fluttering their wings and tail, and adopting a bowing posture, with the breast lowered, the tail raised and the head and bill tilted upwards. As display intensifies, all of the birds move closer until the heads and bodies are oriented towards one another, and more birds may join the group. The corroboree is usually of brief duration, some 5–10 seconds, and it may continue between two individuals while others move away; alternatively, the focus may shift among individuals, or the display may lead to subgroups forming, in which some of the group orient and display towards one bird while others direct their attentions towards another. Among Noisy Miners, corroborees appear to function in greeting and in rallying to maintain aggression against interspecific intruders and predators. They last for up to 30 seconds, and are performed whenever several miners meet, usually involving 5–10 individuals, but from as few as two to 40 or more. Once a corroboree starts, others join in, all birds focusing on an individual by directing the head towards it, and in larger corroborees, of 10–25 or more birds, there can be several focal individuals. The focus of attention often changes, especially in larger groups. These ceremonies occur almost anywhere, from the ground to the canopy, and prominent places, such as large exposed branches and dead trees, are used repeatedly; they are often performed at empty nests. Corroborees are performed also by Tuis, when groups of 5–7 individuals, typically males, sometimes accompanied by their mates, gather on branches 1–2 m from the ground at the intersection of several territories. Typically, two or three Tuis face each other while perched less than a metre apart, and sing vigorously, while others watch in silence; such corroborees can last for up to 10 minutes, during which time those Tuis not singing leave. Corroborees by this species are seen only at the start of breeding, and are thought to function in the maintenance of territories.

Honeyeaters are noted for being highly aggressive and pugnacious, both when breeding and when defending food resources in the non-breeding period. Aggressive interactions between individuals, whether of the same species or of different species, are often, however, fairly simple. The most commonly observed ago-



It is thought that many nectar-rich species of flower are bright red so as to attract birds and other potential pollinators. It is certainly true that honeyeaters often visit red flowers, but many in both Australia and New Guinea feed at flowers that are white, cream-coloured or yellow. An example is the bottlebrush (*Callistemon*) tree at which this **Yellow-tinted Honeyeater** is feeding. Dexterity is a common behavioural characteristic among the Meliphagidae, but this species edges towards the acrobatic when foraging, often hanging upside-down when clinging to inflorescences.

[*Lichenostomus flavescens flavescens*, Derby, Western Australia, Australia.
Photo: Don Hadden]

The diminutive members of the genus *Myzomela* are primarily nectarivorous, even in the New Guinea rainforests where such a practice is comparatively rare among meliphagids.

The **Dusky *Myzomela*** prefers to forage in the forest canopy but also descends to lower levels where it readily probes flowers for nectar. There is some evidence that this species may vary its foraging height through the seasons, birds in north-east Queensland feeding lower in the dry season. The species visits a wide range of flowers, feeding actively and acrobatically, even hanging upside-down, if necessary.

[*Myzomela obscura harterti*,
Atherton Tableland,
N Queensland, Australia.
Photo: Clifford &
Dawn Frith]



nistic interactions, both within and between species, are simple displacements, in which the attacking bird lands on or near a perch vacated by the bird attacked, or chases, whereby the attacked bird is pursued beyond the point at which it takes off. These interactions are common in defence of food resources, but they are also part of broader territorial behaviour at the start of and during the breeding season. In coastal eastern Australia, the White-eared Honeyeater defends permanent territories throughout the year, but, at the onset of breeding, males determinedly chase other species of honeyeater, and any conspecifics that may intrude on a territory – a rare event – at much higher rates than they do at other times of the year. The territorial male can be perched and alert, and then, suddenly, fly 100 m and more in order to displace or chase, for example, a Yellow-faced Honeyeater, ignoring other individuals of the same species much closer. This increased rate of almost indiscriminate attack was found to be a good indicator that pairs had started or were about to start nest-building for the first clutch of the year. On arrival in an area and before breeding, male Black Honeyeaters often chase one another in rapid flights, one behind the other, until territories are established, after which intruders on territories continue to be chased.

Rarely, aggressive interactions escalate to fights, both within and between species. Using the bill or feet, or both, the individual grapples with an opponent and wrestles it from a perch or impedes its movement, and at least sometimes these fights result in physical injuries. Fights with the bill usually involve the grabbing of an opponent's bill, although the honeyeater may also peck at its legs and feet or breast. When fighting with the feet, the attacker grasps at its adversary's breast or other parts of the plumage, or tries to grapple with its opponent's legs or feet. A combatant will sometimes try to place a foot over that of its opponent, clamping it to the perch. When fighting on perches, the birds sometimes fall to the ground, locked together by their feet or bills.

Bill-pointing, or variations of it, is a type of behaviour common to many species of honeyeater. In territorial interactions, usually at territory boundaries, White-eared Honeyeaters often chase one another. It was observed that, on alighting in a tree, they would sometimes face each other, often on a vertical or downward-sloping branch, one bird facing down and the other up, each reaching out and pointing the closed bill at the other, the bills occasionally coming into mutual contact. The pointing display of Noisy Miners is similar, the miner, with the plumage of the

head, neck and underbody sleeked, stretching its neck out and pointing the closed bill at a target individual; at high intensity, the wings are held tight against the body and bill-snaps may be given. With Noisy Miners the angle of the body varies with the substrate, but is most often horizontal.

While aggression is typically associated with defence of breeding territories or food resources, the reasons for observed aggressive behaviour are on some occasions enigmatic. For example, on Seram, in mid-August, a Seram Friarbird was seen to attack a pair of Moluccan Red Lories (*Eos bornea*) which was inspecting a nesting hole. On three occasions, while one lory was inside the hollow and the other perched just outside, a friarbird that had been calling from a neighbouring tree persistently swooped at the lory, which ducked its head with each swoop. On the third occasion, the swooping was even more vigorous and the friarbird struck the lory on several occasions. The lory was pushed along the branch away from the hole, and it uttered alarm calls before flying off, followed by the second bird, which had been inside the hole. On the following day the lories were again at the hole, and a Seram Friarbird was heard to be calling some distance away. It was suggested that the attacks were possibly some form of territorial defence, but the lories were not feeding and could not have posed any competitive threat to the friarbirds. In this instance, the latter's aggression appears rather indiscriminate.

Activity budgets of honeyeaters for behaviour other than foraging have not been well described, but some general summaries can be presented. Studies near Sydney, in south-eastern Australia, in the autumn and winter months, revealed that Little Wattlebirds spent only 8.5% of their time in foraging but 81% in perching, while vocalizing accounted for 2.5% of their time and preening 1.5%, the remaining 6.5% being taken up by flight. The respective figures for New Holland Honeyeaters were 10.5%, 76%, 1%, 1.5% and 11%. In contrast, the time spent in foraging by these two species in Victoria was very different: Little Wattlebirds devoted 42% of their time to foraging for nectar, and New Holland Honeyeaters spent 45–93% of their time in foraging for nectar. During an irruption of Painted Honeyeaters in northern New South Wales, during October and December, this species spent 43% of its total time in foraging, 31% in resting, 10% in flying, 8% in preening, 5% in vocalizing and 3% in involvement in aggression. These gross differences in time spent in various activities may be related to the food resources being utilized and to the season, but



Unlike hummingbirds (*Trochilidae*), honeyeaters tend not to hover when feeding at flowers. Indeed, only three genera do so, namely *Acanthorhynchus*, *Myzomela* and a single member of *Lichmera*. These birds are probably able to do so because they are sufficiently small that hovering provides an energetically cost-effective means of accessing nectar sources at the edge of a plant. The **Scarlet Myzomela** usually probes for nectar from a perched position, but may sally-hover to gain access to inconveniently located flowers. Being small, this species is often chased away from flowers by larger family members.

[*Myzomela sanguinolenta*,
Atherton Tableland,
N Queensland, Australia.
Photo: Clifford &
Dawn Frith]

much further study is needed. It has been found that Eastern Spinebills, when nectar is abundant, devote more time to perching and less time to probing inflorescences and moving around.

It is likely that all meliphagids bathe, although there are no published observations for many of the species. Members of this family have been seen to bathe in streams, rock pools, springs, farm dams, watering troughs for stock, and birdbaths in gardens. In shallow depths they will sit or stand in the water, flapping the wings and splashing water over themselves. In deeper water they plunge-bathe, typically flying out over the surface, often hovering briefly for up to a few seconds, before dropping to the water and partly submerging, though some species submerge fully, before flying back to a perch and preening. Typically, the honeyeater enters the water only once on each sally from a perch. Often, the procedure is repeated several times. White-plumed Honeyeaters have been seen to drop from an overhanging branch into the water, often submerging completely, before flying back to the branch, shaking themselves and preening. Noisy Miners bathe by diving head first into the water and flapping the wings, thereafter flying to a perch in order to preen. With the colonial miners, bathing is performed communally, as are most other activities.

Foliage-bathing is reported for many species. Red Wattlebirds will fly into wet foliage of trees, where they flap and flop about among the leaves, shaking the body, ruffling the feathers and ducking the head for several minutes as though bathing in standing water, before flying out to a branch and preening or flying off. Similar behaviour by a Rufous-banded Honeyeater has been observed in New Guinea, the bird fluttering against leaves wet from a recent shower or through clumps of wet foliage, frequently ducking the forepart of the body and raising and fluttering the wings as if bathing in a pool. Noisy Miners and New Holland Honeyeaters also bathe in dew-laden or rain-soaked foliage, bathing often being triggered by a shower of rain. Members of miner colonies appear to be stimulated to bathe by observing the leaf-bathing of others, until large assemblages become involved in the activity. Similarly, a female Scarlet Myzomela was seen to bathe among leaves of French beans in a recently watered vegetable garden, calling as she did, before flying off to preen. While foliage-bathing is typically done in wet foliage, a Red Wattlebird once appeared to bathe in the dry foliage of a flowering *Pittosporum*, behaving much as described for bathing in wet foliage. Other sources of water are sometimes used for the purpose of bathing. A wide range of species, including the Red Wattlebird

and the Yellow-tinted and Painted Honeyeaters, has been observed while bathing under garden sprinklers, and Guadalcanal Honeyeaters have twice been seen to bathe in a puddle on a large dead branch.

After bathing, whether in free water or in foliage, birds will typically fly to a nearby perch, where they shake the plumage and preen. Among colonial species, the colony-members will preen at the same time as other members are bathing. Furthermore, Painted Honeyeaters feeding on mistletoes sporadically stretch the wings out and up and preen, apparently to remove from their plumage sticky material left by the berries. Allopreening appears not to be common among the Meliphagidae, although it has been reported for several species of *Melithreptus* and, outside Australia, for MacGregor's Honeyeater and the Crow Honeyeater, contrary to claims by Immelmann that mutual preening does not occur in the family. Nevertheless, for a number of well-studied species, including the colonial and co-operatively breeding Noisy and Bell Miners, allopreening has not been seen to occur, at least not among adults.

Dust-bathing is seen occasionally, especially during hot weather. Noisy Miners, for example, dust-bathe in dry soil or fine litter. Sun-bathing has been reported for a few members of the family at various times, the honeyeater typically lying on or leaning to one side on the ground, with one wing outstretched and raised and the plumage fluffed up, although sunning is performed also on perches. Once, two adult Spiny-cheeked Honeyeaters and two young were watched as they sun-bathed, each one leaning over sideways with one wing raised. Seven individuals of the colonial Yellow-tufted Honeyeater were seen while sun-bathing together in a group on the ground, pushing one another aside. Although meliphagids normally sun-bathe with one wing held outstretched, New Holland Honeyeaters sometimes sun themselves with both wings extended, in spread-eagle fashion.

Anting has been recorded for a number of these species. Noisy Miners indulge in this activity at least occasionally, rubbing ants through the feathers of the upperwings, breast and flanks. Similarly, Lewin's Honeyeaters have been observed while anting, once picking up ants with the bill and holding them under the wing briefly, before eating them.

So far as is known, all members of the family are diurnal, and roost at night in trees or taller shrubs. The roosting behaviour of the Meliphagidae is not well known, but there are relevant observations for a few species. Regent Honeyeaters in Australia

Honeyeaters are often important pollinators of plants whose flower morphology coincides with the birds' bill structure. The Tui of New Zealand has a stocky, slightly decurved bill, and therefore prefers to extract nectar from fairly short flowers with little curvature. The Tui feeds regularly on nectar from flax bush (*Phormium*), as here, and from *Metrosideros*, a genus closely related to the eucalypts (*Eucalyptus*) that are so important for many Australian meliphagids. There are sexual differences in the Tui diet at particular seasons, even where the sexes feed together. In spring and autumn, the dominant males feed more extensively on nectar than do the females.

[*Prothemadera novaeseelandiae novaeseelandiae*, Pureora, North Island, New Zealand.
Photo: Neil Fitzgerald]



roost in densely foliated trees, saplings and shrubs, and non-breeding individuals often roosted communally in large flocks of 30 or so, although they appeared not to huddle together. In May, in eastern New South Wales, some 100–150 Regent Honeyeaters arrived at roosting sites in the Howes Valley in groups of 6–15 individuals 40–50 minutes before sunset; they would then fly off and feed elsewhere before eventually gathering into several large flocks, which finally settled after sunset, the birds roosting together in single trees or splitting up and roosting in several trees or a small stand of saplings, between 2 m and 22 m above the ground. By late May, and later in the year, in August and October, they roosted in smaller groups and often far apart from each other. Regent Honeyeaters are also one of the first species to cease activity and go to roost in the evening and one of the last species to leave the roost in the morning; in the Howes Valley, they arrived in the period from 11 minutes before sunset to 18 minutes after it, and in the morning they left the roost 15–29 minutes before sunrise, taking 4–8 minutes to leave the site. Detailed observations of this species elsewhere in eastern Australia produced findings similar to these. White-plumed Honeyeaters are active and vocal at dusk, and fly back and forth between several trees, occasionally perching, but not foraging, before flying off again, finally going to roost almost at nightfall. Family groups or fledglings are known to roost together, and breeding females often roost on the nest at night during the breeding season. After fledging, family groups of co-operatively breeding Brown-headed Honeyeaters have been seen to roost on thin twigs in foliage, usually near the top of eucalypt crowns, side by side and touching each other, but facing in different directions. The birds arrived at roosts quickly, but sometimes the group disbanded and moved off to a nearby tree or branch, before reassembling at a roost. Adults took up outer positions after the juveniles had settled. In New Zealand, newly fledged Tuks have been seen to roost together in a tree, although the siblings later roosted apart.

There are also many anecdotal reports for a number of species indicating that these tend to roost in shrubs or trees. For example, Red Wattlebirds have been observed at roost in trees along a stream, and at another site, when returning to roost in the evening, the birds always followed one another from tree to tree, using the same route. Similarly, Little Friarbirds have been seen to roost in flocks in small trees. During an irruption of Tawny-crowned Honeyeaters in forest near Manjimup, in Western Australia, most of these birds roosted in karri (*Eucalyptus*

diversicolor) regrowth saplings at night. Resident New Holland Honeyeaters foraged away from a gulley during the day, but returned there in the afternoon and roosted there at night. In American Samoa, groups of Cardinal Myzomelas have been seen to fly above the forest canopy at dusk as they moved from foraging sites in mangroves or agro-forests to presumed roosting sites in native rainforest. Similarly, in north-western Australia, a flock of 500 Little Friarbirds was recorded flying from inland roosting sites towards mangroves in the mornings and returning in the evenings.

Honeyeaters are typically active early in the morning, and many species are conspicuous and early contributors to the dawn chorus throughout their range (see Voice). While there has been some examination of morning calling, however, there have been few studies of waking and departure from roosts, or of resting during the day (see activity budgets, above). Some species, such as the Brown Honeyeater, have been observed while basking in the sun in early mornings and late afternoons during the winter months. Most members of the family appear to rest during the day in shady foliage of shrubs and trees. Brown Honeyeaters, for instance, rest during the hottest part of the day beneath dense foliage, and at 41°C the birds often pant with the mouth held open and can become slightly hyperthermic. Occasionally, honeyeaters rest elsewhere. On a day with temperatures of about 46°C in north-western Victoria, nine species of passerine, including Purple-gaped, White-plumed, Spiny-cheeked and Yellow-plumed Honeyeaters, were found to be sheltering in thick accumulations of bark, branches and other macro-litter around the bases of mallee eucalypts.

Meliphagids have been seen to drink from creeks, streams, water seepages, waterholes, various water sources on farmland and dripping taps, and they sometimes visit water in small flocks or congregate at water sources. For example, eight Striped Honeyeaters drank together at a farm dam, and gatherings of up to 50–60 Eungella Honeyeaters have been seen to use puddles for both bathing and drinking. In arid parts of Australia, Spiny-cheeked Honeyeaters drank mainly in the early hours of the morning and in the afternoon, with numbers drinking in the afternoon much lower than those during the morning peak, and few individuals came to drink at other times of the day. At a water tank at Wiluna, in Western Australia, as many as 1500–2000 visits by Spiny-cheeked Honeyeaters were counted during the first two hours of the day.



Voice

The vocalizations of the honeyeaters are incredibly varied, as could be expected with such a large and diverse family. The few generalizations that can be made are that many species have loud, strong and clear vocalizations and, more subjectively, that vocalizations of only a small proportion would be called musical or melodious, although some are. There appear to be few commonalities among genera, although the qualities of some calls within the repertoires of species can be similar, such as the scolding alarm calls of the *Lichenostomus* and *Meliphaga* honeyeaters, which are shared also by other species. Vocalizations range from the loud, harsh and guttural coughs, croaks and squawks of the *Anthochaera* wattlebirds, and the slightly more melodic but still loud and explosive rollicking vocalizations of the friarbirds, to the clear, rising and falling, tinkling bell-like songs of the Scarlet Myzomela, and similar songs of other *Myzomela*, the simple, ethereal and plaintive flute-like whistled songs of the Tawny-crowned Honeyeater, and the plaintive, mournful or piercing drawn-out piping song of the Pied Honeyeater.

A number of meliphagids have ringing or bell-like calls or songs, such as the soft but penetrating, ringing, swelling and slurred syllables of the song of the Regent Honeyeater. The main call of the Bell Miner is a musical bell-like "tink", which is uttered almost incessantly throughout the day by members of the colony. The sound from the whole colony, with individual calls not all of the same tone, ring beautifully through the forest, and Bell Miner colonies produce one of the better-known sounds of the Australian bush. On Viti Levu, in Fiji, the characteristic loud, ringing "keekow" or "kee-yow" calls of Giant Honeyeaters, usually run together in series or repeated monotonously, combine to create a loud yodelling cacophony that reverberates through the forest and can be heard from over 1 km away. Other species have more complex repertoires, with a range of rich and varied songs, such as the Black-chinned Honeyeater and Spiny-cheeked Honeyeater of Australia, and the two endemic New Zealand honeyeaters, the Tui and the New Zealand Bellbird, are classed among the world's best songsters on the grounds of the pureness of tone and the complexity of their vocalizations. The New Zealand Bellbird, as its name implies, has a complex and varying song, the notes like the tolling of a distant bell. Its dawn song

consists of pure bell-like notes, occasionally interspersed with quieter notes, repeated monotonously for up to 40 minutes, and the full song includes bell-like notes as well as "chunks", "clonks", harsh "jars", and quiet notes. The songs of Tuks are loud, rich, complex and highly varied, and include rich, liquid warbling notes, deep bell-like "bongs", chimes, cries, sighs, gurgles, whistles, coughs and wheezes.

Others have much simpler vocalizations and repertoires. Lewin's Honeyeater is a commonly heard species of eastern Australia, with a simple repertoire. The main adult call, the "Rattle", is chatter or rattle consisting of rapidly repeated staccato notes or syllables, like the sound made by a machine-gun. The only other calls which this species is known to make are a repeated, loud and harsh scolding "schwep" in alarm, typical of *Meliphaga* and *Lichenostomus*, and, very occasionally, a slow, single-note "toc" or "chot", repeated rather slowly and monotonously at regular intervals, like a slow version of the rattle call. Similarly, the Tawny-crowned Honeyeater appears to have a fairly simple repertoire, consisting of a whistled song, a mournful call, and one or two alarm or distress calls.

There have been few detailed studies of the vocalizations of the honeyeaters, and much of our knowledge of individual species comes from a diverse range of anecdotal reports. Most of those studies that have been conducted have been in Australia and New Zealand, although Diamond and others have reported on the duetting of a variety of New Guinea and Pacific Ocean species. The vocal, as well as visual, mimicry of friarbirds by orioles has also been widely described; this is discussed in more detail at the end of this section. Unfortunately, the distinction between songs and calls in the Meliphagidae has not been examined, and there is little uniformity in application of the terms to the various genera and species in the family. Definitions used, if considered at all, vary and, more often than not, the term "song" is used on the basis of the melodiousness of a vocalization, harsher and simpler vocalizations being labelled "calls" and the more musical and pleasant sounds labelled as "songs". Alternatively, the term "song" is used for one or several of the more complex vocalizations within the repertoire of a species, or the most common vocalization is thus labelled. This is far from satisfactory, but it is not a problem confined to the Meliphagidae.

Within Australia and New Zealand, a few species have been well studied, and their repertoire described in detail. These include two sibling species of *Lichenostomus*, the Yellow-throated Honeyeater of Tasmania and the White-eared Honeyeater of eastern and southern mainland Australia, the two forming a superspecies, and another *Lichenostomus*, the White-plumed Honeyeater, as well as two of the four miners, the Bell and Noisy Miners, and the New Holland Honeyeater. M. A. Jurisevic and K. J. Sanderson also conducted a detailed study of the vocal repertoire of six species of honeyeater from South Australia, namely the Red and Little Wattlebirds, the Noisy Miner, and the White-plumed, New Holland and Crescent Honeyeaters. Separately, they also examined the alarm vocalizations of these and other species. In New Zealand, the vocalizations of both the Tui and the New Zealand Bellbird, while not the subject of detailed contemporary studies, are nevertheless well known. The *Handbook of Australian, New Zealand and Antarctic Birds* presented detailed summaries of vocalizations of all the Australian and New Zealand meliphagids, and wherever possible included sonagrams of at least some vocalizations. The White-eared Honeyeater was found to have a repertoire of eight fairly loud and distinctive calls, although several of these were used only infrequently. The most commonly used calls were the "Chew call" and the "Two-note call", both of which are loud and appear to be utilized in the same circumstances; "Clock calls", "One-note calls" and "Scolding" also were used often, but less so than were chew and two-note calls; and the "Rapid Clock", "Trill" and "Chip" calls were used only infrequently. Most of these calls consisted of a varying number of repeats of a single distinctive syllable, both chew and two-note calls, for example, consisting of syllables repeated up to six times. Similarly, the Yellow-throated Honeyeater was found to have eight calls. At least some of these vocalizations sound very similar to those of the White-eared Honeyeater of the mainland, and comparisons of sonagrams show that the main calls of

Plants use nectar to attract pollinators. Honeyeaters, however, do not always reciprocate. Whereas the Brown Honeyeater is morphologically suited to feed on the tubular flowers of Eucalyptus stoatei and thus acts as a pollinator, it is not deterred by less conveniently shaped flowers. In such instances, honeyeaters may engage in nectar thievery, piercing the base of the flower to extract the nectar. As the birds do not brush against the stamen or stigma, they do not contribute to the pollination process.

[*Lichmera indistincta* indistincta, Katherine, Northern Territory, Australia.
Photo: Roland Seitre]

In terms of diet, members of the genus *Xanthotis* are generalists. **Macleay's Honeyeater** is primarily insectivorous, but will also take fruit and nectar, for instance from native bottlebrush (*Callistemon*) trees. The species forages at all levels of its forest habitat, but is most frequently encountered in the canopy. Whilst usually an active yet unobtrusive feeder, Macleay's Honeyeater can become rather noisy when feeding among dead leaves, a niche that it regularly exploits. The species usually feeds alone or in pairs, but sometimes forms groups of up to 30 individuals.

[*Xanthotis macleayanus*,
Atherton Tableland,
N Queensland, Australia.
Photo: Marie Read]



the two are similar in structure and composition. Sonagrams of two-note calls of White-eared Honeyeaters and "Breeding Songs" of Yellow-throated Honeyeaters are very similar in appearance, both consisting of two-note syllables and both given during the breeding season. White-plumed Honeyeaters were found to have a repertoire of two calls, including the chip call and three types of "Alarm Call", and three types of song, one of which varies between sites and has two or three variants at any one site. The New Holland Honeyeater has a repertoire of seven main calls, dominated by simple, single-note calls.

Bell Miners have been the subject of several detailed studies, and have a considerably more complex range of calls. A total of 18 adult vocalizations and four juvenile calls has been distinguished, all of which could contain harmonics. Many of these calls, however, have a range of variants; for example, the chip call had five distinguishable variants, making the overall repertoire considerably larger. Noisy Miners, too, have a varied repertoire of loud and penetrating calls, whistles and scolding calls; one study recognized twelve separate vocalizations, and other work identified a further two. In addition, Noisy Miners perform a complex dawn song, which may, incidentally, be given also at dusk. This is composed of, or at least includes, a variety of individual vocalizations and possibly other clear whistled notes; it is delivered by single individuals but more usually is given communally, when it often involves antiphonal singing.

Much work has been done also on the alarm vocalizations of honeyeaters, and other birds, in Australia. Jurisevic and Sanderson examined the alarm vocalizations of twelve species of honeyeater, along with a range of other species. They recorded two basic types of alarm call: the first involved harsh and nasal, broad-frequency (1–10 kHz) calls, of several types, including chattering calls, which allow for interspecific and intraspecific communication, easy location and long-distance transmission; and the second narrow-frequency (1–5 kHz) whistled and tonal calls, the whistles usually descending, emitted as rapidly repeated staccato notes. The White-plumed and Yellow-plumed Honeyeaters and the Noisy and Bell Miners had several types of broad-band call. Some congeneric species had very similar alarm calls: the White-plumed, Yellow-plumed and Singing Honeyeaters, in *Lichenostomus*; the Noisy, Yellow-throated and Bell Miners, in *Manorina*; and the New Holland and Crescent Honeyeaters, in

Phylidonyris. Other species that gave broad-band calls were Lewin's Honeyeater, the Red and Little Wattlebirds and the Noisy Friarbird. The broad-band calls were given in response to avian and other threats which were on the ground or perched, or during mobbing, but they were not recorded as a response to birds of prey or other large birds in flight, unless the meliphagids were mobbing these. Seven species of honeyeater gave narrow-frequency calls. These were the White-plumed and Yellow-plumed Honeyeaters, the Red Wattlebird, the Noisy and Bell Miners, and the New Holland and Crescent Honeyeaters. These species emitted narrow-band calls in response to flying threats or potential threats, such as birds of prey or other large birds, and apparently also when surprised by a potential threat, whether in flight or on the ground. Some narrow-band calls appeared also to provide warnings to other species. For example, the whistled alarm calls of New Holland Honeyeaters would cause European Goldfinches (*Carduelis carduelis*) and White-plumed Honeyeaters, the former an introduced species, to fly for cover, and Crimson (*Platycercus elegans*) and Eastern Rosellas (*Platycercus eximius*) would do the same in response to the tonal alarms of Noisy Miners.

Nearly all information on the possible functions of the various vocalizations of honeyeaters are the result of observational studies, supplemented with many claims in anecdotal reports, the latter usually with little evidence. The main vocalizations, however, appear to function in the defence of a range of territories, associated with aggressive behaviour, ranging from the short-term defence of resources, such as individual flowering plants or even parts of the crowns of flowering trees, to the defence of large and permanent territories or the colonial defence of large areas by species such as the miners. They are sometimes associated also with courtship behaviour. Similarly, song flights, which are performed by a number of species (see General Habits), appear to function in territorial defence, as well as being implicated in courtship behaviour.

The "Tink call" of the Bell Miner, as well as being a contact call among members of the colony, and possibly an alarm call, appears to function as an interspecific territorial call, deterring other species from entering miner colonies. When the sound of a Bell Miner colony was played at sites without Bell Miners, but where colonies of the latter were nearby, other bird species reduced their calling, which was consistent with the silent behav-

The only member of its genus, the **Wattled Honeyeater** is primarily nectarivorous, feeding on a variety of flowering trees, shrubs and palms.

Its target blooms differ wildly in size: those of the nutmeg *Myristica inutulis* are very small, in contrast to the large and splendid flowers of the coral tree (*Erythrina variegata*). The Wattled Honeyeater has also learnt to make use of non-native plants such as banana (*Musa*), coconut palms (*Cocos nucifera*) and, as here, torch ginger (*Etlingera elatior*), a plant native to South-east Asia and the Greater Sundas but now widely cultivated in Fiji.

[*Foulehaio carunculatus*,
Fiji.
Photo: Tim Laman]



four of birds of other species that attempted to intrude into Bell Miner colonies. These intruding birds, however, did not leave the site, which indicated that the eviction of other species from miner colonies probably requires additional stimulus, such as chasing or other aggressive behaviour. Probably all meliphagid species give alarm or distress calls, the function of which is self-explanatory. At least some species appear to have separate alarm calls for aerial and terrestrial predators. For instance, in response to aerial predators Bell Miners give the "Eek" call and Noisy Miners the "Aerial Predator Alarm", whereas ground predators elicit from these respective species the "Mmm call" and the "Chur call". Alarm calls often draw other honeyeaters towards the caller, which may then lead to mobbing of the predator or corroborees (see General Habits), or both. The "Wheek call" of Bell Miners is often given after an alarm, and may attract birds to a mobbing event, but they utter a separate call, the "Waw", when actually mobbing a bird. Whereas nestlings and fledged juveniles tend to give distress calls when handled, adult honeyeaters are typically silent in the hand.

Other vocalizations are commonly considered to be contact calls, between members of a pair or among colony members, and many species, especially migratory ones, such as the White-naped and Yellow-faced Honeyeaters, have characteristic flight calls. The colonial Bell Miner commonly gives the wheek call at dusk, individuals often uttering it continuously while flying to a roosting site, and this call is thought possibly to assist in co-ordinating roosting.

At least some species have specific calls associated with communication with nestlings or fledglings. As an example, the "Mew call" of Bell Miners is given mainly by the adults when with young. With this species, the mew elicits a begging response from the young, and this has been confirmed by call playback, but it is used also to induce another adult to leave the young when the caller is approaching, to signal to other birds that the caller is

leaving the young, to encourage nestlings to leave the nest, and to lead fledglings away from danger. Nestlings and recently fledged juveniles usually have specific begging calls, typically simple whistles or piping notes. Nestling Bell Miners have a begging call, the "Sceet call", that is different from that of fledged juveniles.

For most species, there appears to be little or no difference in vocalizations between the sexes, although, as with many other aspects of meliphagid biology and ecology, relevant observations and, especially, interpretation of anecdotal reports are hampered by the lack of conspicuous differences in morphology between the sexes. Nevertheless, some species do have sex-specific vocalizations. Of the 18 adult vocalizations of Bell Miners, six were given only by females, mainly during the courtship period and not in the non-breeding period or when attending nestlings; one or, possibly, two were given only by males. Further, while the New Zealand Bellbird's song varies greatly, the song of the female is distinguishable from three types of song given only by males. Even with vocalizations given by both sexes, there may be differences in pitch between the two. Again, the bellbird provides a good example of this: on Three Kings Islands, north of the North Island, both male and female have the same harsh call note, but that of the female is a little higher-pitched. Among species for which there are no apparent differences between the sexes in the sounds uttered, it appears that in some cases there are differences in the frequency of use of different sounds, or in the circumstances of their use. Although there are few quantitative data, males of at least some species, examples being the Scarlet Myzomela and the Black Honeyeater, appear to vocalize more than do the females, but such observations are, of course, more easily made for plumage-dimorphic species, such as many myzomelas. On the other hand, female New Holland Honeyeaters were found to be usually more vocal than were the males, especially during the early stages of breeding, although song flights, which are conspicuous, are performed only by males.

Most members of the family show diurnal and seasonal variation in rates of vocalizing, although some appear to exhibit little variation in this respect. The Bell Miner, for example, appears to call throughout the day, though there may be quiet periods in colonies, and calling seems not to vary seasonally. A few species, such as the Tui, not uncommonly sing on moonlit nights. Keast has conducted several studies examining diurnal rates of singing, with most data from the Hawkesbury River in New South Wales, in south-eastern Australia, and some comparisons with data from the Northern Territory, in northern Australia. Several species of honeyeater were major contributors to the dawn chorus, and included the Little Wattlebird and Yellow-faced Honeyeater on the Hawkesbury River, and the White-gaped and White-throated Honeyeaters in the Northern Territory. The rates of singing of these species in spring, however, varied much through the day, the Little Wattlebird and the White-gaped Honeyeater calling much less after sunrise, whereas the Yellow-faced and White-throated Honeyeaters continued to call intermittently throughout the day. On the Hawkesbury River, in October, Little Wattlebirds began vocalizing 28–23 minutes before sunrise and continued to sing until about five minutes after sunrise, with a peak of singing during the 20 minutes preceding sunrise. Thereafter, only sporadic and brief bursts of song were heard from wattlebirds during the rest of day, but with a resurgence before sunset. In comparison, at the same site and time, Yellow-faced Honeyeaters began their dawn song within a few minutes of the first calls of the dawn chorus, 35–20 minutes before sunrise, and stopped singing suddenly, 14–8 minutes before sunrise; thereafter, they uttered daytime song throughout the day but at low rates, with slightly higher rates in the first hour or so of daylight and again towards sunset.

In a separate study, in north-east New South Wales, in May, Little Wattlebirds apparently defending feeding territories were found to call throughout the day, with highest rates of calling in the morning and lower rates at midday and in the afternoon. This recorded decline in vocal activity from the morning to the afternoon was possibly related either to re-establishment of feeding territories in the early hours or to a decline in the standing crop of nectar during the day.

The Blue-faced Honeyeater, a large, distinctive meliphagid placed alone in its genus, has a very varied diet. The species probes for nectar at flowers, particularly those in the genera *Eucalyptus*, *Melaleuca* and *Grevillea*. Usually foraging in small groups, it also preys on arthropods and small lizards, and feeds on fruit from both indigenous and exotic plants. This individual is using its strong legs and powerful claws to hang dexterously from a non-native banana (*Musa*) inflorescence. It may be seeking nectar or, alternatively, insects lurking within the flower. In addition to gleaning and sallying, the Blue-faced Honeyeater also flutter-chases through foliage, pouncing on any arthropod that it disturbs.

[*Entomyzon cyanotis* cyanotis, Beerwah, Queensland, Australia.
Photo: Graeme Chapman]



Some meliphagids, particularly in Australia, are believed to be at least partially nomadic. The movements in the non-breeding season of some subspecies of the **Noisy Friarbird** are complex, but appear to be associated with the flowering of food plants, particularly members of the Myrtaceae, such as the genera *Eucalyptus* and *Angophora*, and Proteaceae, for example *Banksia* and *Grevillea*. Populations of the Noisy Friarbird race *monachus* that are migratory appear to move north through east Australia in autumn, returning south in late winter or spring. In addition to probing flowers for nectar, the Noisy Friarbird exploits another plant resource by consuming pollen. The species, like its congeners, also captures arthropods up to the size of cicadas, eats fruit, ingests lerp and manna, and probes for *Eucalyptus* sap. To add to the dietary mix, the species is reported to take eggs and nestlings of the Common Starling (*Sturnus vulgaris*) and even to capture fish up to 30 mm long. The Noisy Friarbird tends to forage alone or in pairs, but small groups are regular and larger flocks of up to 30 birds may congregate at fruiting or flowering trees. Sometimes friarbirds may feed quietly alongside fellow honeyeaters such as Red Wattlebirds (*Anthochaera carunculata*); at other times they may interact in an aggressive fashion.

[*Philemon corniculatus*,
Australia.

Photo: Jean-Paul Ferrero/
Ardea]



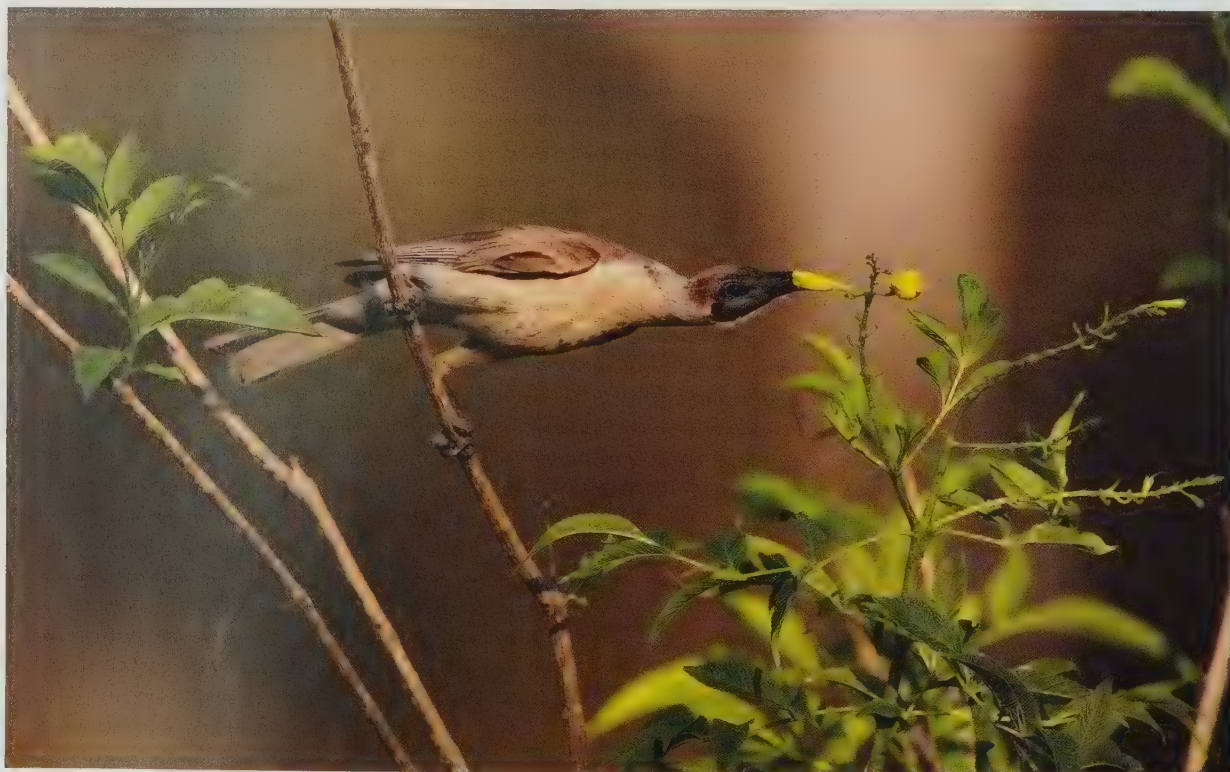
Keast made some observations also on the effect of weather on calling activity during the austral summer months of December and January. He found that, for example, Yellow-faced Honeyeaters exhibited no significant differences in the amount of dawn song between fine mornings and foggy or dull mornings, but rain reduced the singing rates significantly and delayed the onset of dawn song by 15–20 minutes.

There have been few quantitative studies of seasonal changes in rates of singing. Near Sydney, the White-eared Honeyeater, while vocalizing at generally similar rates throughout the year, showed a major shift in the vocalizations used. Most significantly, the use of chew and two-note calls was inversely correlated, although the function of such a switch was not clear. The decline in use of chew calls and the increase in use of two-note calls corresponded with the beginning of breeding behaviour, and the peak of use of two-note calls was in late winter and early spring, which corresponded also with the peak of breeding. Interestingly, the Yellow-throated Honeyeater, the Tasmanian sibling species of the White-eared Honeyeater, makes a similar switch in use of the two main territorial vocalizations over the year, the "Tonk call", or "Non-breeding Song", being used throughout the year and the "Song", or "Breeding Song", used only during the breeding season. Seasonal changes in singing or in use of different types of song are often associated with breeding and the establishment and defence of territories, both breeding and feeding territories. For example, on arrival on the breeding grounds from the wintering areas, male Tuists establish territories by means of frequent and intense bouts of song, diving displays and song flights, which continue at high levels until the start of incubation. Near Sydney, between late February and late August, calling by Little Wattlebirds exhibited peaks in April, June and August, which were probably associated with the establishment of feeding territories at new sources of nectar.

Dual singing, or duetting, has been widely reported for the family, although, again, there have been few studies of the behaviour. Duetting has been reported for all or most species of the genera *Anthochaera*, *Philemon* and *Melidectes*, and for the Spiny-cheeked Honeyeater in the monotypic *Acanthagenys*. The two well-studied species of *Manorina*, the Bell and Noisy Miners, both duet, as does the Giant Honeyeater but not, apparently, the two other *Gymnomyza* species. Diamond and J. W. Terborgh described dual singing by a range of species in New Guinea and the southwestern Pacific, including the Cinnamon-browed, Belford's, Yel-

low-browed, Wattled and Giant Honeyeaters and the Helmeted and New Britain Friarbirds. Apparent duetting has been anecdotally reported for many other species. The form of duetting, however, varies among these species, and even within genera. Duets by the New Britain Friarbird were unison duets, pair-members repeatedly giving the same song nearly or exactly in synchrony, whereas Helmeted Friarbirds from Madang, of the subspecies *jobiensis*, sang antiphonal duets, the two singing different phrases alternately, although the duetting was not always tightly synchronous. Similarly, Belford's Honeyeaters perform antiphonal duets, two individuals uttering "caw" phrases in rapid and perfect alternation up to 34 times, while the perched singers face each other on a branch. Wattled Honeyeaters of Samoa and Fiji duetted, usually within a metre or two of each other on the same branch, with repeated loud, mellow notes in antiphonal patterns, although they also performed unison duets. In Australia, pairs of Spiny-cheeked Honeyeaters perform well-developed antiphonal duets while perched beside each other, one of the pair immediately beginning to call when the phrase of the other finishes. The first bird to sing points its tail towards its partner and stretches its throat until its head is straight in front of its partner, and then sings a phrase. At the end of the song phrase the second bird adopts the same posture and sings immediately. These duets are used in greeting, apparently to strengthen the pair-bond. Little Wattlebirds likewise perform antiphonal duets in the breeding season and, at least sometimes, when defending feeding territories, the duets often beginning with high-pitched metallic shrieks from the female and lower-pitched chuckling squawks from the male.

Several examples of vocal mimicry are evident within the Meliphagidae, though the function of this phenomenon is not clear. The Tui is an accomplished mimic, and is said to imitate almost every bird species that it hears, often with its own added embellishments. Domesticated individuals were reported as imitating almost every noise heard, and captives were much prized by Maori people, and were taught sentences of welcome, platitudes, and insults (see Relationship with Man). The Tui is thought to mimic the New Zealand Bellbird, especially as there are few bell-like notes in its own song in those parts of the range where bellbirds do not occur, but mimicry of the bellbirds requires confirmation. In Australia, the Regent Honeyeater is an excellent mimic, although such mimicry is almost confined to the non-breeding period, and is typically brief and given by single individuals when foraging with other, larger species of honeyeater. In the non-breed-



It may seem odd that a large honeyeater such as a **Little Friarbird** probes a tiny flower for nectar, but research suggests that meliphagids target flowers that provide the most plentiful nectar. In a study in northern Australia, half of Little Friarbird nectarivorous visits were to flowers with stamiferous cups, such as Eucalyptus; a fifth were to brush inflorescences, for example Banksia; and an eighth to gullet-shaped flowers such as Grevillea. Time of day is also a factor, as nectar is most abundant at dawn. Flowers with little nectar may be visited only when more copious supplies have expired.

[*Philemon citreogularis sordidus*, near Mt Barnett, Gibb River Road, Kimberley, Western Australia. Photo: Don Hadden]

ing season, single Regent Honeyeaters have been heard to mimic larger honeyeater species while associating with them, including nearly the whole repertoire of the Red and Little Wattlebirds, at least two Noisy Friarbird calls, and calls identical to those of the Little Friarbird, some calls of which are, however, very similar to the Regent Honeyeater's own. Some of the wattlebird vocalizations were mimicked less harshly and more quietly, but the imitated Noisy Friarbird calls were excellent, if quieter. All the mimicked calls were given by the Regent Honeyeater as discrete calls, and not as part of song or subsong. There have been reports of mimicry, or possible mimicry, of the calls also of the Olive-backed Oriole, the Grey Shrike-thrush (*Colluricincla harmonica*), the White-browed Babbler (*Pomatostomus superciliosus*) and the Spiny-cheeked Honeyeater. Mimicry has been heard from non-breeding flocks of Regent Honeyeaters, and this species has been heard, rarely, to utter mimicked songs or calls of Grey Butcherbirds (*Cracticus torquatus*) and Noisy Friarbirds in the breeding season. It has been suggested that the function of this mimicry is to deceive the models and to reduce competition for food and possible aggression by the models, and possibly to promote cohesion between Regent Honeyeaters and larger honeyeaters or to help in defence of resources or territories against smaller competitors. The models mimicked generally tolerate or ignore the Regent Honeyeater in circumstances that would otherwise result in aggressive interactions between them. Regent Honeyeaters that utter their own call when foraging with Red Wattlebirds were chased away by the latter. Little Wattlebirds have been heard to respond to mimicked calls made by Regent Honeyeaters.

Spiny-cheeked Honeyeaters, too, mimic a range of species, including the Grey Shrike-thrush, the Olive-backed Oriole, the Regent Honeyeater and the Western Wattlebird, and also, in quiet subsong, the Noisy Friarbird and the Crested Bellbird (*Oreoica gutturalis*), the last a member of the whistler family (Pachycephalidae). In Australia, occasional mimicry has been reported for a number of meliphagids. A Little Wattlebird that associated with Red Wattlebirds over four or so days was not heard to give any of its own calls, but only those of Red Wattlebirds, although not so loudly, and individual White-eared Honeyeaters have been known to mimic a call of the Hooded Robin (*Melanodryas cucullata*) and the call of a Spiny-cheeked Honeyeater. Mimicry of the calls of the Pacific Baza (*Aviceda subcristata*) and the Golden Whistler (*Pachycephala pectoralis*) were once heard from a group of White-plumed Honeyeaters, and White-fronted Honeyeaters are reported as mimicking Australian ringnecks (*Barnardius*) and the Crested Bellbird. A few other species, such as the Singing Honeyeater and the Yellow-throated Miner, are suspected of mimicry.

In New Guinea, the Streak-headed Honeyeater is both a visual and a vocal mimic of the Brown Oriole, which in turn is a visual mimic of the Helmeted Friarbird of the local race *novaeguineae*. The vocal mimicry of friarbirds by orioles itself is also of great interest, and is discussed briefly elsewhere (see pages 698–701).

Meliphagids produce some non-vocal sounds. Many, or perhaps all, honeyeaters loudly snap or click the bill, singly or in clattering series, sometimes as a component of vocalizations or during agonistic interactions, such as chases and fights. Some also perform bill-clicking during distraction displays at the nest or when with fledglings. Unusual among honeyeaters are the wing noises of the two New Zealand endemics, the Tui and the New Zealand Bellbird. Both of these species produce loud, distinctive noises when in flight, that of the Tui described as a whirring or "whurru". These sounds appear to be created by slots in the wing, formed by notches in the eighth primary of the Tui and in the ninth primary of the bellbird, which are larger in males than in females and are lacking or extremely small in juveniles and immatures. The noises are thought to be under the control of the birds, and are heard in flight during chases and displays, most conspicuously during aggressive interactions, but also during rapid aerial courtship chases; an audible noise is produced also when the birds fly from branch to branch and when they sally after insects.

Recently, there has been an appreciation of the importance of behavioural characters, especially vocalizations, in determining



the taxonomy of species, particularly when examining the differences between allopatric forms. The ground-breaking work *A Guide to the Birds of Wallacea*, by Coates and K. D. Bishop, not only provides for the first time descriptions of the vocalizations of many of these species, but also highlights differences between subspecies or island populations. These differences, where they exist, point to fruitful directions for the study of the systematics of some of these species and subspecies, and indicate the kind of observations that ornithologists should be making in the field.

Food and Feeding

Probably all honeyeaters visit flowers to consume nectar. Insects and spiders (Araneae), providing protein, are an essential part of the diet of all species. Fruit, too, features prominently in the diet of several species, especially those living in rainforest. A number of other sweet foods can be important for honeyeaters at times. These are primary or secondary plant exudates that are rich in sugar or other carbohydrates. To some degree, the species' morphology, especially that of the bill, reflects its diet and feeding behaviour. Smaller, long-billed species tend to feed more on nectar than on insects, whereas smaller, short-billed species tend to feed more on insects. The larger, short-billed species often include more fruit in their diets.

Nectar is a very simple food, consisting mostly of sugar and water. A wide range of birds, from Silvereyes (*Zosterops lateralis*), woodswallows (*Artamus*) and trillers (*Lalage*) to crows and ravens (*Corvus*), consumes nectar from Australian plants, suggesting that no major specialization is required. Meliphagids do show some adaptations that presumably increase their efficiency in gaining access to the nectar in flowers (see Morphological Aspects). Generally, the more insectivorous honeyeaters have a longer bill than that of other insectivorous passerines, and nectarivorous honeyeaters are longer-billed than are insectivorous ones, in relation to body weight. A long and relatively narrow bill presumably allows better access to flowers, especially tubular ones. Proportionately, the bills of honeyeaters are much shorter than those of hummingbirds, and even those of sunbirds. This is perhaps due to the importance of insects, and alternative carbohydrates, in the diet of honeyeaters compared with these other nectarivores. The one adaptation to nectar-feeding shown by all honeyeaters is a brush-tipped tongue, the tip of which may be divided into two, four or more clusters of bristles to allow rapid uptake of liquids, such as nectar (see Morphological Aspects). Although many other passerines have a slight brush at the

Although fully mature flowers are most likely to have abundant nectar, it pays meliphagids not to pass up any opportunity.

This **Dark-brown Honeyeater** is reaching down to investigate a flower that is just starting to emerge. Any nectar present will be efficiently extracted with the brush-tipped tongue common to almost all honeyeater genera. The tip of the tongue is split into clusters of bristles, the large surface area of which accelerates the bird's ingestion of the sugary liquid.

[*Lichmera incana incana*,
Rivière Bleue Park,
New Caledonia.
Photo: Roger Le Guen]

tip of the tongue, this is most developed in honeyeaters, being relatively larger in the more nectarivorous species. The digestive systems of honeyeaters also differ slightly from those of insectivorous birds, the former having a less muscular gizzard and shorter intestines. Honeyeaters also have strong legs and claws, a fact appreciated by all who have handled them. These presumably assist the birds in clinging to branches to reach flowers.

Many aspects of the behaviour and ecology of honeyeaters are clearly related to nectar-feeding. Examples include their dexterity in moving among shrubs and trees to reach isolated flowers, and their tendency to be aggressive around rich nectar sources. Moreover, the complex seasonal movements or nomadism of some members of the family are related to a rich resource that varies greatly, and sometimes unpredictably, in time and space. Honeyeaters visit a great diversity of flowers in their search for energy. The decurved bill helps them to probe in flowers, although only the spinebills have a long curved bill and the myzomelas and *Melidectes* species a moderately long bill. Nectar is absorbed onto the brush-tipped tongue, which flicks in and out of the bill at high speed. Unlike hummingbirds, which typically take nectar while hovering, honeyeaters are almost always perched while they visit flowers. Only the spinebills, the myzomelas and the Brown Honeyeater have been seen often to hover at flowers. Such small birds may be able to visit flowers more rapidly and efficiently by using this method of feeding, especially when flowers are scattered around the periphery of a plant. Honeyeaters may ingest significant amounts of pollen, but this passes through the bird largely undigested; pollen consumption appears, therefore, to be largely accidental and it is not a major food source. The heathlands and open forests of coastal Australia are floristically diverse, numerous plants producing regular supplies of nectar, sometimes from showy flowers or inflorescences. These vary in their structure, from being simple cup-shaped flowers, as in the eucalypts, to being narrow tubes and collections of hundreds of tiny flowers in a brush-like inflorescence.

The genus *Eucalyptus*, of the plant family Myrtaceae, has diversified into some 500 species in the drier forests and woodlands, and its flowers are remarkably uniform, a cup with a central style surrounded by rings of stamens. The flowers are arranged in loose clusters, and nectar production can be modest or copious. Insects are the commonest visitors to the smaller-flowered species, but honeyeaters, lorikeets, other passerines, bats (Chiroptera) and even non-flying mammals may consume nectar

from the larger-flowered ones. All of the common honeyeaters of southern Australia, such as Red Wattlebirds and New Holland Honeyeaters, have been seen to probe into eucalypt flowers for nectar, and for shorter-billed species, such as the Yellow-faced and White-naped Honeyeaters, this genus provides the most significant source of nectar. The ironbarks, such as *Eucalyptus sideroxylon*, provide a critical energy source for the globally threatened Regent Honeyeater, and many other birds, on the inland slopes of the Great Divide. A few eucalypts seem to be visited almost exclusively by honeyeaters. *Eucalyptus stoatei* has almost tubular flowers to which access is denied to smaller visitors by the densely incurved stamens, but at which Western Wattlebirds and Brown and Purple-gaped Honeyeaters are able to feed. Bloodwoods (*Corymbia*), closely related to *Eucalyptus* and until recently placed in the latter genus, provide a nectar source for meliphagids, such as Little Friarbirds and Yellow-throated Miners, in northern and central Australia. A number of relatives of the eucalypts in the Myrtaceae have similar individual flowers, but they are arranged into inflorescences that resemble bottle-brushes. Indeed, "bottlebrush" is the common vernacular name for the genus *Callistemon*, which is popular with such honeyeaters as the New Holland Honeyeater. The paperbarks in the genus *Melaleuca*, which are small to large trees forming woodlands and forests in damp areas, especially around the northern coasts, have similar, though usually white or cream, inflorescences to which Helmeted Friarbirds and Banded, Bar-breasted and Brown-backed Honeyeaters are common visitors.

Proteaceae is the other major family the flowers of which provide nectar for birds and which is found almost throughout Australia. In *Grevillea* and *Adenanthos* the petals are reduced to a small bulb, containing the nectar. These are visited by New Holland and Purple-gaped Honeyeaters in southern Australia, whereas *G. pteridifolia* of northern Australia is visited by many species, including White-gaped and Blue-faced Honeyeaters. The most important genus in this family, however, is *Banksia*, in which many hundreds of flowers, similar to those of *Grevillea*, are packed into a tight inflorescence shaped like a bottle-brush. *Banksias* reach their greatest diversity in south-west Australia, but there are a number of species on the eastern coast. The individual flowers may produce only modest amounts of nectar, but this can coalesce along the central stem of the brush to produce a veritable feast for a visiting bird. In the coastal heaths, banksia nectar sustains dense populations of New Holland and White-



For meliphagids such as the **Yellow-spotted Honeyeater** that primarily inhabit rainforest, fruit is a particularly important dietary component, providing a significant source of carbohydrates. In northern Queensland, some 84% of trees produce fleshy fruits, and two-thirds of these species are dispersed by birds. The most common fruit colours are yellow, orange, red and purple, all of which stand out amongst green foliage. The Yellow-spotted Honeyeater usually forages in the mid-canopy or shrub layer, and may glean insects from the fruit surface as well as pecking flesh from the fruits themselves.

[*Meliphaga notata mixta*, Paluma, Queensland, Australia.
Photo: Roland Seitre]

In Australia and New Guinea, many honeyeaters occur sympatrically and in the same habitats, but are able to co-exist by dint of exploiting different ecological niches. A good example involves the **White-eared Honeyeater**, which specializes in foraging on tree trunks and branches, where it probes under flaking bark or into crevices in rough bark to reach sources of sap that leak after insect damage, or to extract honeydew excreted by insects such as aphids (Aphidoidea). At some sites, the White-eared Honeyeater almost entirely forsakes nectar in its quest for manna. It forages mainly on trees of the genus *Eucalyptus* and, indeed, may only venture to other genera when they are in flower.

[*Lichenostomus leucotis*
leucotis,
Scottsdale Reserve,
New South Wales,
Australia.

Photo: Jiri Lochman/
Lochman Transparencies]



cheeked Honeyeaters, and Little Wattlebirds are rarely found away from banksias. The Western Wattlebird feeds on a wide range of proteaceous flowers, including *Dryandra*, which also has brush-like inflorescences. The coastal forests also may be carpeted by shrubs bearing tubular flowers, typically members of the family of southern heaths (Epacridaceae). Genera such as *Epacris* and *Astroloma* are popular among the longer-billed honeyeaters in winter. Eastern Spinebills, in particular, insert the fine, decurved bill into the red tubular heath flowers.

The coastal heaths and woodlands of south-western Australia contain what is one of the greatest varieties of plants found anywhere on Earth. Although many belong to the families Myrtaceae and Proteaceae, they include representatives of a wide range of families that in eastern Australia are typically insect-pollinated. The kangaroo paws (*Anigozanthos*) are of special interest. These relatives of the lilies present gullet-shaped flowers on stalks growing up from the ground. Smaller honeyeaters, such as the Western Spinebill, cling to the stems in order to probe the flowers, whereas larger honeyeaters, such as the Red Wattlebird, stand on the ground to feed on the nectar. The woodlands and drier forests of northern Australia, New Guinea and Indonesia also have the familiar eucalypts and grevilleas, but several other plants are important nectar sources here. Helmeted Friarbirds feed on flowers of black bean (*Castanospermum*), whereas Silver-crowned Friarbirds visit flowers of *Xanthostemon*, a relative of the eucalypts. The arid regions of central Australia are not without sources of nectar for honeyeaters. There are scattered eucalypts here, as well as shrubs of *Hakea*, a relative of *Grevillea*, which may flower prolifically. Even Crimson Chats feed on *Hakea* flowers, along with Grey-headed and Spiny-cheeked Honeyeaters. One of the most spectacular genera of flowering shrubs is *Eremophila*, a name that means "desert-lover". After good rain, these plants produce masses of red or yellow gullet-shaped flowers, which

draw in honeyeaters from the surrounding areas. The nomadic Black, Pied and White-fronted Honeyeaters are especially associated with *Eremophila* flowers.

Rather less is known about the flowers visited by honeyeaters in the rainforests scattered along the eastern coast of Australia and covering much of New Guinea. This is partly because, in these places, fruit is relatively more important than nectar, and partly because it is difficult to make observations here. A further problem is that identification of the plants is often far from easy. Nectar-feeding honeyeaters are uncommon in the temperate rainforests of Tasmania, with only leatherwood (*Eucryphia lucida*) and the laurel *Anopterus glandulosa* providing significant sources of nectar for Eastern Spinebills. Strong-billed Honeyeaters, too, feed on leatherwood nectar. In the rainforests of New South Wales, Scarlet Honeyeaters and Eastern Spinebills visit mistletoes and a number of small-flowered shrubs. The silky oak (*Grevillea robusta*) also is popular with honeyeaters in this area, although most observations involve trees that have been planted as street trees outside the forest. Despite studies of the foraging ecology of birds undertaken in lowland and highland rainforest in north-east Queensland, there is little published information on the plant species that honeyeaters visit for nectar; nevertheless, *Syzygium*, a large tree related to the eucalypts, is popular with honeyeaters in lowland forest. In New Guinea, most meliphagid visitors to flowering trees and vines are the tiny myzomelas or members of the generalized genera *Xanthotis* and *Meliphaga*. Many of the trees produce thousands of small flowers up to 30 m above the ground and are difficult to identify. The myzomelas appear to be nomadic, moving into the area to feed on the trees, which flower asynchronously or unpredictably and yet produce masses of flowers. *Syzygium*, as in north-eastern Australia, is popular, but flowers only irregularly. The other honeyeaters, members of the genera *Xanthotis*, *Meliphaga* and *Melilestes*, are more sedentary and switch to fruit when few trees are flowering. Belford's and Ornate Honeyeaters, in *Melidectes*, are the most common visitors to flowering *Metastemma yamamotoi* (Rafflesiaceae), and a range of honeyeaters visits flowers of the epiphyte *Schefflera*, which flowers throughout the year. It seems that the nectar-feeding honeyeaters come into their own in New Guinea only in the high-altitude heaths, where the rhododendrons have diversified and are visited by honeyeaters such as species of *Melidectes*. Similarly, honeyeaters visit rhododendrons in the highlands of Lombok and Sulawesi.



Invertebrates are as integral to the honeyeater diet as nectar. This is particularly true of the shorter-billed meliphagids, which are morphologically less well equipped for nectarivory. Insects and spiders are the main types of quarry, but larger honeyeaters such as the **Noisy Miner** also take annelids, chilopods and pseudoscorpions. Insects feature particularly prominently in the honeyeater diet during the breeding season, when protein is in greater demand. Most insects are caught by gleaning, but the Noisy Miner is one of many species that also sally or even sally-hover.

[*Manorina melanocephala*
melanocephala,
Mort Bay, Balmain,
New South Wales,
Australia.

Photo: Ian Montgomery]

A habitat that has only recently been studied is mangrove. The Mangrove and Varied Honeyeaters are most associated with this habitat in northern and north-eastern Australia and New Guinea. They often feed on flowers, such as those of umbrella tree (*Schefflera*) and coral tree (*Erythrina*), which are outside the mangroves. Red-headed Honeyeaters also are common in mangroves, and near Darwin they feed from a succession of flowering mangroves in the genera *Rhizophora*, *Bruguiera* and *Aegiceras*.

At times, the two New Zealand honeyeaters can be highly nectarivorous, visiting a variety of plants through the year. Some of these plants are related to genera that are important nectar sources in Australia and New Guinea. *Metrosideros* resembles, and is related to, *Eucalyptus* and *Syzygium*, and its sugar-rich flowers are exploited by both of the New Zealand honeyeaters. *Knightia*, a member of the Proteaceae, is also an important nectar source. Some plants, however, do not have Australian counterparts, examples being the lily-like New Zealand flax (*Phormium tenax*) and *Vitex lucens*, the latter a small tree with scattered but nectar-rich flowers. *Fuchsia*, a genus associated more with South America, is popular with New Zealand Bellbirds and Tuis.

Nectar is provided not only within the flowers. Some species of *Acacia* possess nectaries on their phyllodes, and these are visited by honeyeaters when the plant is flowering. Rufous-banded Honeyeaters are often associated with *Acacia*, taking extra-floral nectar, as well as consuming the carbohydrate-rich arils that attach the seeds to the pods. It is often assumed that flowers visited by birds are brightly coloured, often red. Although flowers exploited by honeyeater are sometimes red, as illustrated by, among others, the epacrids, *Eremophila* and *Correa*, it is a fact that white, cream and yellow are very common colours of "bird flowers" in Australia and New Guinea. Perhaps more surprisingly, some bird flowers are quite cryptic, being green, as are some mistletoes, or brown, as are some grevilleas. Perhaps this is because there is a cost in being too showy, in attracting unwelcome visitors, which take the nectar but without pollinating the flowers. Whereas most honeyeaters take nectar by probing the flower and brushing against stamens and stigmas, in a few cases short-billed species may pierce the base, especially of tubular flowers. The Rufous-backed Honeyeater of New Guinea does this when feeding on rhododendron flowers, and Brown-headed

Honeyeaters sometimes exploit *Astroloma* and *Correa* flowers in this way.

Fleshy fruits provide an alternative source of carbohydrate-rich food for some honeyeaters in some habitats. The smallest meliphagids, the myzomelas and spinebills, only rarely take fruit, whereas the medium-sized generalists, such as *Lichenostomus*, include a small amount of fruit in their diet. A handful of species are specialized frugivores. For example, the Painted Honeyeater feeds mainly on mistletoe berries, and MacGregor's Honeyeater prefers podocarp fruits but may also take fruits from low shrubs. The Painted Honeyeater is often found in acacia woodlands where the mistletoe *Amyema quandong* is common. Spiny-cheeked Honeyeaters likewise eat a lot of mistletoe berries in semi-arid woodlands and shrublands, whereas Lewin's Honeyeaters feed on mistletoe berries in rainforests. There are few fleshy fruits in the forests and heaths of southern Australia, perhaps because they grow on soils that are low in many nutrients, such as potassium. Yellow-faced Honeyeaters and the wattlebirds sometimes consume significant amounts of fruit, including those from the epacridaceous genera *Astroloma* and *Leucopogon* and those of the native cherries (*Exocarpos*), and the Yellow-tufted Honeyeater feeds on *Coprosma* fruits (Rubiaceae). Several meliphagids, such as Lewin's Honeyeater and wattlebirds and friarbirds, also consume a variety of exotic berries and fruits, and they may be responsible for the spread of environmental weeds, such as bitou bush (*Chrysanthemoides monilifera*) along the coastal dunes of eastern Australia. Semi-arid habitats can contain a range of fleshy fruits, especially in the shrub-steppes, where the chenopod family dominates. Here, fruit makes up a significant component of the diet of Singing and Spiny-cheeked Honeyeaters. Saltbush berries (*Rhagodia*) are eaten by at least 18 species of honeyeater, including Grey-headed and Pied Honeyeaters. Singing Honeyeaters may also feed on and spread the African boxthorn (*Lycium ferocissimum*) through semi-arid Australia. Seeds pass through honeyeaters intact, allowing for their identification and also demonstrating that honeyeaters play a role in dispersing these plants. Coastal shrub communities may resemble the saltbush plains in having plentiful food throughout the year.

The colours of fruits eaten by honeyeaters cover the whole spectrum, though yellow, orange, red and purple are the most common. Some fruits are even bicoloured, or the fruits contrast strongly with their background. The native apricot (*Pittosporum*



The larger the honeyeater, the more sizeable the invertebrate prey it can take. This Red Wattlebird has caught a cicada (*Cicadidae*), which lies towards the upper end of the insect size range. Wattlebirds tend to increase their capture rate of invertebrates during the breeding season, to meet the demands of females and growing chicks for protein. Red Wattlebirds deploy several foraging techniques when seeking invertebrates. They probe bark, glean from foliage, sally over long distances, and hop along the ground before pouncing on an unsuspecting insect.

[*Anthochaera carunculata*
carunculata,
Gundagai,
New South Wales,
Australia.
Photo: David Stowe]

phylliraeoides) advertises its orange seeds against a yellow capsule. Some honeyeaters, such as the Singing and Spiny-cheeked Honeyeaters, are occasionally duped by plants, consuming seeds that contain no reward. The deep glossy blue seeds of the sheebush (*Geijera linearifolia*) and the red nuts of *Gahnia sieberana* emerge unaltered after passing through the digestive system of the birds. They apparently mimic edible fruits, with which they co-occur.

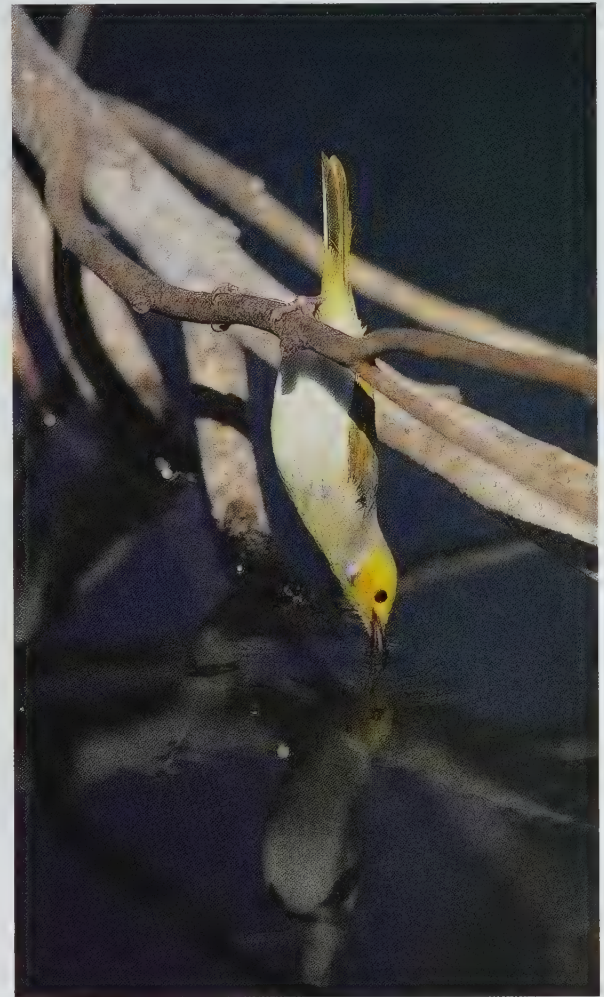
In the rainforests of eastern Australia and New Guinea fruit has become a major food source for birds, 84% of tree species in north Queensland rainforests producing fleshy fruits, 68% of which are dispersed by birds. The major frugivores are pigeons, bowerbirds (Ptilonorhynchidae) and, of course, cassowaries (Casuariidae). Honeyeaters are only relatively minor players. Lewin's Honeyeaters are the most frequent consumers of fruit in the south and in the highlands of Queensland, where they may deplete *Myoporum* plants very rapidly. In the Queensland lowlands, and especially in New Guinea, the genera *Meliphaga* and *Xanthotis* become more diverse and consume much fruit. Not only do many tree species produce fleshy fruit, but they are taxonomically diverse, with no one family predominating. Figs (*Ficus*), along with members of the Lauraceae, Meliaceae, Elaeocarpaceae and Araliaceae, are among the more important sources of fruit for birds in rainforests. Both species of honeyeater in New Zealand consume fruit, especially in autumn and winter. Here, *Podocarpus* trees and *Coprosma* shrubs are the most frequently visited, but there are many other plants that produce edible fruit. A rather unconventional "fruit" is presented by some acacias, in which the dry pod opens to reveal black seeds attached by a red or yellow aril; this aril is rich in lipids, whereas the majority of fruits contain mostly sugars. Lewin's Honeyeaters consume the aril and seed and defecate the seed intact. Rufous-banded Honeyeaters, however, remove the seeds of black wattle before consuming the arils.

Seeds have been recorded as the food of a number of meliphagids, such as Striped, White-lined and Singing Honeyeaters. As the majority of these are seeds that have been found in stomachs, it is likely that they are mostly those from fleshy fruits, which are passed by the birds undigested. In a few cases, however, seeds may be the intended food, because the plant does not have fleshy fruits. Banded Honeyeaters have been found with grass seeds in the stomach.

All honeyeaters consume invertebrates, mainly insects and spiders, either as a major food or as a source of protein. Many of the shorter-billed honeyeaters, for instance those in the genera *Lichenostomus* and *Melithreptus*, consume considerable numbers of arthropods throughout the year. The Green-backed and Grey Honeyeaters may be almost exclusively insectivorous. The most frequent foraging method is to glean insects from foliage, often of eucalypts, but also that of acacias. Honeyeaters often move rapidly among the foliage, and quite often hang from twigs in order to take insects from below them. White-naped and Black-chinned Honeyeaters feed on caterpillars that tie leaves together. Macleay's Honeyeaters specialize in foraging on dead leaves and large leaves of rainforest trees, and a few honeyeaters have become specialized for foraging on bark. MacGregor's Honeyeater probes into soft wood and moss, opening its bill to allow access to invertebrates. The myzas of Sulawesi are said to scurry about in the moss-draped branches of highland rainforest trees in the manner of squirrels (Sciuridae). In Tasmania, the Strong-billed Honeyeater probes into the trunk and main branches of trees, just as an Australasian treecreeper does, perhaps enabled to forage in this way by the fact that there are no true treecreepers in Tasmania. It also clings to long strips of bark and prises out insects. The Long-billed Honeyeater in New Guinea sometimes climbs up tree trunks like a treecreeper, gleaning and probing in crevices in bark for insects. Many of the more nectarivorous honeyeaters capture their insect prey by sallying from perches, taking midges (Diptera) and small hymenopterans in the air. The larger species do not appear particularly adept at this. Sometimes they may take insects, even those up to the size of honeybees (*Apis*), from flowers, and this is conspicuously different from when they are imbibing nectar. Tawny-crowned and Rufous-throated Honeyeaters feed on the ground, the former frequently and the latter

Access to water is as imperative for honeyeaters as for most birds, enabling them to drink and ablute. Such resources are all the more valuable in arid areas such as large parts of Australia. The **White-plumed Honeyeater** tackles this particular issue by inhabiting riparian forests or woodlands that border waterbodies such as springs, swamps or lakes. This species has a varied diet, consisting of nectar, arthropods, insect products such as lerp, pollen and fruit. It forages at all levels, favouring the canopy but apparently being forced lower by the **Fuscous Honeyeater** (*Lichenostomus fuscus*) where the two overlap.

[*Lichenostomus penicillatus carteri*, Lyons River, Gascoyne, Western Australia, Australia.
Photo: Stuart Miller/Lochman Transparencies]



occasionally. Most honeyeaters take a wide range of insects and spiders, with little indication of specialization. Beetles (Coleoptera) and ants are common prey, as are various flies (Diptera) and wasps (Hymenoptera) for honeyeaters foraging in the air.

There is a tendency in southern Australia for nectar to be a more important source of energy in winter, whereas insects are more important in summer. In the tropics, honeyeaters tend to consume more nectar in the dry season and more insects in the wet season. These seasonal differences are in part related to breeding. The breeding season places far greater demands on birds for protein. Some honeyeaters, such as wattledbirds and friarbirds, which may feed mostly on nectar during the rest of the year, become more insectivorous while nesting. They then take a wide variety of insects, including, in the case of Noisy Friarbirds, large beetles and cicadas (Cicadoidea). The wide gape of the friarbirds allows them to swallow the largest cicadas, even if at times after a struggle. New Zealand Bellbirds also take cicadas in late spring and summer.

The careful observations made by Paton revealed that many honeyeaters that were assumed to be feeding on insects were, in fact, consuming other foods that are rich in carbohydrates. These are plant products, although insects play a part in making them available to birds. Some plants leak sap, usually after damage by insects. Honeyeaters consume this from such diverse places as the unripe fruits of corkwood bushes (*Hakea divaricata*) in the Australian desert, mangrove buds in northern Queensland, and trunks of beech trees in temperate rainforests in New Zealand. Manna is the best-known of these direct exudates from plants. It consists of high concentrations of simple sugars, initially as a sticky liquid, but later as white crystals. Insects are more directly involved in the production of honeydew, which is excreted by the nymphs of aphids (Aphidoidea), coccids and psyllids. These bugs feed on the sap of plants, but they need to extract far more carbohydrate than they require in order to gain enough protein;



Most birds prefer to drink while perched, as this enables them to take in more water over a long period without needing to rush. Such conditions, however, may not be universally available. For example, the waterbody may be prone to disturbance or may lack suitable low perches. In such circumstances, birds may have to employ other techniques. Honeyeaters such as the **Red Wattlebird** are accustomed to sallying for insects, and drinking in flight is perhaps not so very different. To do so, the bird flies low over the water, dipping its bill into the water and rapidly ingesting liquid before flying off to a safe perch.

[*Anthochaera carunculata carunculata*, Ocean Grove, Victoria, Australia.
Photo: Peter Fuller]

the excess, as sugars or other simple polysaccharides, passes out of the insect as a sweet solution. Honeydew is also important to New Zealand Bellbirds and Tuis in beech forests, accounting for about a third of their food in one area. Some psyllids in Australia convert the sugars into more complex carbohydrates, which produce a protective covering, known as the lerp. All of these substances are consumed by honeyeaters as substitutes for nectar, and most honeyeaters that have been studied closely have been found to consume some alternative carbohydrate foods. White-naped Honeyeaters glean blobs of manna from the foliage of eucalypts, whereas White-eared Honeyeaters lap honeydew from under the peeling bark of other species of eucalypt. Alternative carbohydrate sources occur in a wide range of habitats and are available for much of the year. Furthermore, harvesting them can be energetically more profitable than is the capturing of insects, and at times even superior to taking nectar. The short-billed honeyeaters may depend on manna, lerp or honeydew for most of the year, whereas long-billed species, such as New Holland Honeyeaters, may use them when nectar is scarce. Sometimes insects are not responsible for the damage to plants. Thus, Red Wattlebirds and Noisy Friarbirds feed on sap oozing from the scars on eucalypts produced by sugar gliders (*Petaurus breviceps*), and a wide variety of honeyeaters and other birds is known to take sap from the scars made by yellow-bellied gliders (*Petaurus australis*) in forests.

So close is the relationship between some honeyeaters and lerp-producing psyllids that one ornithologist, R. H. Loyn, suggested that Bell Miners behave like farmers towards these insects, as they protect them from other predators. Miners live in dense colonies, from which most other small birds are excluded. As they feed mostly on lerp, Loyn suggested that the sugary coat is harvested from the psyllid insects, which are protected from the predation attempts of other birds. Certainly, psyllids thrive in Bell Miner colonies, often to the detriment of the trees. When Bell Miners were removed from a site, it was invaded by many other insectivorous birds and honeyeaters. Within a few months, the number of lerp-producing psyllids was greatly reduced. This supports the hypotheses that, first, the miners do keep other birds out and, secondly, their impact on the psyllids is less than that of a more diverse bird community. A. Poiani has questioned Loyn's lerp-farming hypothesis, both its appropriateness as a metaphor

and the way in which it may operate. He suggested that the defending of the lerp insects is similar to the defence of any renewable resource, such as nectar, which many honeyeaters defend. The relationship between miners and psyllids, however, may be more subtle than this. Miners sometimes take only the protective lerp, leaving the psyllid nymph to build a new one. If the miner is doing this intentionally, it may be behaving more like a farmer that harvests wool, milk or eggs, while protecting the animal. On the other hand, it could be simply that the psyllid is difficult to take. Even the miner may forage more efficiently if it moves from lerp to lerp, rather than wasting time by trying to take the psyllid as well. A further part to the farming analogy is that miners take only large lerp, leaving smaller ones to grow. Again, there could be benefits to the miners in ignoring less rewarding prey, if richer units are common. It is hard to see how the two more specific hypotheses can be tested. Nevertheless, there is the intriguing possibility that Bell Miners may forgo a small immediate reward, in the form of energy from the psyllid, for a longer-term reward, that of an assured food supply. The high degree of relatedness in miner colonies may be enough to allow this level of co-operation.

A few other foods are occasionally eaten by meliphagids. Several species, among them Brown-headed and Singing Honeyeaters, Red Wattlebirds and Helmeted Friarbirds, have been recorded as breaking the eggs or killing nestlings of other species; the victims include Spangled Drongos, thornbills, waxbills (Estrildidae) and Australasian robins (Petroicidae). Noisy Miners were found to be frequent predators of artificial nests in urban areas. To what extent eggs or nestlings are items of food, as opposed to being destroyed for competitive reasons, is not clear. The Wattled Honeyeater has been recorded as killing and eating a lizard, and small skinks (Scincidae) are sometimes taken by the larger honeyeaters. There are records of the eating of frogs by Noisy Miners, and, even more surprisingly, Noisy Friarbirds have been seen to eat mosquito fish (*Gambusia*). Mangrove and Varied Honeyeaters, both of which live in mangroves, feed on molluscs and crustaceans, such as crabs (Decapoda). Several other honeyeaters have been noted as consuming snails (Gastropoda), possibly as a source of calcium during the period of egg-formation.

Honeyeaters readily take to artificial foods in captivity. These diets consist mostly of honey and water, but meliphagids also need protein sources, usually provided by egg-cake mixture or similar

food. Wild honeyeaters may also accept food offered by humans. Macleay's and Lewin's Honeyeaters, for example, visit cafes to take cream, jam and scones. A wide range of species will visit birdfeeders offering artificial nectar, but these are not uncommonly monopolized by aggressive species. Feeders have sometimes been used in scientific studies in order to examine how increased food abundance may alter the behaviour of species.

In both Australia and New Guinea, many species of honeyeater can occur in the same habitat at the same time. Except when there is a very rich source of food, they tend to forage in different ways and to occupy different ecological niches. There tends to be a separation between the more insectivorous short-billed species, such as those in the genera *Melithreptus* and *Lichenostomus*, and the longer-billed nectarivorous species. This pattern seems to hold in both south-eastern and south-western Australia. In fact, both groups consume nectar and insects, as well as alternative carbohydrates. Members of the *Lichenostomus* genus tend to occupy different habitats, possibly because their generalized foraging habits would make it difficult for them to co-exist. One of these, however, the White-eared Honeyeater, is a specialized bark-forager, and may co-occur with almost any other congener. Among the *Melithreptus* species, the White-naped Honeyeater feeds mostly on foliage, with the Brown-headed and larger Black-chinned Honeyeaters more on branches. The White-throated Honeyeater, found in northern Australia and New Guinea, rarely with any congeners, is a foliage-gleaner. In Tasmania, the Black-headed Honeyeater is the foliage-gleaner and twig-gleaner, while the Strong-billed Honeyeater forages on bark. The different species of miner tend to occur in separate habitats, and owing to their aggressiveness few other honeyeaters are common where miners are established. The more nectar-dependent honeyeaters tend to use different ranges of flowers, the size of the birds to some extent matching the rewards that the flowers offer. Thus, spinebills visit the tubular flowers of epacrids in the south-east and the gullet-shaped flowers of *Adenanthos* in the south-west of Australia. Larger honeyeaters can experience difficulty in gaining sufficient energy from small flowers unless they are abundant. At the other extreme, the wattlebirds and friarbirds tend to visit large-flowered eucalypts or the productive inflorescences of banksias. These rich nectar sources can be defended against smaller visitors.

In many habitats, though, it is the medium-sized New Holland or White-cheeked Honeyeaters that are most abundant for most of the year. Perhaps it is their flexibility in using a wide range of nectar sources and their ability to defend flowering shrubs from most other honeyeaters that make them so successful. Nevertheless, there are exceptions to this pattern of larger honeyeaters in richer areas and smaller species where nectar is more sparse or difficult to harvest. Eastern Spinebills are the most abundant meliphagid species in the uplands of northern New South Wales, despite the fact that numerous and highly productive banksias exist in that region. Although nectar may be abundant in winter at this site, its production depends on the minimum temperature. A series of nights of hard frost results in little nectar being produced, leading to food shortage and loss of weight for the spinebills, and it may be therefore that the food source is too unreliable for larger honeyeaters. In the arid centre of Australia, the generalized *Lichenostomus* species again tend to be separated by habitat, with White-plumed Honeyeaters in the riparian woodland, Grey-headed Honeyeaters in mulga in rocky ranges, and Grey-fronted Honeyeaters in mallee and spinifex. The Singing and Spiny-cheeked Honeyeaters are reasonably sedentary, but they switch among insects, nectar and fruit in their diet. Nectar is an unpredictable food source, tending to be abundant only after substantial rainfall. Not surprisingly, the more nectarivorous Pied, Black and White-fronted Honeyeaters display complex movements, being at any locality common in some years and rare in others.

The New Zealand honeyeaters also partition nectar resources according to richness. The large Tui feeds on rich flowers in trees and large shrubs, which it defends. The nectar-feeding Stitchbird, which is now known not to be a meliphagid (see Systematics), is subordinate and may feed on peripheral flowers of the rich sources, but it tends to visit poor nectar-producers or those with

dispersed flowers. The New Zealand Bellbird occupies a niche between these two in its choice of flowers. All three species may switch to eating many insects or fruits.

Honeyeaters are a far less dominant component of the bird communities of tropical rainforest in Queensland and New Guinea. Lowland rainforest in north-east Queensland has Dusky Myzomelas representing the long-billed, nectarivorous guild. In the uplands, a number of long-billed species move into the forest to feed from flowering trees in the wet season. Only the Eastern Spinebill remains all year, in small numbers, feeding on nectar and insects. In the lowlands, Macleay's Honeyeater specializes on dead and large leaves and the Yellow-spotted and Graceful Honeyeaters are generalists, including fruit, nectar and foliage insects in their diet. The Bridled and Lewin's Honeyeaters are the generalized feeders in the uplands. Honeyeaters living in the drier forests of eucalypts and paperbarks in the Northern Territory have been well studied. Two species of friarbird visit eucalypt flowers and scramble through the foliage to dislodge insects. The Brown Honeyeater is a generalized small nectarivore, which also gleans and flits among foliage for insects, while Rufous-banded and Rufous-throated Honeyeaters capture insects in a similar manner, but are less nectarivorous. Bar-breasted Honeyeaters move roughly among foliage and fidget, apparently to uncover prey; they also sally and hover for insects. Similarly, White-gaped Honeyeaters are fidgeters, but they also like vines and they forage on branches and trunks. The large Blue-faced Honeyeater hovers and probes for insects. There is an absence of foods such as manna and lerp in these regions, and there are no counterparts to the long-billed spinebills of southern Australia.

New Guinea rainforests are home to more than 60 species of honeyeater. Perhaps only ten of these, mostly the tiny myzomelas, are primarily nectarivorous. The majority of the others are generalized feeders, taking nectar as well as insects and fruit. In lowland rainforest in New Guinea, there are three similar species of *Myzomela* and four similar species of *Meliphaga*. How they differ in foraging ecology is yet to be determined. Meyer's Friarbird and the myzomelas feed on nectar in the canopy, the latter also coming down to the ground. Tawny Straightbills glean among the understorey, usually in mixed-species flocks based around New Guinea Babbblers and Rusty Pitohuis (see General Habits). The *Meliphaga* species and two members of the genus *Xanthotis*,

Vocal duets are relatively common among meliphagids such as the **Spiny-cheeked Honeyeater**. Pair members perform facing each other, with the body elongated and neck outstretched. Members of many bird families duet, but almost all inhabit dense vegetation in the tropics, are monogamous, and are resident rather than migratory, thus maintaining a year-round territory over several years. This led ornithologists to suggest that duetting seeks to strengthen pair-bonds. Current thinking, however, suggests that duets serve as territorial proclamations directed at neighbouring pairs.

[*Acanthagenys rufogularis*,

Mornington Peninsula, Victoria, Australia.
Photo: Glenn Ehmke]





Meliphagids tend to collect nest materials from the vicinity of the nest. The smaller species search the adjacent ground and vegetation, whereas the larger ones may venture a few hundred metres distant. In many honeyeaters, the female takes sole responsibility for gathering material and constructing the nest, although she may be guarded by the male. This **Varied Honeyeater** has found a plant fibre for its nest. This coastal species usually locates its nest close to the sea or a couple of metres above tidal waters in mangroves.

[*Lichenostomus versicolor*, Cairns, Queensland, Australia.
Photo: Peter Fuller]

the Tawny-breasted and Spotted Honeyeaters, are mixed feeders, grading from more fruit through to more nectar. Finally, the Long-billed Honeyeater feeds on nectar and insects, specializing in foraging on branches and trunks, especially rotten wood.

The bird communities of the Indonesian and Pacific islands are more simple than those of Australia and New Guinea, rarely having more than three honeyeater species. Fiji and Samoa have a small nectarivorous myzomela, a medium-sized generalist, the Wattled Honeyeater, and a large, scarce and poorly known forest honeyeater. A similar pattern of a small myzomela, one or two generalized medium-sized species, often of the genus *Lichmera*, and up to three large friarbirds is found in the islands of eastern Indonesia, although these await detailed ecological studies.

Nectar-feeding birds such as honeyeaters are suitable subjects for the study of energetics, because the volume and sugar-concentration of nectar are easy to quantify. At times, especially during dry periods, honeyeaters visit flowers with little nectar. Often, nectar is most abundant at dawn and is rapidly depleted by the visits made by birds, so that there may be intense competition for nectar. This can lead to trees or shrubs being defended by individuals or groups, even during the non-breeding season. The large wattled birds and the New Holland and White-cheeked Honeyeaters often defend small territories. These often expand as nectar becomes scarce and contract as it becomes abundant. When nectar becomes very abundant, as, for instance, in coastal banksia heaths in winter, there may be little benefit in defending a territory. New Holland and White-cheeked Honeyeaters often ignore many intruders at such times. This change in behaviour may, however, be partly because defence is greatest in autumn, when territories are being established, rather than being due simply to food abundance.

Perhaps surprisingly, territories are sometimes defended even when they provide inadequate food. A possible reason for this is that the establishing of a territory at such a time makes it easier to defend later, when food has become more abundant. The abundance of nectar also influences behaviour in other ways. When nectar is scarce, honeyeaters can spend 80% or more of their day in foraging, sometimes wandering far from their territories to find food. In contrast, when food is very abundant, they are able to satisfy their energy requirements by spending less than 20% of their day in foraging. Other foods, such as alternative carbohy-

drates and insects, are harder to measure. The former may replace nectar as the major energy source at times. Insects can be an important food, but the small midges and wasps captured by sallying wattled birds and New Holland Honeyeaters do not even replace the cost of this expensive foraging technique. Presumably, such insects are taken in order to provide protein or other dietary needs.

Breeding

Many aspects of the breeding biology of the family are conservative and commonly shared. In common with Australian passerines in general, honeyeaters tend to have small clutch sizes, long breeding seasons with repeated attempts in a season, low nesting success, high adult survival and extended parental care, with a high incidence of co-operative breeding. In general, most honeyeaters build neat and well-made open cup-shaped nests, although nests of some, particularly the larger species, appear loosely constructed and bulky. The eggs are typically pale with fine dark spots, dots or speckling and some blotching, and the typical clutch is of two eggs. The role of the sexes at all stages of nesting varies. In many species only the female collects nesting material and builds the nest, although she is often closely accompanied by the male, and only the female incubates and broods, but both parents feed nestlings and fledglings. In at least some species, however, the male is known to assist with nest-building and with incubation and brooding, but the extent of this involvement is often not well known, and claims of male participation are often compromised by the fact that, for most species of meliphagid, it is not possible to determine the sex of individuals by external appearance.

In contrast to the somewhat conservative nesting behaviour of the Meliphagidae, the social and spatial organization of the family shows more diversity. While nearly all species are socially monogamous, breeding systems vary from solitary pairs that maintain long-term, all-purpose territories, to clumped or colonial breeding by territorial pairs, with occasional co-operative breeding, to the complex and obligate colonial and co-operative breeding of the Australian miners. Interestingly, the breeding biology of MacGregor's Honeyeater, which was formerly considered a bird of paradise (see Systematics), is consist-

ent with that of most meliphagids, rather than with that seen in the Paradisaeidae: MacGregor's are socially monogamous, with apparently permanent pair-bonds, the male accompanies the female as she constructs the nest and on foraging trips during incubation, nests are cup-shaped, incubation and brooding is apparently by the female only, and both female and male feed nestlings.

As with so many aspects of the biology of the family, most detailed studies of breeding and social organization have been conducted in Australia and New Zealand, and there are few or no detailed studies from Wallacea, New Guinea or the islands of the south-western Pacific Ocean, although some detailed reports of individual nesting attempts are available for a few species, such as the Long-billed Honeyeater in New Guinea. The detailed summaries of breeding for the 70 species of honeyeater in the *Handbook of Australian, New Zealand and Antarctic Birds* provide a new and more accurate baseline for comment on the social organization and breeding biology of the Meliphagidae, including detailed analyses of the previously unpublished data held in the Nest Record Scheme run by the Royal Australasian Ornithologists Union. Most detailed studies, however, have been of largely sedentary species, including the Noisy and Bell Miners, in the genus *Manorina*, the Red Wattlebird, in *Anthochaera*, the New Holland and Crescent Honeyeaters, in *Phylidonyris*, the Yellow-tufted Honeyeater, in *Lichenostomus*, the Brown-backed Honeyeater, in *Ramsayornis*, and the Rufous-banded Honeyeater, in *Conopophila*. Other, less sedentary species that have been the subject of detailed study include the migratory Yellow-faced Honeyeater and Noisy Friarbird, and the enigmatic Regent Honeyeater. The breeding biology and life-history strategies of most dispersive or nomadic species, and especially the many arid-zone species, have been little studied.

Overwhelmingly, honeyeaters breed as socially monogamous pairs, even in colonial and co-operatively breeding species. With essentially sedentary species, pair-bonds are often long-term, being maintained throughout the year, and from year to year. In the co-operatively breeding Bell Miner, pair-bonds are typically lifelong, and divorce occurs only rarely, if a mate is ill, although divorce sometimes occurs for no obvious reason. Crescent Honeyeaters maintain pair-bonds for successive breeding attempts in a season, and throughout the year, with no instances of divorce

found in a study over six years. Similarly, White-eared Honeyeaters maintain pair-bonds throughout the year, and from year to year, with partners known to stay together for more than one breeding season; in a two-year study there were no instances of divorce, although several changes of partner were observed following the disappearance of one member of a pair. The Yellow-tufted Honeyeater of the subspecies *cassidix*, known as the "Helmeted Honeyeater", is an obligate colonial breeder, but individuals usually mate for life, and most remain in the same territories. Noisy Friarbirds likewise maintain long-term pair-bonds from season to season. In contrast, studies of the migratory Yellow-faced Honeyeater found that, while mates remain together for the duration of the breeding season and are typically multi-brooded, only 12.5% of pairs consisted of the same individuals in a subsequent breeding season, despite the fact that both partners from a previous season were often alive; a divorce rate of 75% for males and 66% for females was found.

In contrast to the social monogamy of most of the family, both sexes of the Noisy Miner are promiscuous. In this co-operatively breeding species, a female may copulate with more than one male, and a male may copulate with more than one female, often on the same day. The dominant male in a coalition appears, however, to achieve most, but not all, copulations with a female, and broods are normally genetically monogamous. Other complications are noted occasionally. Polygyny was observed once for the non-colonial Rufous-banded Honeyeater of northern Australia. This species normally breeds as simple territorial pairs, but in one season a male was shared by two females that occupied adjacent "subterritories", and he attended young in two nests concurrently in December 1988, when one of the nests was successful, and in February 1989, when both were successful. In the following season, this male appeared to be paired with one female only.

There have been few studies of extra-pair paternity among honeyeaters. Although pair-bonds of the co-operative and colonial Bell Miner are typically lifelong, extra-pair fertilizations have been found to be responsible for at least 4% of nestlings in a range of studies, and levels of extra-pair paternity may be even higher. In the colonial "Helmeted" form of the Yellow-tufted Honeyeater pairs are socially monogamous, usually remaining in the same territory and mated for life, but extra-pair paternity was found to be fairly common, 10% of broods of this

Animal hair is commonly used by meliphagids for their nests. Being warm and soft, it serves as a lining, and its strength and suppleness also renders it a useful binding material. Moulted mammal hair can be found on the ground or on objects against which the animal has rubbed. Alternatively, fresh hair can be tweaked from a live animal, as in the case of this **Brown-headed Honeyeater**, which is making good use of a western grey kangaroo (*Macropus fuliginosus*).

Both sexes of this honeyeater collect nesting material, but only the female is thought to build the nest, which is a small, neat, deep cup.

[*Melithreptus brevirostris pallidiceps*,
Adelaide, South Australia,
Australia.

Photo: Roland Seitre]





The typical meliphagid nest is a neat, open cup. That of the **Brown Honeyeater** is round or elliptical in shape, with external dimensions of around 6 cm in diameter and 5 cm in depth. Grass and bark form the most part of building materials, with paper or leaf-skeletons as alternatives. The binding is provided by spiders' webs, hair or plant fibre. Plant down, fine grass and hair make for a comfortable heat-retaining inner layer. The Brown Honeyeater tends to place its nest in dense foliage a metre or so above ground, often close to water.

[*Lichmera indistincta* ocularis, Goomboorian, SE Queensland, Australia. Photo: Cyril Webster]

subspecies containing extra-pair young. Some species exhibit behaviour that indicates the possibility of extra-pair copulations. For example, female Crescent Honeyeaters may wander into neighbouring territories, and males make only a modest contribution to parental duties, suggesting that some extra-pair copulations may occur. Similarly, while pairs of migratory Yellow-faced Honeyeaters defend all-purpose territories and nest within the boundaries of them, paired females were occasionally observed within the territories of neighbouring males, which were not seen to react aggressively to intruding females. As with Crescent Honeyeaters, these intruding females may present opportunities for extra-pair copulations, although it is not yet known whether the monogamous social pair-bonds accurately reflect genetic pair-bonds.

Whereas the mating system of the family is fairly simple, the spatial organization of breeding honeyeaters is far more complex, although it is worth noting that most studies have concentrated on resident or sedentary species, rather than migratory or nomadic species. The majority of meliphagids appear to breed as simple pairs in discrete, defended territories, either permanent all-purpose territories or smaller and short-term breeding territories. For example, studies of both Crescent and White-eared Honeyeaters revealed that these species defend permanent, all-purpose territories throughout the year, the boundaries of neighbouring territories abutting and with little overlap. Males rarely intruded into neighbouring territories, when they usually behaved furtively, although female Crescent Honeyeaters were occasionally observed in neighbouring territories.

In studies of migratory Yellow-faced Honeyeaters in Victoria, in the south of their distributional range, it was found that the birds arrived at the end of the austral winter, in late August, and from then until about the end of October males and females moved over a wider local area than that which they would later defend. They began to establish territories by the end of October, corresponding with a decrease in flowering mistletoe, neighbouring territories typically abutting. After a female joined a male on a territory, both partners defended the territory from intrusions by both conspecifics and other species, although males were significantly more likely to be involved in aggressive acts than females. By early February, territorial boundaries were less aggressively defended and territories gradually dissolved before

most of the population left, in April. No pair was ever observed to change territory within a season, even though pairs usually made several nesting attempts. Among breeding individuals known to have survived from one season to the next, males were significantly more likely than females to return to the territory of the previous season.

A number of species are colonial nesters. All four miners are obligate colonial, and co-operative, breeders. Noisy Miners possibly have the most complex social and spatial organization of any meliphagid. This species gleans food from foliage and the ground, eating insects and a range of non-nectar carbohydrates (see Food and Feeding), and lives in large, structured colonies, ranging in size from a few individuals to several hundred birds. These obtain virtually exclusive use of an area, and the resources within it, by indiscriminate aggression against nearly all other bird species, including non-predatory ones, that intrude into the colony. Intruders are nearly always attacked and are sometimes killed, although a few larger species, such as Laughing Kookaburras (*Dacelo novaeguineae*), are sometimes tolerated in colonies, usually close to the edges.

Within Noisy Miner colonies, males outnumber females significantly, by a factor of 3:1, and the spatial arrangement differs between the sexes. Most males have small activity spaces, or core areas of their home range, which tend to overlap with those of other males. Clusters of neighbouring and nearby males tend to form associations, typically of 10–25 individuals, termed "coteries". These are the most stable unit within a colony, particularly in the non-breeding season, and membership changes little. In some circumstances, a colony may behave as if consisting of only a single coterie. Members of coteries unite to drive off intruders belonging to other coteries. Within coteries, subgroups of males form, comprising individuals involved in the same activities; termed "coalitions", they usually contain 5–8 males, but sometimes as few as two and, during mobbing, up to 40–50 individuals. Coalitions move freely within the area occupied by their coterie, and membership of coalitions changes as individuals leave when a coalition moves beyond the boundaries of their activity space, and other males enter as the coalition passes into their activity space. Female Noisy Miners use activity spaces that overlap those of males but not those of other females, so that, while females will join coalitions of males that form in their own

The nest of the **Little Wattlebird** is usually saucer-shaped, but deeper cups and even rough domes are fairly frequent. The structure is solidly built from sticks, grass and plant stems. Other plant material such as bark and moss may be woven in, as may wool or artificial materials such as plastic twine. For the soft inner lining, the Little Wattlebird seeks out shredded bark, plant down and feathers. Whereas most honeyeater nests are suspended from the rim, those of larger species such as wattlebirds tend to be placed in a vertical fork of a tree. The nest tree is usually short and replete with foliage, and the nest is normally placed about 3 m above ground.

[*Anthochaera chrysoptera chrysoptera*, French's Forest, New South Wales, Australia.
Photo: Graeme Chapman/Ardea]



activity space, there is rarely more than one female in a coalition. Within Noisy Miner colonies, young females may be driven from their natal area more often than are young males, probably at least partly because female activity spaces do not overlap and so young females cannot settle in their natal territory. Emigration of males is thought not to occur until the density within a colony reaches some critical level. Female vacancies within colonies appear to be filled by emigrants from other colonies.

Similarly, Bell Miners defend stable colonies that consist of a number of breeding pairs, each occupying a permanent and discrete foraging range or core area within the colony, and a larger number of non-breeding members, which include the offspring of the colony's breeding members and immigrants from other colonies. The non-breeders occupy foraging ranges that overlap extensively with those of one or more breeding pairs. Colonies remain in the same areas for many years, but sometimes individuals move as a colony to a new site, especially to exploit food resources, or a new colony may be started by a few individuals from an existing colony. Colonies range in size from five to more than 50 birds; one colony in Victoria, over a period of six years, contained an average of 29 members but ranged from nine to 58 birds, and had 3–9 breeding pairs. The area of the colony is defended by all of its members, which co-operate to drive conspecifics and almost all other birds from the communal territory, resulting in almost sole occupancy of a site by the miners. Young males nearly always remain in their natal core area with their parents until they gain a breeding position of their own, usually within the same colony. Female offspring, however, share the core area of their parents only until they reach sexual maturity, at about 8–9 months of age, at which point they try to disperse to neighbouring colonies in order to obtain a breeding position. If they are unsuccessful in obtaining a breeding position, they return to the natal range before making further forays in search of one.

A number of other honeyeaters, in a diverse range of genera but including several species of *Lichenostomus*, nest in small colonies. Apart from the miners, however, only the Yellow-tufted Honeyeater appears to be an obligate colonial breeder. Yellow-tufted Honeyeaters that breed successfully as single pairs apparently do so only when they constitute a remnant of a former colony. Yellow-tufted Honeyeater colonies consist of several pairs that

maintain separate all-purpose territories, but the colony itself has a well-defined boundary, which may persist for many years, although the numbers of pairs and individuals within the colonies can vary. Various other meliphagids sometimes nest colonially. Fuscous Honeyeaters will nest solitarily or semi-colonially, the neighbouring pairs interacting without aggression. It was found that nests with close neighbours were much more likely to succeed than were isolated nests, and it has been suggested that, while resources may be sacrificed by a clumped distribution of breeding pairs, the increased rate of detection of and defence against threats increases success. Yellow-plumed Honeyeaters, too, are possibly colonial, with some indication that the birds live in colonies like those of Yellow-tufted Honeyeaters, although colonial breeding has not been confirmed. Black-headed Honeyeaters breed in small loose colonies, as also do Painted Honeyeaters, the latter in groups of possibly up to twelve pairs, though most reports are of smaller numbers. Brown-backed Honeyeaters, too, tend to nest in loose groups or colonies, containing up to ten or even 21 nests, but they also successfully nest solitarily. This species' sole congener in *Ramsayornis*, the Bar-breasted Honeyeater, while very poorly known, is thought also to nest sometimes in loose colonies. Black Honeyeaters similarly tend to nest in groups or loose colonies, and White-streaked Honeyeaters may also nest in small groups, possibly with synchronous breeding, but further study of this is required.

While some species are colonial or loosely colonial breeders, there are many isolated instances of close nesting by other species. Such observations have often led to claims that these species are colonial or loosely colonial when, in fact, this behaviour appears far from normal. For example, the Blue-faced Honeyeater has been said to be loosely colonial, but there appears to be only a single instance of pairs nesting close together. This was a note concerning two pairs with nests in one tree and another two pairs in another tree not far away, all appearing to nest without aggression towards one another. It seems that this observation is the basis for the suggestion in subsequent literature that this species may be loosely colonial. Some claims of apparent colonial breeding appear to refer to clumped breeding simply as a result of restricted habitat preferences.

Co-operative breeding has been reported for 24 species of honeyeater, all of them from Australia. Of these, however, only

the four species of *Manorina*, the Bell, Noisy, Yellow-throated and Black-eared Miners, are obligate co-operative breeders. In addition to the miners, co-operative breeding, or co-operative behaviour, has been reported for a further eight genera. In an earlier review, Dow listed five species for which co-operative breeding was regular and well described, and eight others for which it had been reported only once or twice. Subsequently, in 1991, D. C. McFarland and H. A. Ford, while not listing individual species, identified co-operative breeding by 22 species in nine genera. A decade later, the summaries published by P. J. Higgins and colleagues, including the analysis of the Nest Record Scheme, and studies subsequent to the earlier analyses, have clarified the extent of co-operative breeding and behaviour in the family. For example, all the instances listed as "suspected" by McFarland and Ford appear to be definite examples of co-operative behaviour, although apparently not representing co-operative breeding as such by the species in question.

Two of the co-operatively breeding species have perhaps the most complex social organization of all the honeyeaters. As detailed above, Bell Miners are colonial and always breed co-operatively, assisted by up to 20 auxiliaries, although the mean numbers of auxiliaries at two study sites were, respectively, 7.5 and 6.5. Auxiliaries, or helpers, can be juvenile siblings of the brood being helped, being offspring from the previous nesting attempt and no more than 1.3 months old; or they can be unpaired immatures, subadults typically first helping when 3 months old, or unpaired birds of breeding age; or they can even be neighbouring breeding adults simultaneously raising their own young. Auxiliaries are overwhelmingly males, and usually close relatives of one or both members of the breeding pair, more often the breeding male, and are thus siblings or half-siblings of the young being provisioned. Auxiliaries assist with defence of the nest and its contents from predators, feed the nestlings and fledglings, remove faeces and ectoparasites from the nests and nestlings, and, rarely, feed the sitting female. They may assist at up to three different nests simultaneously, male auxiliaries assisting more pairs than do female auxiliaries. Unpaired Bell Miners of breeding age provide the greatest proportion of all aid given by auxiliaries; in order of proportion of help contributed, they are followed by independent juveniles, by paired birds and, last, by dependent young.

Noisy Miners are also colonial and obligate co-operative breeders, with up to 22 auxiliaries recorded at a single nest. In one study, however, nests were attended by an average of 4.6 males, and in another study a maximum mean of 11.5 marked males visited nesting females through the breeding period. Again, auxiliaries are nearly always male, but they are usually not closely related to the breeding birds that they assist, although young males preferentially visit nests of their mothers. The number of auxiliaries at a nest varies with the number of nests begun by a female and the stage of nesting, nests with young usually having higher levels of attendance than do those with eggs. Auxiliaries, even breeding males, often help at several other nests, and at up to 14 nests, in a single breeding period. Unlike the situation with Bell Miners, the breeding female always had the greatest or the second-greatest levels of attendance at her own nest, and, among males, fathers provide most food for the nestlings; juveniles do not assist in the season in which they hatch. All auxiliaries feed nestlings and remove faecal sacs, and all feed the young for 1–3 months after they have left the nest.

Co-operative breeding has been recorded for 20 meliphagids other than the four miners, but for only a few of these is it known to occur regularly and to be of any significance in the social organization of the species. All six species of *Melithreptus* appear to breed co-operatively at times, and the phenomenon is known to be regular for Black-chinned, Brown-headed and White-naped Honeyeaters. In these three, co-operatively breeding groups usually consist of up to four or five adults attending nests, all members of the group contributing to the feeding of nestlings and fledglings, although as many as twelve White-naped Honeyeaters have been seen to be feeding the same young. Co-operative breeding has been reported at least occasionally for the less-studied Strong-billed and Black-headed Honeyeaters, and nestlings of the latter have been observed to be fed by adult auxiliaries, which are possibly males, and by juveniles or immatures from the previous brood. Additional individuals occasionally feed nestling and fledgling White-throated Honeyeaters, but the breeding behaviour of this species is poorly known.

Auxiliaries are observed regularly but uncommonly at nests of the colonial Yellow-tufted Honeyeater, up to five birds feeding the nestlings or fledglings and removing faecal sacs. In the case of the "Helmeted" subspecies *cassidix*, auxiliaries are of-



The Yellow-tinted Honeyeater suspends its neat cup-shaped nest from a branch or horizontal fork in the outer crown of trees such as *Eucalyptus* or, as here, *Acacia*. Accompanied but not assisted by her partner, the female firmly weaves a nest from fine grass, spider web, bark fibre and plant down. Some nests are left unlined, and others given a covering that may comprise feathers, rootlets or fine grass. The Yellow-tinted Honeyeater has been recorded breeding in all months of the year in Australia, with a peak in the dry season, and in most months in New Guinea, where the peak appears to be between September and November.

[*Lichenostomus flavescens flavescens*, Port Moresby, SE New Guinea. Photo: Brian J. Coates]

In common with other members of the genus *Meliphaga*, the **Graceful Honeyeater** usually elects to nest close to the ground, at a mean height of 1.5 m. Occasionally, birds nest much higher, up to 15 m above ground in Australia and up to 21 m in New Guinea. The deep, cup-shaped nest tends to be suspended from its rim and is lodged in the fork of a small branch towards the outside of a shrub or tree. The basic structure comprises moss, vines, roots and bark fibre. Plant down and fibre provide the inner lining, and the whole unit may be covered with moss, lichen or even insect cocoons.

[*Meliphaga gracilis imitatrix*,
Iron Range National Park,
N Queensland, Australia.
Photo: Clifford &
Dawn Frith]



ten, and possibly always, adults. They may be paired, and some are related to the breeding pair which they are helping, in which case they are often offspring, whereas others are apparently unrelated. In detailed observations at seven "Helmeted Honeyeater" nests, auxiliaries were present at two. At one of these nests, the auxiliaries consisted of three mature siblings of the nestlings and these, in combination, made at least 30% of the feeding visits to chicks and removed 25% of the faecal sacs; at a second nest, an extra female made at least 32% of the feeding visits.

Whereas several detailed studies have shown that New Holland Honeyeaters do not breed co-operatively, it was found in one study that a small proportion of fledglings were attended by more than two adults, although the circumstances of these observations appear complex and vary. Sometimes, members of adjacent breeding pairs perched together near the nest of one of the pairs, and in at least some of these instances these were parents breeding alongside their offspring from the previous year. Further, fledglings were usually attended only by the parents, but in several cases broods of neighbouring pairs amalgamated and adults of two breeding pairs carried food to a single site; in most of these amalgamated broods, the two neighbouring breeding males were likely to have been father and son. In these amalgamated broods, adult males sometimes fed both their own and their neighbour's young. Territorial males without young have been seen also to feed young of neighbouring broods. Young males in territories adjacent to their natal territory, and breeding for the first time, seem often to have some assistance from neighbouring males, probably their fathers, which feed their fledglings. It is possible that this system results from amalgamation of broods and familiarity, rather than being due to the paternal relationship. Apparently similar observations of co-operative behaviour or amalgamation of broods have been reported elsewhere, with individuals other than the parents seen to attend young. Similarly, White-cheeked Honeyeaters do not breed co-operatively, but birds other than the parents have occasionally been observed to feed young. The system may be similar to that pertaining to the closely related New Holland Honeyeater.

A number of other meliphagid species have been reported as having auxiliaries at the nest. These are the Red and Little Wattlebirds, five species of *Lichenostomus*, namely the White-plumed, Fuscous, Varied, White-eared and Yellow Honeyeaters,

the Little Friarbird, the Rufous-throated Honeyeater, the Blue-faced Honeyeater and the Striped Honeyeater. Most of these species, however, are reasonably well known and do not normally breed co-operatively. Indeed, instances of co-operative breeding by these species are exceptional, and often involve a third bird feeding nestlings or fledglings. For example, Fuscous Honeyeaters have been well studied and are not co-operative breeders, but there have been two instances of young being fed by birds other than the parents; in both cases, the feeding was attributed to misplaced parenting, and not to co-operative breeding. In the single observed instance for the Striped Honeyeater, three individuals, thought to be the breeding pair and a single auxiliary, fed nestlings, but only two, thought to be the parents, brooded the young. Of 61 feeding visits to this nest, 25 were made by each of the parents and only five were identified as by the auxiliary; in the remaining six cases, the visitor was not identified. There were several aggressive interactions, which were possibly between the male parent and the auxiliary. In the case of the Red Wattlebird, there are occasional observations of dependent fledglings begging for food and being fed by immature wattlebirds, as well as by their parents. The immatures are believed to be young from previous breeding attempts in the same season.

Several further examples of possible co-operative behaviour are of interest. At a White-lined Honeyeater nest with eggs, a male and a female with a brood patch, thought to represent a breeding pair, were caught near the nest on one day; on the following day, a third, unsexed, individual was also caught within 1 m of the nest. While it was suggested that the third bird might have been an auxiliary, it cannot be accepted at this stage as evidence of co-operative behaviour. In another instance, this involving the Yellow Honeyeater, an offspring from the previous year was once seen to assist a female in the construction of a nest. While most instances of co-operative breeding involve the feeding of nestlings and fledglings, the removal of faecal sacs, and the defence of the nest or young, auxiliaries sometimes assist with other aspects of breeding. For example, in one group of Brown-headed Honeyeaters consisting of the breeding pair, two unsexed adults and a juvenile, all except the juvenile assisted with incubation, although the adults of the breeding pair undertook most of this task, and all members of the group fed the breeding female while she incubated.



Most honeyeaters appear to have a long breeding season, and make multiple breeding attempts in a season, even after having successfully raised young. The peaks of breeding activity, however, vary over the broad latitudinal range of the family, and the duration of the season appears also to vary with the pattern of movements of a species and the local abundance of resources. A few species, especially inland ones, appear to be opportunistic, breeding when conditions are suitable.

In temperate and subtropical Australia, most breeding occurs from late winter through spring to early summer, but in southern Australia and New Zealand breeding seasons are shorter. A few other Australian meliphagids, particularly the few migratory species studied, also have a shorter season. In a study of New Holland Honeyeaters and White-cheeked Honeyeaters at a site near Sydney, in temperate eastern Australia, both species laid through autumn and winter, with breeding centred on the period of peak nectar availability, which occurred in June–July. New Holland Honeyeaters laid clutches from mid-February to early September, most starting by late March and continuing to mid-August, and had 1–7 clutches per territorial male over the year; White-cheeked Honeyeaters laid from early April to early September, most starting by mid-April and continuing to mid-August, and had 1–4 clutches per territorial male. There was, however, a strong seasonal change in nesting success, all clutches laid before 1st April failing, whereas 57% of clutches laid after that date were successful in producing at least one fledgling; this is discussed in more detail below.

On the New England Tableland of eastern Australia, two species of large honeyeater had significantly different breeding seasons. Red Wattlebirds are sedentary at this site and had long breeding seasons characteristic of most honeyeaters, with first clutches completed in August and last clutches in January, and the latest young fledging in February. In contrast, Noisy Friarbirds, which are migratory at this site, arriving in early August and leaving in April, had a shorter season, with the first clutches completed in early November and two late clutches laid in January. The calculated number of “equally good months” (EGM) was 4.3 months for Red Wattlebirds and 2.1 for Noisy Friarbirds. When comparing data from throughout these species’ ranges, breeding seasons for both were longer than those observed on the New

England Tableland, with EGM of 5.9 and 4.1 months, respectively, Red Wattlebirds laying from July to February, with outliers in May and June, and Noisy Friarbirds from mid-August to January, with no outliers.

A curtailed breeding period similar to that of the Noisy Friarbird was observed also for the migratory Yellow-faced Honeyeater. In the south of its range, breeding began in mid-November, about two months after the return from migration, and the overall breeding season lasted some 3.5–4 months, with last clutches laid in mid-January to early February. Breeding pairs of this species were multi-brooded, producing an average of 2.14 clutches per season, and always renested within the same territory and with the same partner within a season. Pairs renested after successful attempts, as well as after failure.

In New Zealand, the two members of the family have short breeding seasons. Tuis on Tiritiri Matangi Island, in the Hauraki Gulf of the North Island, had clutches in November–December, and construction of nests coincided with the earliest availability of nectar from New Zealand flax and rewarewa (*Knightia excelsa*), the first nests being built by those birds that had home ranges near available sources of nectar. Similarly, on the Chatham Islands, clutches of the local Tui subspecies *chathamensis* have been recorded from mid-November to early December, with the onset of breeding likely to be influenced by the flowering of flax. On the North Island generally, clutches have been recorded from October to mid-January, with fledglings as late as March, and outlying records of unspecified breeding in August and of nestlings or fledglings in April–May. Tuis only occasionally raise two broods in a season. On the Poor Knights Islands, New Zealand Bellbirds laid from late September to late November, with a peak from mid-October to mid-November, with fledglings recorded to late December. On the Poor Knights the bellbirds were probably single-brooded, but they sometimes re-laid after failure.

Noske and D. C. Franklin, who analysed breeding in coastal and subcoastal Northern Territory, in the monsoonal tropics of Australia, found that breeding by landbirds reached a peak during the austral spring, from September to November, although many species were recorded as breeding in most or all months of the year. Among the Meliphagidae, the Rufous-banded Honeyeater was found to breed throughout the year in urban Darwin, with a prolonged but distinct peak from September to March. In contrast, the two smallest honeyeaters, both nectarivores, both bred during the dry season, the Red-headed Myzomela, a mangrove specialist, mainly in June–September, and the Brown Honeyeater, a habitat generalist, in May–August. Most other honeyeaters appeared to breed throughout the year, with records in nearly all months: these included the nectarivorous Dusky Myzomela, with breeding recorded in all months except January and June; the White-gaped Honeyeater, all months except June; and the Helmeted Friarbird, all months except May and July. Although there were few records, White-throated Honeyeaters appeared to have a bimodal seasonality, with peaks in April and September. Noske and Franklin argue that the restricted breeding seasons of such species as the Red-headed Myzomela suggest that their resources are predictably good at certain times, whereas the nearly year-round breeding for other species, such as the Dusky Myzomela, indicates that their resources may be available throughout the year, though not necessarily superabundant at any time. Red-headed Myzomelas breed when their major nectar source, the rib-fruited mangrove, is in flower. The Bar-breasted Honeyeater, which is strongly associated with paperbark woodlands, breeds predominantly during the wet season, coinciding with the major flowering seasons of the two dominant species of paperbark in the region.

There is little information on the breeding seasons of Wallacean honeyeaters. Nevertheless, Noske has analysed breeding seasons for landbirds on Timor, and J. A. J. Verheijen has done so for Flores. For all landbirds on Timor, breeding occurs throughout the wet season, from November to April, with a possible peak in activity in November, although there are few data for August–November, whereas breeding in western Flores is concentrated between April and June. The few data that exist for the three honeyeaters occurring on Timor appear to fit within this broad general pattern, but with a breeding record for the

Not surprisingly, there are far fewer breeding data recorded on the meliphagids of New Guinea than on those occurring in Australia and New Zealand. The Rufous-backed Honeyeater, a New Guinea endemic, is a case in point, as very little information is available on its breeding ecology. The nest seen here in a Casuarina tree is one of the few nests of this species so far reported. Indeed, an old published description of a nest initially attributed to this species is now thought more likely to have belonged to the congeneric Black-backed Honeyeater (*Ptiloprora perstriata*).

[*Ptiloprora guisei*, New Guinea.
Photo: Clifford & Dawn Frith]

Streak-breasted Honeyeater in October. The Helmeted Friarbird on Flores exhibited a double peak of laying, late in the wet season to the dry season, in February–May, and again late in the dry season, in October–December; there was a sharp decline in December–March, a period usually characterized by continuous heavy rain. The greatest peak in breeding was at the beginning of the dry season, in April–May, and this was then followed by a gradual decline.

Far less detailed information is available for New Guinea. H. L. Bell found the breeding season of honeyeaters in rainforest and savanna near Port Moresby to be at a peak in the late dry season, in August–September, and again in the early wet season, in November–December, with lowest levels of breeding activity in January–June. This peak in the austral spring is generally similar to that for northern Australia, with the culmination of breeding before substantial wet-season rains. There are also many scattered anecdotal reports for New Guinea. For example, a pair of Long-billed Honeyeaters, which was assumed to consist of the same two partners throughout, was observed in detail at the Baiyer River Sanctuary, in the Western Highlands. A nest under construction in mid-October, had a complete clutch of two eggs on 13th of that month; the eggs hatched on 29th October, 16 days after the completion of the clutch, and young successfully fledged on 13th November, 15 days after hatching. A second nest was built in exactly the same spot, and a second clutch of two eggs was completed on 17th December; these hatched on 4th or 5th January, 18–19 days after laying, and young fledged on 19th January, 14–15 days later. The total incubation–nestling period was 31 days for the first attempt and 32–34 days for the second. No breeding took place during the height of the wet season, but another nest was built in the same place, with a clutch of two eggs present on 4th May. These eggs hatched on 12th May and the young fledged on 29th May, 17 days after hatching. If the same pair was involved, it successfully raised two broods between October and mid-January, and then a third in the subsequent May–June. In New Guinea, breeding of MacGregor's Honeyeater, which is a specialist frugivore (see Food and Feeding), appears to be synchronized with the local production of ripe fruit of its preferred species, *Dacrycarpus compactus*, which does not always occur annually. Even so, a nest with a single chick has been found when there was almost no *Dacrycarpus* fruit available.

Throughout the south-western Pacific Ocean, breeding tends to occur in all months of the year, although it is known well for only a few species. The Wattled Honeyeater is known to breed throughout the year on Fiji, and pairs are multi-brooded, but there appear to be peaks in activity in February–April, June–July and September–October. In Fiji, breeding by Orange-breasted Myzomelas has been recorded in all months except March–April, and pairs are possibly double-brooded.

Detailed observations of nest-site selection are few. Male New Holland Honeyeaters appear to perform song flights and they dive into vegetation, where they are joined by the female, the two then moving about in the vegetation, with occasional quiet calling. The males appear sometimes to perform song flights when the female is at a potential nest-site. In observations of Black Honeyeaters, the female has been seen to settle in a suitable site and to turn and twist for a variable period, from several seconds up to several minutes; the male called near a nest-site until the female returned, when both flew to the nest-site and briefly twisted and turned, before flying off, the male chasing the female.

Copulation and the pre-copulatory behaviour of meliphagids have been observed only occasionally, and appear to be characteristically brief. Copulation by ringed Yellow-faced Honeyeaters has been recorded twice. The partners perched beside each other on a branch and began much bill-clapping, before the male jumped over the female and back on to the branch two or three times; he then mounted the female for less than half a second, doing so twice in one observation. In both observations, the entire event lasted for less than five seconds before one of the pair left. These copulations occurred three days and one day, respectively, before the laying of the first egg.

The roles of the sexes in the construction of the nest appear to vary. Typically, however, the nest is built either by both sexes or by the female alone, in the latter case usually with the male in close attendance but not gathering material or doing any building work. Among those members of the family in which both sexes build, the contribution by the male is often much less than that of the female and sometimes trivial. When dealing with sexually monomorphic species, caution needs to be exercised in assessing claims, based on anecdotal observations of unmarked individuals, that both sexes build, as it is possible that the close attendance of the male is confused with physical assistance with

The only meliphagids that do not share the family trait of cup-shaped nests are the two species in the genus *Ramsayornis*. Both build bulky, domed nests. That of the **Bar-breasted Honeyeater** has a hood, as well as a side entrance which often encompasses a landing pad. Unlike the neat nest of other meliphagids, this is a ragged affair, with long strips of bark hanging from the sides and base. The nest materials are broadly the same as for other honeyeaters, but the notable proportion of paperbark (*Melaleuca*) reflects the Bar-breasted Honeyeater's close association with such forests.

[*Ramsayornis fasciatus*,
Manning Gorge,
Gibb River Road,
Kimberley,
Western Australia,
Australia.
Photo: Don Hadden]



building. Equally, detailed studies of marked honeyeaters have shown that, even for species in which the female had been thought to do all of the work, the males do sometimes assist to some extent. Such studies are needed for most species before a proper assessment can be made of the roles of the sexes throughout the family. The details evidently vary even within genera. For example, in *Lichenostomus*, nest construction appears to be done mainly or solely by females, although males of some species contribute. In detailed studies of Fuscous Honeyeaters, it was found that usually only the female builds, but males occasionally brought material; females returned to the nest 16 times per hour, each visit being of about 27 seconds in duration, whereas males returned only 1.8 times per hour and their visits were brief, about 7 seconds. Within *Conopophila*, both sexes of the well-studied Rufous-banded Honeyeater collect material and build, contributing roughly equally to the task, whereas in the Rufous-throated Honeyeater it is said that only the female builds the nest, although there are also anecdotal observations that both sexes collect material and build. In the three *Phylidonyris* honeyeaters, the female alone collects nesting material and builds; during nest construction, the male New Holland Honeyeater often accompanies his mate as she collects material, often sitting above her on an exposed perch, and sometimes performing a song flight as she approaches the nest, descending to perch above it. As with the Rufous-banded Honeyeater mentioned above, both sexes of the Bar-breasted Honeyeater, in the genus *Ramsayornis*, and both sexes of the Painted Honeyeater, in *Grantiella*, collect nesting material and build the nest. Among other species, even though both sexes build, there is some variation in their contributions. In the case of Scarlet Myzomelas, for example, construction was by the female alone at one nest but mostly by the male at another. In the co-operatively breeding miners, only the female gathers material and builds, but with another co-operative breeder, the Black-chinned Honeyeater, the roles of group-members in nest construction vary. At some nests of the latter species all members of the group appear to build, whereas at others apparently

only one individual, assumed to be the breeding female, does all of the building, although sometimes others may collect material or accompany her.

Nesting materials are collected from an area around the nest, up to 200–400 m away for larger species but typically much closer to the nest for smaller species. Material is gathered from the ground, often around the base of shrubs and trees or around fallen trees, and from live or dead trees and shrubs, and is carried to the nest-site in the bill. For example, Crescent Honeyeaters collect material from within 20–50 m of the nest-site, mainly within their own territory but sometimes from neighbouring territories, the female making up to six trips with material before sitting at the nest-site and positioning and working material, while turning slowly in nest. On the second day of building, females made an average of 32 visits per hour to the nest, and 5.5 visits per hour on the fifth day. Female New Holland Honeyeaters in Victoria travelled a mean of 40 m from the nest to collect material, making an average of 2.1 collecting trips per hour, with fewer trips during the early stages of construction than later. The larger Red Wattlebird gathers nesting material from up to 300–400 m from the nest, and Noisy Friarbirds gather material from up to 200 m away. One female Scarlet Myzomela tore strips of red bark from an *Angophora* by grasping the bark in her bill, clinging to the stem of the tree with her feet and claws and spreading the rectrices against the stem for support, and then tugging at the bark. As bark began to peel, she held on with the bill alone and rapidly fluttered her wings until a shred of bark was torn off. Another female of this species collected spider web from trees and then flew back, with a bill full of web, to a partly built nest; she then hung by one leg from foliage and, while using the other leg to hold foliage down against the nest, bound the leaves into place. Red Wattlebirds used twigs of specific shape and size for different parts of the nest: twigs were first worked together and locked into place around branches of the nesting plant, and bound with hair, plastic, fine bark and thread; an inner cup was then constructed from naturally curved twigs, interlocked with a few vertical pieces, and the lining finally added.

Studies of Fuscous Honeyeaters revealed that, for 46 nests, the time taken for building varied from 3 days to 11 days, the average being 5.3 days. For 14 nests of New Holland Honeyeaters, the building work took 10–45 days, with the average 25 days. Some species appear intolerant of disturbance during construction. Tuis will abandon both complete and incomplete nests if disturbed by an observer, although they sometimes complete a nest and then abandon it before laying. White-eared Honeyeaters, when disturbed or observed too closely during nest construction, have been seen similarly to continue working on the nest until it is finished, or nearly so, but then to abandon it before laying; they sometimes reuse the material to construct a new nest nearby.

Nests of the Meliphagidae, where known, are almost universally cup-shaped, although they are sometimes described as bowl-shaped, as baskets or, when the diameter at the rim is slightly narrower than the widest point of the nest, as pouches or as being purse-shaped. The only exception to these cup-shaped nests is the domed nests of the two species of *Ramsayornis*. Thus, the Brown-backed Honeyeater has a bulky, elongated, penduline and domed nest, with a side entrance near the top and, usually, a hood, and the Bar-breasted Honeyeater builds a bulky domed nest with a side entrance and, typically, a landing at the entrance. A few species occasionally have partly covered nests, those of the Little Wattlebird, for example, at times having a roughly domed roof. Although almost always cup-shaped, meliphagid nests vary greatly in size and shape, and in the neatness and robustness of their construction. In conspicuousness they range from being fairly obvious to being well hidden. The five species of wattlebird in the genus *Anthochaera*, all large to very large honeyeaters, build a typical deep, open cup, but the nest of several of these species can be almost flat or saucer-shaped; it has been suggested, however, that these flatter structures are the result of flattening of the cup-shaped nest during a breeding attempt. Friarbird nests, where known, are large, loosely constructed and open cups or bowls. The nest of the Striped Honeyeater is fairly deep, with the opening of the cup often slightly smaller than the lower parts of the nest and with attach-

In those meliphagids for which data are available, clutch size appears to be universally small, with the most frequent number of eggs being two. The mean clutch size for the Yellow-faced Honeyeater fits the norm, at 2.35 eggs; clutches comprising a single egg are rare. The typical meliphagid egg is ovoid, smooth-shelled and slightly glossy. It is pale in colour, ranging from white to pale pink, and often spotted. Yellow-faced Honeyeater eggs are typical in shape and texture, vary in colour from white to light pink, and are marked with darker blotches. Pairs bonds in this well-studied species appear to be relinquished after a single breeding season, even when both partners are still alive and return to the breeding area.

[*Lichenostomus chrysops*, Photo: W. R. Taylor/Ardea]



When incubating or brooding, honeyeaters often sit very tight, some birds even allowing themselves to be touched. Alternatively, the **Eastern Spinebill** may perform a distraction display if it feels that its nestlings are under threat. Across the family, duration of the nestling period varies within the range of 11–20 days; in the Eastern Spinebill, it takes 12–15 days. This species may raise up to four broods in a season. A new nest is built for each clutch, no mean feat given that each construction may take up to a week to produce.

[*Acanthorhynchus tenuirostris*,
Australia.
Photo: ANT/NHPA]



ment points running up from the nest rim to the nesting plant, so that the structure appears rather untidy and festooned. Nests of Rufous-throated Honeyeaters are neat, fragile and purse-shaped, usually suspended by one side from a fork of a branch, with the unattached side of the rim hanging lower.

Unusually, the Blue-faced Honeyeater prefers to utilize the nests of other species, especially the large, domed stick nests of Grey-crowned Babblers (*Pomatostomus temporalis*), although they have been seen also to reuse old nests of Noisy, Silver-crowned and Little Friarbirds, Noisy Miners, Red Wattlebirds, Australian Magpies (*Gymnorhina tibicen*) and Magpie-larks (*Grallina cyanoleuca*). When using babbler nests, they usually enlarge the existing entrance and build a round, open nest of bark and grass inside, or they build a new nest in a depression on the top or side of the babbler's nest. Blue-faced Honeyeater nests not in or on nests of other species are typical cup-shaped honeyeater nests, although it seems that this species usually builds its own nest only at sites where the babblers do not occur.

As would be expected, nest size varies with the size of the species. Nests of Scarlet Myzomelas are small neat cups, with an average external diameter of about 5 cm and external depth of 3–8 cm, and those of Red-headed Myzomelas are similarly small, with an external diameter of 5–5.8 cm and external depth of 3–4.3 cm. At the other extreme, friarbird nests are among the largest in the family. Helmeted Friarbirds build a large, open cup-shaped structure with external diameter and depth of 20–23 cm and 18 cm, respectively, the corresponding measurements for Noisy Friarbird nests being 12.7–17.8 cm and 7.6–10.2 cm. The mean external diameter of 17 Red Wattlebird nests, another large honeyeater, was 21.7 cm, with a range of 12–36 cm, these details excluding two extraordinary nests that were as much as 80 cm in diameter. The bulk of nests of medium-sized species fall between these extremes. For example, the medium-sized White-eared Honeyeater builds nests with an average external diameter of about 9 cm and external depth of approximately 5 cm, and those of the medium-large Striped Honeyeater have an external diameter of some 6–10.4 cm and an external depth of 6.5–12.3 cm.

Looking at the family as a whole, the honeyeaters use a wide variety of materials in their nests, as also do individual species. Nests are often made from, or include a large component of, bark or bark fibre, broad and large strips or pieces in nests of larger

species and smaller and finer strips or pieces in those of smaller meliphagids. Twigs and grass are commonly included in nests with bark; larger nests often have a large proportion of sticks or twigs, and smaller nests often include much grass. Other materials used in constructing the main cup-shaped structure include leaves, phyllodes, casuarina and pine needles, fern fronds, fine plant stems and fibres, pieces of vine and vine tendrils, rootlets, egg cases of moths (Lepidoptera) and spiders, and soft material such as wool, feathers, including those of Emus (*Dromaius novaehollandiae*), and fluffy seedheads. Some Helmeted Friarbird nests are made entirely from sticks or twigs, while the nests of Mangrove Honeyeaters consist of dried grasses and seagrass. In several species, nests built in paperbarks are often made with the bark of this tree. Foliage of the nesting plant is sometimes incorporated into the sides of the nest.

Nests are often bound externally, from tightly to loosely, with spider web or, less often, wool or other materials. The exterior is sometimes covered or festooned with moss, lichens or liverworts or other materials that appear to match the surroundings. Nests of Crescent Honeyeaters in Tasmania, for example, are occasionally adorned with small clumps of moss, which are of the same colour as that of the surroundings. Other nests have spider egg sacs and cocoons attached to the outside, and nests with wool woven untidily to the outside, hanging from the sides and bottom, have been reported. Striped Honeyeater nests often have a layer of wool so thick as to obscure the grass framework entirely, and they often also have Emu tail feathers worked into the upper part, which may partly hide the sitting bird but frequently serve to make the nest more conspicuous, at least to humans. The nests of some species can be thick-walled, while those of others may appear thin and frail, although they are usually sturdy and well made. For example, nests of Painted Honeyeaters are usually frail-looking, with eggs and daylight often visible through the sides, but they are in reality quite strong, and some are substantial structures. The nests of Black-chinned Honeyeaters are sometimes so finely woven, including the lining, that they will hold water when damp.

Meliphagid nests are usually lined with soft materials, which typically extend a little way up the sides. For instance, the lining in New Holland Honeyeater nests, which have an internal depth of 3–3.8 cm, extends about 1 cm up the side of the inner wall.

Species which usually line their nests, however, sometimes leave them unlined. In the case of Red Wattlebirds, it has even been suggested that there is a geographical variation in this respect, nests in Western Australia usually being unlined, whereas those elsewhere tend to be lined. Lining materials include shredded bark or strips of bark, fine grass, plant down from banksias, ferns, thistles and cycads and other plants, hair and fur from a variety of mammals, including possums (Petauroidea), kangaroo and wallabies (Macropodinae), rabbits (*Oryctolagus cuniculus*) and cattle, and wool from sheep and goats, feathers, leaves and leaf shoots, including casuarina needles, soft downy seeds, often of grasses, soft hairy buds, moss, fine rootlets, flowers and flower calyxes, small twigs and other plant material, such as bracts and stamens from banksias, and spider web. The lining of nests of larger species sometimes consists of much the same material as that of the external structure of the nests of smaller species, such as small sticks and twigs and coarse stalks of grass. One New Holland Honeyeater nest was lined with about 100 *Leucopogon* flowers, more than 20 banksia bracts, 2–3 feathers, and a piece of wool, and another was lined with more than 100 banksia bracts. Feathers lining the nest may sometimes cover the eggs. One Eastern Spinebill nest was lined with 25 Crimson Rosella (*Platycercus elegans*) feathers.

Hair is sometimes plucked from live animals, including koalas (*Phascolarctos cinereus*), cattle and even people. The White-eared Honeyeater is renowned for its habit of collecting hair or fur from live mammals, and regularly gathers materials from the head, body or clothing of humans, or accepts material offered by people, such as clippings of hair, wool or cotton wool. Around human habitation or places of human activity, artificial materials make their way into the nest structure and lining of meliphagid nests; these include such items as string, twine, rope fibres, paper, paper tissues, pieces of plastic, scraps of cloth, pieces of fibre from carpet, felt carpet underlay, and cigarette filters. Again, White-eared Honeyeaters have been seen to take strands from hessian or rope, fibres from a blanket on a clothes-line, and fibres from socks, and wool from clothing, and individuals have even attempted to take the laces from an observer's shoe.

When examined closely, at least some meliphagid nests appear to have a dual structure in the external layer, although this

varies among species, or perhaps is dependent on the interpretation of the observer. At Golton Vale, in Victoria, nests of New Holland Honeyeaters had three distinct layers: an outer layer of dead, often branched, twigs, a middle layer of strips of bark from messmate (*Eucalyptus obliqua*), and a lining of soft plant material and wool. At another Victoria site, Cranbourne, where less bark was available, the middle layer of nests was composed mainly of *Cassytha* vines and bark from tea-trees (*Leptospermum*) and paperbarks. Similarly, a Yellow Wattlebird nest had an external layer of twigs and rootlets, an inner layer of leaves, bark and grass, and a lining of wool. On the other hand, nests of Red Wattlebirds, while also of three distinct parts, consist of a concave substructure of sticks or grass, with a cup built in the hollow of the substructure and made of smaller sticks, bark or grass, and a soft inner lining of wool or fur. Twelve New Holland Honeyeater nests, when taken apart, were found to contain an average of 384 items of material in the outer layer, these ranging in length from less than 15 cm to 30 cm or more, and an average of 1713 banksia bracts; the number of items in the outer layer ranged from 225 to 610, and the number of banksia bracts from 250 to as many as 4000.

Most honeyeater nests are suspended by the rim, often from a horizontal or angled fork in a thin branch or branchlet in dense foliage towards the outer edge of a tree, sapling or shrub. Many are built among drooping outermost foliage and branches. Larger nests, such as those of friarbirds, are often, however, firmly woven over fairly thick branches, and nests can be suspended in a vertical fork or cluster of twigs or branches. Some species build closer to the centre of the nesting plant. A number of species commonly build the nest over water, the Bar-breasted Honeyeater of northern Australia being one such example. While the miners have been said to stand apart from other honeyeaters in that, among other things, the nest is supported and not suspended, supported nests are a common feature of a range of other species, including those, such as the Crescent and New Holland Honeyeaters, which more typically build a suspended nest. For example, in an analysis of nests of Singing Honeyeaters, 146 were suspended and 42 were supported, and 14 of 19 nests of White-eared Honeyeaters were suspended and the rest supported. Nests of Blue-faced Honeyeaters are often supported, especially when sited in palms, where they can be built on top of fronds,



Unlike most members of the family, **Scarlet Myzomela** pairs appear to be flexible in their division of breeding responsibilities. Either sex may build the nest, in contrast to almost all other honeyeaters, where the female takes charge. The female probably incubates alone, but is fed on the diminutive cup-shaped nest by the male. Once the eggs have hatched, both parents feed the nestlings. In common with other *Myzomela*, this species is strongly sexually dichromatic, the male being brightly attired and the female comparatively drab.

[*Myzomela sanguinolenta*, Goomboorian, SE Queensland, Australia. Photo: Cyril Webster]

often close to the trunk on top of a base of fronds. Similarly, a nest of the Long-billed Honeyeater was supported between the trunk and multiple leaf bases of a palm-like *Pandanus* tree. Some nests, while suspended, can in fact rest on the ground, as is the case with some White-cheeked Honeyeater nests.

Nests of this family are usually built in a live tree or shrub, but the nest-site varies much, as does the height of the nest above the ground. Some species tend to build in prickly shrubs, such as *Hakea* or *Acacia*. Other recorded sites are in mistletoes, dead shrubs, grass tussocks, clumps of rushes, bracken (*Pteridium esculentum*), among tangles of creepers and vines, in small palms, in grass-trees (*Xanthorrhoea*) and even on a fallen branch among grass. Mangrove Honeyeaters nearly always nest in dense mangrove shrubs or small trees. The Regent Honeyeater almost invariably uses rough-barked trees, mainly eucalypts. Exceptionally, nests have been recorded between a dead mallee eucalypt stem and the peeling bark, with the nest bound around the bark. On Solomon Island, off southern New Zealand, where petrels (*Pterodroma*) return to their nests at night, Tuis place their nests in sites protected by a small branch or cluster of twigs strong enough to deflect descending petrels.

Artificial sites are occasionally used. For example, a pair of Lewin's Honeyeaters attached its nest to a clothes-line beneath a house, and the site was used each season for an unknown number of years. In New Guinea, the little-known Long-billed Honeyeater has been seen to nest repeatedly in roofing material on the underside of a thatched roof in a well-used building.

Heights of nests vary considerably, from close to, or occasionally on, the ground, to 45 m above it in the crowns of tall trees. In general, most members of the family tend to build reasonably close to the ground, at 3–6 m, and there seems to be little correlation between height of the nest above ground and size of the species. Some species invariably nest low down. For example, the mean height of 120 Tawny-crowned Honeyeater nests throughout the species' range was 30 cm, varying from being on the ground to 1.2 m above it; and the mean height of 181 White-cheeked Honeyeater nests was 0.58 m, with the range 0.15–3.6 m, and 96% of these nests below 1 m. The generally medium-sized *Lichenostomus* and *Meliphaga* species of Australia tend also to nest close to the ground, but Fuscous and White-plumed Honeyeaters often or nearly always nest high up, mostly in the crown of a eucalypt or a tall acacia, and less often in a shrub. The medium-sized Bell Miner, while usually occupying tall forest habitats, usually nests in the shrub understorey; the height of 305 nests throughout the species' range was 0.30–25 m, with a mean of 2.6 m, and at one site 175 nests were 1–20 m above ground, the average being 2.8 m, with most nests 1–3 m above ground. The larger Noisy Miner tends to nest somewhat higher, with a mean of 6.3 m for 649 nests. In one study in the Northern Territory, the average height above ground of 195 nests of the small Rufous-banded Honeyeater was 5 m, varying from 1.6 m to 11 m, though with significant differences depending on nesting plant. The similarly small Eastern Spinebill tends to nest fairly high at some sites, although the mean height of nests throughout the geographical range was 3.1 m.

Among the larger species of honeyeater, nest height varies, although a few nest quite high up. The average height of nests of three of the four Australian friarbirds, the Helmeted, Silver-crowned and Little, ranges from 6.3 m to 7.3 m above ground; that of the Noisy Friarbird is 9.1 m. Similarly, the height of wattlebird nests varies. The means for the two smaller species, the Little and Western Wattlebirds, are 2.9 m and 3.5 m, respectively, although sample sizes for the latter are small, whereas that for the larger Red Wattlebird is 6.4 m. The Yellow Wattlebird usually nests quite high in trees, the average for 15 nests being 17.9 m. The remaining wattlebird, the Regent Honeyeater, nearly always nests high up in the crowns of tall trees. In the Bundarra-Barraba area of northern New South Wales, Regent Honeyeater nests were at an average height of 13.4 m, in trees which were about 18 m tall and were significantly taller than all trees measured in the surrounding 1 ha of woodland. In the Capertee Valley, in central-eastern New South Wales, in 1997, the mean height of nests in riparian sites was 12.8 m, whereas in woodland sites it was 7.8 m.



A number of species appear to have nesting associations with other breeding birds, although none seems to be an obligate association. The Striped Honeyeater, for instance, often associates with Grey Butcherbirds; of 27 of its nests at one site, 22 were noted as being near those of butcherbirds, and there are at least eight documented records of Striped Honeyeater nests having butcherbirds nesting nearby, once as close as 3 m. The Helmeted Friarbird evidently has a close nesting association with three species in Australia, the Australasian Figbird (*Sphecotheres vieilloti*), the Spangled Drongo and the Metallic Starling (*Aplonis metallica*). The same friarbird species in New Guinea has twice been reported as nesting in the same tree as a pair of Brown Orioles, and it has nested also in the same tree as White-bellied Cuckoo-shrikes (*Coracina papuensis*). Noisy Friarbirds and Leaden Flycatchers (*Myiagra rubecula*) also appear to have a nesting association, although the flycatchers probably seek out a nesting site near the friarbirds, rather than the reverse, and potentially benefit from the friarbirds' harassment of predators. In one study, however, flycatcher nests built within 26 m of a friarbird's nest were no more successful than were those built more than 48 m away.

Aside from these associations, there are many examples of various species of honeyeater nesting in the same tree as other bird species, although whether most of these are simply fortuitous events or represent closer but as yet unidentified associations is not known. For example, the Striped Honeyeater, in addition to its association with Grey Butcherbirds, has been recorded as nesting in the same tree as eight other species, most commonly black-and-white ones, including Willie Wagtails (*Rhipidura leucophrys*) and Magpie-larks. There are further records of nearby nesting of these and other species, though not in the same tree.

Honeyeaters, in common with many of the old endemic passerines of Australasia, tend to have small clutch sizes. It must be remembered, however, that there are virtually no accurate determinations of clutch size from regions beyond Australia and New Zealand, and not all Australian species are properly known. Thus, we probably have an accurate idea of clutch size for some

Nearly all members of the Meliphagidae are socially monogamous, but this characteristic does not preclude colonial or even co-operative breeding. All six members of the genus *Melithreptus* are known to have bred co-operatively, and the **Brown-headed Honeyeater** does so regularly. One such group comprised the breeding pair, two adult auxiliaries and a juvenile. The four adults shared incubation responsibilities, although the breeding pair assumed this role for three-quarters of the time. While incubating, the breeding female was fed by the other four group-members. Nestlings tend to be fed by both parents and any helpers.

[*Melithreptus brevirostris leucogenys*,
Manmanning,
Western Australia,
Australia.

Photo: Graeme Chapman/
Ardea]

one-third of the total number of species. For example, there are reasonable estimates of clutch size for only four of the 16 friarbirds, and whether the estimates of those four, all Australian species, are representative of the genus elsewhere throughout its predominantly tropical range is not known. The most frequent meliphagid clutch is of two eggs, even for large species such as the Red Wattlebird, which has a mean of 1.97 eggs. However, clutches of three or four and, rarely, five eggs are laid by species of friarbird and miner. Clutches of Helmeted and Noisy Friarbirds contain from two to five eggs but tend to be mainly of three or four, whereas the usual clutch of Silver-crowned and Little Friarbirds seems to be of two or three eggs, and occasionally four. Noisy and Yellow-throated Miners normally lay two to four eggs, the latter rarely five, and the mean for both is about three: throughout the species' ranges, the mean clutch size of Noisy Miners was 2.9 eggs and that of Yellow-throated Miners was 3.16. The usual clutch size of Bell Miners, however, is of two eggs; in five studies, the average ranged from 1.8 to 2.01 eggs. The two New Zealand endemics likewise have larger clutches, usually of three or four and, occasionally, five eggs. While there are few accurate determinations, Tuis on Tiritiri Matangi Island lay 2–4 eggs, with a mean of three, but first-year females laid more clutches of two and four than did older birds. Bellbirds on Poor Knights Islands had a mean clutch size of 2.87 eggs and those on Tiritiri Island a mean of 3.6 eggs.

While exceedingly poorly known in general, some island endemics of the south-western Pacific Ocean appear to lay single-egg clutches, or at least mainly do so. For example, Barred Honeyeaters are said to have a clutch of one egg, but clutches of the Vanuatu Honeyeater are said to consist of two eggs, although the basis of this claim is not certain. The clutch size of the Wattled Honeyeater is reported as usually one egg, but is said sometimes to consist of two or three eggs, while the Kadavu Honeyeater, too, is said to lay only one egg. Further, while the clutch size of the Giant Honeyeater is not known, only single dependent juveniles have ever been recorded.

Clutches larger than the usual, as recorded for the Blue-faced Honeyeater, among others, are thought to have been the result of more than one female laying in the same nest. At nests of Bell Miners, microsatellite analysis of parentage of 50 nestlings in 31

clutches found that five nestlings were the result of intraspecific brood parasitism.

There is some evidence that the clutch size of Noisy Miners increases slightly through the course of a breeding season. Similarly, in north-western Australia, early clutches of Yellow-throated Miners are said to be almost all of three eggs, whereas many later clutches contain four or more. At one site, the mean size of first clutches of Noisy Miners in a harsh year was significantly lower than that in a better year. In eastern Australia, clutch size of New Holland Honeyeaters appears to increase from north to south.

Eggs of the Meliphagidae are typically oval, and usually elongate oval, but they range from being almost spherical to being rounded ovals or thick ovals to elliptical and pointed ovals. They are usually close-grained, finely textured and smooth; and slightly lustrous or glossy, although some are said to be lustreless. Ground colours range from white, through cream and buff to pink and salmon, and eggs are often spotted, varying from finely so to heavily blotched, with light to dark lilac or purple, purplish-brown, reddish-brown or red, brown or black. Eggs are typically more heavily marked at the large end, where the markings sometimes form a well-defined zone or cap. The eggs of many species also have underlying spots and blotches, often of violet or grey.

Laying intervals have been found to be approximately 24 hours for the few species that have been studied. With some larger species, however, the intervals may be more than 24 hours. The Noisy Friarbird lays its eggs at intervals of 24–48 hours, and laying intervals thought to be greater than 24 hours occur at least sometimes with Little Friarbirds. There are no data for the other friarbirds, nor for the wattlebirds, other than a laying interval once of between 29.5 and 34 hours for a Little Wattlebird.

Incubation periods range from 12 to 17 days, and nestling periods from 11 to 20 days, occasionally longer. While the range for these periods across the family is not great, they tend to be shorter for smaller species and longest for the large species. For example, the mean incubation period at eight nests of Rufous-banded Honeyeaters, a small tropical species, was 14 days 7 hours, ranging from 13 days 13 hours to 15 days 5 hours, and the mean nestling period was 14 days, ranging from 13 days 4 hours to 14 days 21 hours. In the medium-small Yellow-faced Honeyeater,



Larger honeyeaters tend to have longer incubation and nestling periods than smaller species. The **Noisy Friarbird** incubates for 15–19 days and broods for 16–19 days. The lower ends of these ranges are longer, for example, than the equivalent mean figures for the considerably smaller Rufous-banded Honeyeater (*Conopophila albogularis*). Noisy Friarbirds are aggressive parents, readily attacking predators that venture near their nest. As such, they make useful neighbours, so species such as the Leaden Flycatcher (*Myiagra rubecula*) apparently often breed near friarbirds for protection.

[*Philemon corniculatus monachus*,
Goomborian,
SE Queensland, Australia.
Photo: Cyril Webster]

the incubation period was 14–16 days, with an average of 14.4 days, and the nestling period lasted 11–15 days, with an average of 13 days. The mean incubation period of the medium-sized Singing Honeyeater of arid and temperate regions was 13.2 days, ranging from 12 to 14 days, although at least once it was greater than 14 days. In temperate northern New South Wales, the incubation period of Noisy Friarbirds, a large species, was 15–19 days and the nestling period 16–19 days. In most instances, the sample sizes are small.

Among most species, incubation of the eggs and brooding of nestlings is carried out primarily or exclusively by the female. Even among the colonial and co-operatively breeding miners, the female alone incubates and broods. Some claims of incubation or brooding by males of monomorphic species within genera in which these duties are otherwise undertaken solely by the female require confirmation, especially in cases when the birds were not individually ringed. For example, within the genus *Lichenostomus*, incubation is solely by the female, or nearly so, but it has been variously claimed, in the case of White-gaped Honeyeaters, that both parents brood and that the female alone broods. With a few species, however, males do assist with incubation or brooding. Both sexes of the Painted Honeyeater incubate and brood, the male also sometimes feeding the female on the nest. In *Melithreptus*, both sexes of the Brown-headed Honeyeater are known to incubate, and both sexes are thought to do so at nests of the Black-chinned, Strong-billed and White-throated Honeyeater, although there are few observations for these three. For White-naped Honeyeaters, it has been suggested that probably only the female incubates, and for Black-headed Honeyeaters it has been variously suggested that incubation is by the female alone or is shared between the sexes. Further, there can be variation within a species. Sometimes both sexes of the Black Honeyeater incubate the eggs, although incubation was mainly by the female at one nest, with the male seen on the nest only once, yet at other nests of this species incubation was done solely by the female. Both sexes also brood the young, but the female does the greater share.

Occasionally, even auxiliaries of co-operatively breeding species may participate in incubation. In detailed observations of a co-operatively nesting group of Brown-headed Honeyeaters that consisted of the breeding pair, two unsexed adult auxiliaries and a juvenile auxiliary, the primary pair incubated for 73% of the time, shared about equally between them, the two unsexed adult auxiliaries for 24% and 3% of the time, and the juvenile did not incubate at all; over eight days, this nest was unattended for only 1% of the time.

Incubation seems usually to begin with completion of the clutch, but even when this is normally the case it may begin earlier. For example, female Bell Miners occasionally began incubating after laying the first egg of a two-egg clutch or the second of a three-egg clutch. In other species, asynchronous hatching indicates that incubation probably began before the clutch was complete.

All honeyeater chicks are altricial and nidicolous. The young hatch blind and naked, or almost naked, but soon develop a light covering of down. The time spent in brooding them during the day decreases over the nestling period, although nocturnal brooding often continues to the end or close to the end of this period. For example, in Crescent Honeyeaters, in which brooding is solely by the female, nestlings are brooded for 50% of the day on the first day, but the brooding time declined steadily, until diurnal brooding had almost stopped on the eighth day. Among Bell Miners, the brooding behaviour of the breeding female, which carries out all of this duty, varied with a number of factors. Thus, the mean number of bouts decreased as nestlings grew older; brooding decreased as ambient temperature rose, although with a small increase at 36–40°C, presumably when the female shaded the young; and larger broods were brooded significantly less than were smaller ones, even though the number of nestlings ranged only from one to three. The number of brooding bouts also increased significantly with an increase in the numbers of auxiliaries attending the nest. During incubation and brooding periods, sitting birds will leave the nest for short periods during the day in order to forage.



While incubation and brooding are done almost solely by the breeding female, both parents, and also, in co-operative breeders, auxiliaries feed the nestlings and fledglings, guard them from predators, and remove or eat the faecal sacs. At Crescent Honeyeater nests, both male and female parents fed the nestlings, removed faecal sacs, and tended the chicks by removing remains of faecal sacs, food and feather scales from them; females, however, made more feeding visits than males, 69% as against 31%, and females removed more faecal sacs and tended the young more. The two sexes of the Yellow-faced Honeyeater fed the young and removed faecal sacs at about equal rates. In the case of co-operatively breeding Bell and Noisy Miners, both parents and auxiliaries feed, guard and care for nestlings, but most of the nest-sanitation work is carried out by the breeding female.

Evidence from a few species indicates that young become independent from 26 to 42 days after fledging, although this is a progressive process, the young starting to feed themselves in about half of this time. There are, however, few hard data. In Victoria, the mean age of independence of young New Holland Honeyeaters was 37.6 days, with a range of 22–52 days. Fledglings of the Rufous-banded Honeyeater stay with the parents for at least 30 days after leaving the nest, and they may continue to beg at that stage, with two fledglings seen to be fed by the parents 35 days after leaving the nest. Fledgling Bell Miners are wholly dependent on the parents or auxiliaries for food for at least eight days after they leave the nest, and they are fed for an average of 10.6 weeks after fledging. In northern New South Wales, juvenile Red Wattlebirds were still being fed by their parents 15 days after fledging, and elsewhere another brood was noted to be largely independent one month after fledging.

A Rufous-banded Honeyeater pair may

raise up to five broods in a season, with an average of just under one fledgling leaving the nest per attempt.

Such breeding success requires considerable parental investment, so it is not surprising that members of the pair share breeding responsibilities. Both adults play a roughly equal role in collecting material for and subsequently constructing the nest. Both sexes also feed the nestlings and fledglings. The diet of the adults is mainly arthropods such as insects and spiders, and it is likely that such protein sources also form the bulk of the young birds' calorie intake.

[*Conopophila albogularis*, Darwin, Northern Territory, Australia.

Photo: Raoul Slater/Lochman Transparencies]



Like many meliphagids, the **Tawny-breasted Honeyeater** conceals its nest deep in the dense foliage of a shrub or tree, a tactic aimed at avoiding the attention of predators. During the two-week nestling period, the most perilous moments are when the parent returns to the nest-site with food. The adult thus does so quickly, quietly and with the minimum of fuss. Both sexes of the Tawny-breasted Honeyeater are thought to feed the nestlings and fledglings, and insects such as beetles (Coleoptera) and grasshoppers (Orthoptera) provide the bulk of the species' diet.

[*Xanthotis flaviventer filiger*,
Iron Range National Park,
N Queensland, Australia.
Photo: Clifford &
Dawn Frith]

Interestingly, broods of New Holland Honeyeaters in New South Wales sometimes join together to form larger groups. Of 44 broods of fledglings, seven amalgamated with a neighbouring brood, the adults of both breeding pairs then carrying food to a single location.

During the incubation and nestling stages, meliphagids can sit very tightly, not leaving until almost touched or, in some instances, until they are physically touched. Brooding and incubating female Black Honeyeaters, for example, did not leave the nest until almost touched by the observer, and one brooding female had to be lifted from the nest for the observer to inspect the young. When approached, an incubating female Black Honeyeater sinks down into the nest, with the bill and tail held vertically.

Distraction displays by honeyeaters, designed to lure a predator or potential predator away from nests or away from fledglings, have been reported widely, including for some New Guinea genera such as *Melidectes* and *Melilestes*. Most observations, however, involve responses to human observers. Distraction displays include the feigning of injury or juvenility by making fake falls and tumbles from branches close to the source of the perceived threat, sometimes with the wings spread, fluttering in the vegetation, fluttering along the ground with one wing dragging in the so-called "broken-wing display", or flopping about on the ground with both wings spread, flapping and calling weakly. In New Guinea, a Long-billed Honeyeater performed a broken-wing distraction display along the ground, moving quickly away from a nest with eggs. The birds also utter alarm or distress calls, with bill-snapping, and they may attack or mob a human observer or other perceived threats.

For well-studied meliphagid species in Australia, breeding success in terms of the number of nests fledging at least one young ranges from as low as 5.6% to as high as 76%. The low value is for Noisy Miners. The high one was for Rufous-banded Honeyeaters breeding in a tropical urban environment; of 78 complete clutches, 63, or 81%, produced nestlings and 55, 71%, produced fledglings. Rufous-banded Honeyeaters produced 5.82 young per pair per season, and there was no significant difference in success between clutches of two and of three eggs, between nests built in the same tree as the previous nest and those in a new site, and between nests above 5 m and those below 5 m from the ground. Moreover, productivity did not vary signifi-

cantly during the three-year study period or among four periods within the breeding season. For Crescent Honeyeaters in Victoria, during one season, of 76 eggs in 27 nests, 55 hatched and, from these, 22 young fledged, with overall breeding success of 29.6%. At one site in Victoria, 34.6% of Bell Miner nests fledged at least one young; at another site, a mean of 0.62 fledglings per breeding attempt was achieved, and females had a mean lifetime productivity of 3.83 fledglings.

The causes of failure are the same as those for many other bird species. A proportion of eggs are, of course, infertile; for example, in one study of Bell Miners 3% of eggs were infertile. Other eggs become addled during incubation. Poor weather can cause failure, with nests blown down or their contents blown out during strong winds, storms or cyclones; further, nestlings often die in cold, wet weather, and persistently bad weather and rain eventually causes females to abandon eggs. Predators are responsible for many losses, and reptiles are considered an important cause of failure. Nestlings are known to have been taken by monitors (*Varanus*), including Gould's monitor (*Varanus gouldii*), and by snakes, including the eastern brown snake (*Pseudonaja textilis*) and the copperhead (*Austrelaps superbus*). D. P. Armstrong and G. H. Pyke, in a study of nesting attempts made by New Holland and White-cheeked Honeyeaters north of Sydney, concluded that the patterns of success and failure that they observed were not a result of seasonal changes in availability of food energy in the form of nectar, but were due to the effects of predation, which may prevent successful breeding over the warmer months.

Avian predators are also responsible for losses. Eggs or nestlings of meliphagids are taken by birds of prey, including Australasian Goshawks (*Accipiter fasciatus*), Spotted Harriers (*Circus assimilis*) and Black Falcons (*Falco subniger*), and by kookaburras, currawongs (*Strepera*), crows and ravens, butcherbirds, Common Blackbirds (*Turdus merula*) and Common Mynas (*Acridotheres tristis*). Further, Spiny-cheeked Honeyeaters are known to take eggs of Painted Honeyeaters. Mammalian predators include domestic and feral cats, common brush-tailed possums (*Trichosurus vulpecula*), black rats (*Rattus rattus*) and, in New Zealand, stoats (*Mustela erminea*) and Pacific rats (*Rattus exulans*). Predators also cause nest failure when they kill sitting adults. Nestlings may be attacked by green tree-ants

(*Oecophylla*), and nests are sometimes abandoned or the nestlings killed by other ants.

Nests are sometimes abandoned when disturbed, either by human observers or by other sources, such as attacks by White-winged Choughs (*Corcorax melanorhamphos*). Tuis may desert a newly laid clutch if disturbed by an observer, or some other potential threat, but they do not abandon well-incubated clutches. Nests appear sometimes to be simply abandoned for no obvious reason. Formerly, many eggs were taken by collectors, and eggs are still occasionally damaged by researchers. Nestlings are also sometimes infested with parasites, such as larvae of botflies (of the genus *Passeromyia*), or die from disease. Ectoparasites, however, probably only rarely cause mortality. Infanticide and egg destruction by other species have been recorded.

Occasionally, fate intervenes. A Painted Honeyeater abandoned a clutch of three eggs when these became stuck to the bottom of the nest by a liquid dripping from an overhanging mistletoe, which made it impossible for the female to turn the eggs. At two nests, nestling Helmeted Friarbirds died when their legs became entangled in polypropylene twine incorporated into the nest rim, although, at one nest, two young thus entangled and hanging upside-down outside the nest still accepted food from the parents. One nest built next to a door failed when the door was opened, smashing the nest, and another nest with eggs failed after the tree in which it was placed was cut down.

For Bell Miner nests at one site in Victoria where cause of total failure of nests was known, the details were as follows. Of 63 nests, 53.9% were preyed on, 9.5% were partly preyed on and then deserted, 28.5% were deserted by the parents, in 3% the young were killed by disease and, in single nests, the eggs were infertile, the eggs were broken, or the nestlings were deserted.

Honeyeaters are hosts to a number of cuckoos. They are one of the main hosts of Pallid Cuckoos (*Cuculus pallidus*) in Australia, meliphagids comprising some 66% of 1052 records of nest parasitism by this cuckoo or of adults feeding the cuckoo fledglings, though the latter are not definitive instances of brood parasitism. Pallid Cuckoo eggs or chicks have been recorded in nests of *Acanthorhynchus*, *Anthochaera*, one *Meliphaga* species, twelve *Lichenostomus*, three *Manorina*, five *Melithreptus*, one *Lichmera*, three *Phylidonyris*, two *Philemon*, one *Ramsayornis* and in nests of the monotypic *Purnella*, *Gliciphila*, *Acanthagenys*, *Plectorhyncha* and *Entomyzon*. The larger species, such as the friarbirds and wattletails, in addition to being hosts of Pallid Cuckoos, are parasitized by the larger Common Koel (*Eudynamys scolopacea*), and in New Zealand eggs of the Long-tailed Koel (*Eudynamys taitensis*) have been found in nests of Tuis and New Zealand Bellbirds. Brush Cuckoos (*Cacomantis variolosus*) also parasitize nests of small and medium-sized honeyeaters, such as those of *Conopophila*, *Lichenostomus* and *Ramsayornis*. Honeyeaters are only occasionally parasitized by bronze-cuckoos, but eggs or nestlings of the Shining (*Chrysococcyx lucidus*) and Horsfield's Bronze-cuckoos (*Chrysococcyx basalus*) have been found in nests of species of *Acanthorhynchus*, *Lichenostomus*, *Melithreptus*, *Phylidonyris*, *Lichmera*, *Myzomela* and the monotypic *Purnella*, *Gliciphila* and *Sugomel*. Honeyeaters are also, no doubt, parasitized by some of these, and other species, elsewhere in their geographical ranges, but there are few reports outside Australia. Honeyeaters mob or attack cuckoos. Helmeted Friarbirds, for example, have been seen to attack Common Koels near a nest, and one chased a Pheasant Coucal (*Centropus phasianinus*), which is not a nest parasite, and then returned to its nest. A Dusky *Myzomela*, along with other species of honeyeater, was seen to attack a Brush Cuckoo, fluttering above it and scolding it.

While not known in any detail for most species, many members of the family probably breed in their first year, in the season subsequent to the one in which they hatched. There are many instances of first-year Regent Honeyeaters nesting successfully. Yellow-tufted Honeyeaters first breed in the year after they fledge, with successful breeding attempts recorded for an 11-month-old female, as well as unsuccessful attempts by both first-year males and first-year females. North of Sydney, New Holland Honeyeaters are able to establish territories, attract a mate and successfully breed when one year old; in Victoria, females are able to breed when about one year old and most probably do so,

whereas males first bred between the ages of one and at least two years, two aged 1.5–2 years having not yet bred. In northern Australia, Immelman claimed that White-gaped Honeyeaters could breed before finishing the post-juvenile moult, although confirmation of this is needed.

Honeyeaters, like many Australian passerines, can be long-lived, and there are many records of longevity greater than 10 years. For all members of the family in Australia and New Zealand for which relevant data are available, the mean longevity is just over 9 years 11 months. The longest-lived individual was a White-plumed Honeyeater, which had a lifespan of 15 years 10 months.

Movements

With a few exceptions, there is no simple categorization for the movements of meliphagid species. Analysis of the movement patterns of Australian birds is severely limited by the combination of huge land areas and the low density of human populations, and even lower densities of ornithologists and bird-ringers. The situation is even worse in New Guinea, and there have been few analyses of movements on the islands of Wallacea and the south-western Pacific Ocean. The majority of honeyeaters, however, could be considered sedentary, with no large-scale seasonal movements observed for many of the Australian species and for nearly all of the others. Least identified rainforests as having the greatest proportion of sedentary species among Australian honeyeaters, and this is a pattern likely to be repeated throughout the range of the family. Nevertheless, all species probably undertake some, usually ill-defined, local or regional movements to exploit food resources, with such movements more prominent among the more strongly nectarivorous species. The extent of these movements varies, but they are often described as nomadic.

Honeyeaters can be broadly classified under three headings. The majority are sedentary, or resident, most individuals of the species usually remaining in a stable territory or home range; some are migratory, all or most individuals moving regularly between breeding and non-breeding ranges; and some are nomadic or dispersive, their movements and occurrence apparently unpredictable, but not necessarily random, within suitable habi-



Black Honeyeaters are diligent parents. Although many incubating meliphagids sit tight on the nest when approached, one female Black Honeyeater took this to an extreme by having to be physically lifted from the nest for the human observer to inspect her eggs. Black Honeyeaters also employ a quite different strategy towards intruders, performing distraction displays, and, on at least one occasion, even attacking the observer.

Both sexes incubate, brood and provision their offspring, although the female probably performs the bulk of the first two functions and the male most of the last.

[*Sugomel nigrum*,
Bollon, Queensland,
Australia.
Photo: Raoul Slater]



Breeding success among honeyeaters varies considerably. One investigation revealed that just 5.6% of nests of the studied species produced one or more fledglings, whereas research into a different species produced an equivalent figure of 76%. **Lewin's Honeyeater** appears to tend towards the upper end of the scale of breeding success, with a mean of one fledgling raised for every two nests. To be successful, adults must run the gauntlet of nest predation by Pied Currawongs (*Strepera graculina*) and brood parasitism by Fan-tailed (*Cacomantis flabelliformis*) and Pallid Cuckoos (*Cuculus pallidus*).

[*Meliphaga lewinii lewinii*, Goomboorian, SE Queensland, Australia. Photo: Cyril Webster]

tat, and these can be considered to be intermediate between the previous two patterns. Other types of movement made by honeyeaters include irruptions, sometimes beyond the normal range of a species, dispersal of young from their natal range, and vagrancy, which is characterized by the occurrence of individuals beyond their normal range or habitat. The last is of little biological importance, other than when it may represent the beginnings of a species' range expansion.

There is, however, some intraspecific variation in the patterns of movements, at local, regional and continental scales. In common with other regions at middle latitudes, partial migration is well developed among Australian birds. K. Chan, who recently reviewed partial migration by Australian landbirds, listed 25 species of honeyeater as partial migrants, having both sedentary and migratory components, which represents 36% of the Australian meliphagid species. Further, nearly all species considered sedentary have been recorded as moving locally at some sites. Such variation makes it difficult to generalize about the patterns of movement at a species level, as birds respond to availability of resources, especially food, or climatic or other factors, such as drought or fire, on local and regional scales. While there have been studies that show a correlation between abundance or occurrence of honeyeaters and nectar production or numbers of flowers, others have failed to detect a correspondence between meliphagid presence and nectar or other resource production.

Nomadism and nomadic movements are perhaps the most problematic category of movements of Australian birds, and of honeyeaters in particular. The mobility of nectarivores at local or regional scales, often in apparent response to the distribution of flowering plants and nectar production, is well known for the Australasian avifauna as a whole. Nomadism is a response to highly varying distributions of resources in time and space, and diet is commonly perceived as an important predictor of nomadic behaviour, although mass and other factors have also been identified as possible predictors. The term "nomadism" is frequently associated with the movements of honeyeaters, even to the extent that some authors have listed all or nearly all Australian honeyeaters as nomadic, whether partially, locally or seasonally so. The term is often used to describe apparent movements of some honeyeaters in Wallacea, New Guinea and the south-west-

ern Pacific. The description of movements as nomadic or dispersive, however, often reflects a lack of knowledge of the true patterns of movement within a species, and is often used indiscriminately as a convenient catch-all classification to explain observations that do not readily fit other patterns. Further, while local movements, and the species performing them, are often described as being nomadic or locally nomadic, such movements can be interpreted as residence within a large home range. As has been pointed out, the expression "local nomad" is virtually a contradiction of terms. Although beyond the scope of this discussion, the concept of nomadism is the source of some debate in respect both of its extent within the Australian avifauna, and elsewhere, and of the drivers of such movements. In summary, nomadic movement can be distinguished from migratory movements by having one or more of the following characters: no return journey to a fixed breeding area; much overlap of breeding and non-breeding areas; irregular timing of movements; unpredictable or less predictable timing of movements; and movement often occurring over a large proportion of the lifetime of an individual. It is apparent that many species of honeyeater, and Australian birds in general, that have been labelled as nomadic do not have patterns of movements with these characteristics. Use of the term "nomadic" to describe movements often implies that the movements are random, but there is no evidence to suggest that such is the case. Indeed, one needs to question whether purely random movements would be an evolutionarily adaptive strategy. Although movements may appear unpredictable to human observers, this is not to say that there is no underlying pattern. For example, other mobile species that have been thought of as highly nomadic, such as the Budgerigar (*Melopsittacus undulatus*) and the Zebra Finch (*Taeniopygia guttata*), seem to have an underlying pattern to their movements. Detailed knowledge of the spatial scales over which a species may be moving and of the phenology of resource abundance over large spatial scales and long time-scales is required before the so-called unpredictability or otherwise of the movements can be assessed.

In recent years, there have been a number of continent-wide reviews or analyses of the patterns of movements of Australia's birds. The *Handbook of Australian, New Zealand and Antarctic*

Both **White-throated Honeyeater** parents feed the chicks for the 14 or so days that they are in the nest and provision the fledglings once they have left the nest. Breeding data for this species neatly demonstrate the contrast between the extent of meliphagid research in New Guinea and Australia. There are very few observations of White-throated Honeyeaters breeding in New Guinea, but quite detailed information is available from Australia. Studies suggest that the breeding seasonality in the latter is bimodal, peaking in April and September. The standard clutch size is two, and the cup-shaped nest is usually suspended from a horizontal branch of a tall tree.

[*Melithreptus albogularis inopinatus*,
Goomboorian,
SE Queensland, Australia.
Photo: Cyril Webster]



Birds provides a summary of the published literature on the movements of all Australian species, including the honeyeaters. Earlier, in 1968, Keast reviewed the seasonal movements of Australian honeyeaters, this based on an examination of the literature to that time and on his own and others' unpublished observations. Keast distinguished seven patterns of seasonal movement. Of the 69 meliphagid species which he recognized, 34 were considered resident, some with local movements, and 25 were split between his three classes of nomadism: moderately well-developed nomadism, blossom nomadism, and desert nomads. The remaining species were north-south latitudinal migrants or altitudinal migrants. As already stated, Chan also reviewed partial migration by Australian landbirds. Few studies, however, have directly examined the actual movements of the birds discussed. Most analyses of the movements of Australian honeyeaters have relied largely on scattered local or regional studies of avian-community composition and any changes, seasonal or unpredictable, in presence or absence within those communities. Almost invariably, claims of movements, and especially of nomadism, are based simply on the occurrence or absence of a species in an area. Whereas the continuous presence of a species in a given area can often be reliably interpreted as indicative of that species' residence or sedentariness, its absence indicates movement from the site but, in isolation, provides little or no information on the extent and timing of the species' movements; admittedly, continuous presence does not rule out migration or dispersion of local populations, which are then replaced by similar populations from elsewhere, but such changes are often noticeable.

With data from sufficient sites over similar periods, it would be possible to make better analyses of patterns of occurrence and conclusions on the movements of species. The two bird-atlas projects in Australia, the first conducted between 1976 and 1981 and the second between 1998 and 2002, produced a huge amount of data on the overall and seasonal distribution of birds. The subsequent ground-breaking work of P. A. Griffioen and M. F. Clarke, combining the use of bird-atlas, count and ringing databases to analyse the large-scale movements, or lack of them, of the birds of eastern Australia, has provided a much better understanding of the broad-scale patterns observed for many species with suffi-

cient data. For many meliphagids, however, there were insufficient data to indicate movements, or the data were sufficient only to suggest probable patterns of movements. As a quantitative analysis, the work of Griffioen and Clarke supersedes much of the qualitative, and often inadequate, analyses made earlier. Of the 51 species of meliphagid listed by Griffioen and Clarke as having sufficient data for analysis, 39, or 76.5%, exhibited no movements, three showed local movements, four showed a confused pattern of movement, and for five species, 9.8%, there was strong evidence of long-distance movement, though the patterns showed by each of these varied. For two species, the Painted Honeyeater and the Bar-breasted Honeyeater, there were insufficient data.

The high proportion of sedentary species identified here contrasts with that indicated in earlier analyses, but the scale of the analysis must be considered. At the grid-scale of 200×200 km, species showing no movements may still be mobile, even highly mobile, at scales of less than this. For example, the analysis by Griffioen and Clarke found evidence suggesting an absence of movement by the Regent Honeyeater, yet this species is highly mobile and makes complex movements, at least on regional scales, throughout its range.

Nevertheless, most species of honeyeater appear to be primarily sedentary, albeit with the possibility of local movements. Virtually all except the most restricted-range ones, however, exhibit a range of movements at different sites throughout their ranges. Noisy and Bell Miners are notably sedentary and colonial, but colonies can show some shifts in location over time; the other two miners, the Yellow-throated and Black-eared, appear also to be sedentary. The rainforest species of north-eastern Australia are poorly known but seem to be largely sedentary, albeit with possible altitudinal movements by a small proportion of the populations of some species. In a detailed study in woodland north of Sydney, it was found that White-eared Honeyeaters defended permanent all-purpose territories, with no indication of movement of established pairs beyond the territory. This species is considered sedentary and territorial generally throughout its range, but in all areas it has been observed to undertake some, apparently local, movements. At several localities, individuals make local seasonal movements between habitats. At two sites in Vic-



An essential element of parental care is to keep the nest free of disease. This includes the removal of the nestlings' faecal sacs soon after their excretion. This adult Spiny-cheeked Honeyeater is extracting the shiny white sac from the nest in order to dispose of it a safe distance away. Some meliphagids also ingest their offspring's faecal waste as it contains substantial quantities of undigested nutrients. For hygiene reasons, honeyeaters also remove unconsumed food and feather scales from the nest. This brood of three chicks is typical for the Spiny-cheeked Honeyeater. The nestling period lasts at least two weeks, and parents continue to provision their young for a further twelve days or so.

[*Acanthagenys rufogularis*, Uluru, Northern Territory, Australia.
Photo: Stanley Breeden/
Lochman Transparencies]

tor, White-eared Honeyeaters were territorial when breeding but moved locally when not breeding: at Yellingbo they dispersed locally within the study area in late autumn and early winter, and in the Brisbane Ranges their foraging areas broadened in winter, extending to open woodland of open slopes. Similarly, in a study in northern New South Wales, White-eared Honeyeaters were recorded only in March–July and October, although the birds appeared to be moving only locally from adjacent grassy forest and open woodland to the open-layered forest of the study area. In the Southern Highlands, however, White-eared Honeyeaters are altitudinal migrants, and elsewhere they are considered occasional visitors at a couple of sites, although the extent of the movements involved is not known.

Lewin's Honeyeater is another species considered generally sedentary throughout its range, with the possibility of some altitudinal migration in the north-east. As with White-eared Honeyeaters, however, Lewin's Honeyeater undertakes some local movements, mostly in autumn–winter, primarily between habitats. For example, in northern New South Wales, some appear to move into dry sclerophyll forest from neighbouring wetter forests, where they are common throughout the year. This species is sporadic in occurrence at some sites and is a vagrant at others.

Other species exhibit more complex variation in patterns of movements across their ranges. Regent Honeyeaters are highly mobile and appear to have a quite complex pattern of movements, in large part governed by the flowering of a small group of eucalypts, but with three main trends. First, there is movement in autumn into parts of northern New South Wales and south-eastern Queensland, and formerly also South Australia, with a subsequent contraction to core breeding areas on the inland slopes of the Great Divide in New South Wales and north-eastern Victoria in late winter, sometimes earlier in Victoria. Secondly, a corresponding movement out of southern Victoria and the high country of south-eastern Australia occurs from late autumn to early spring. The third trend is the regular use of sites with predictable annual peaks in nectar production. The movement patterns of

Red Wattlebirds are also complex and not well understood, varying much from one site to another. This species is apparently sedentary at sites through much of its range, but this is overlaid with various poorly understood movements, including migration or partial migration of some populations, altitudinal migration in the Southern Highlands of south-eastern Australia, and possible nomadism or unpredictable movements in places. It is also considered a partial north–south migrant in Western Australia. In Brisbane Water National Park, north of Sydney, White-cheeked Honeyeaters are present all year but there is much movement of individuals, mostly subadults, through the area at times, and there are also significant seasonal changes in rates of capture.

The five species exhibiting long-distance movements in eastern Australia were the Noisy and Little Friarbirds, the Yellow-faced Honeyeater, the Scarlet Myzomela and the Black-chinned Honeyeater. All five had previously been recognized as undertaking long-distance movements, although all are partial migrants, with parts of their populations sedentary. Perhaps the best-known and best-studied migratory meliphagid is the Yellow-faced Honeyeater of eastern Australia. From extensive work, especially by U. Munro and her colleagues, we know a good deal about the patterns and timing of movements and behaviour of this species. Even this well-known latitudinal migrant, however, demonstrates the complexity in patterns of movements of Australian honeyeaters: whereas part of the population undertakes regular large-scale migration to and from south-eastern Australia, with at least 20% of the population moving north in autumn and returning in spring, populations throughout the range are also sedentary, with local populations seasonally augmented by passage migrants. Individuals leave coastal Victoria and the Great Divide from areas on the Victoria–New South Wales border and the Southern Tablelands, the main stream of migration following the Great Divide and the eastern coast, tending north-eastwards during the early autumn passage in north-east New South Wales and south-east Queensland, and then changing to a north-westerly direction during the latter stages of autumn migration, birds wintering in northern New South Wales and inland. Orientation and behavioural tests of captive Yellow-faced Honeyeaters revealed an increase in hopping activity during March–July and September–December, coinciding with the species' usual migratory periods; and at the time of early autumn passage, in March–April, the birds tended towards a north-easterly course, whereas in later stages, in May–July, they tended towards a north-westerly direction, reflecting the migrational route along the Great Divide and the east coast. The birds also showed an increase in activity in the early morning and early afternoon, and a smaller peak during the late afternoon, which corresponded to the times of most movement during migration.

The other species identified as long-distance migrants had different patterns of movement. Those of Noisy Friarbirds and Scarlet Myzomelas are characterized by passage along the eastern coast, the friarbird with an obvious movement extending along the entire east coast, whereas the myzomela has a pattern like that of the Yellow-faced Honeyeater during the winter months. The remaining two species showed inland patterns of movements. The Little Friarbird evidently moves through the inland areas or along the coast towards the north, with some movement from the northern extremes of its range in the summer wet season. The Black-chinned Honeyeater appeared to be the sole representative of a suspected inland west–east movement: the south-eastern populations of this species seemed to be sedentary, but the population of the eastern Northern Territory and adjacent north-west Queensland greatly increased in the northern dry season, that increase possibly a result of movement of birds from northern Western Australia and western Northern Territory. All of these observations are consistent with more general observations throughout the ranges of the species concerned, but it is apparent that all of these species are only partial migrants.

Altitudinal migration is evident in some areas. In the Southern Highlands of south-eastern Australia, in subalpine woodland at about 1500–1800 m in the Snowy Mountains, two species of meliphagid, the White-eared and Brown-headed Honeyeaters, were found to be present in winter above the winter snow-line, while five were spring migrants. These five are the Eastern

Spinebill, the Red Wattlebird, and the Yellow-faced, White-naped and Crescent Honeyeaters, the timing of arrival of which varied annually, with return occasionally in late winter, and a general increase in numbers from arrival to October. At these sites, *Grevillea victoriae* is an early spring foodplant for honeyeaters and may flower while snow remains on the ground, so long as the plant projects from the snow and temperatures are warm enough. For all birds, the proportion of *Grevillea victoriae* inflorescences with open flowers was a good predictor of the numbers of bird species present. Species that were not latitudinal migrants, such as Crescent and White-eared Honeyeaters and Eastern Spinebills, were thought to descend to nearby tablelands. There is some indication of winter movement also from the tablelands of the wet tropics of north-east Queensland. For example, part of the Bridled Honeyeater population of the uplands descends to lower altitudes in winter, both to the east towards coastal lowlands and westwards into drier areas. Similarly, small numbers of Lewin's Honeyeaters move in winter to lower altitudes in north-eastern Queensland, occasionally even reaching sea-level. Altitudinal migration has been reported also in Tasmania, with a descent from the highlands in autumn–winter. For example, Crescent Honeyeaters are common visitors to lowland and coastal areas in autumn–winter, usually arriving in March and leaving in September, most of the population then returning to the highlands.

Most species have been recorded as vagrants beyond their normal range, but some of the records seem unusual. For example, Bell Miners are sedentary and colonial, but vagrants have been recorded hundreds of kilometres from the nearest populations, up to 320 km west of the normal range in Victoria, for instance, although such individuals rarely survive.

There are, however, even further complications to the patterns of movements of this family. K. French and her colleagues conducted a detailed four-year study of nectarivorous bird assemblages in woodlands in the Capertee Valley of central-eastern New South Wales, an area of about 100,000 ha and an important region for the globally threatened Regent Honeyeater. This study highlights some of the difficulties in assessing community-wide patterns of bird movements in Australia. The study recorded 20 species of honeyeater, some constantly and others only occasion-

ally; the large Noisy Friarbird, Noisy Miner and Red Wattlebird were regularly recorded, and the most abundant species were the medium-sized White-plumed, Fuscous and Yellow-faced Honeyeaters. There was no predictable temporal variation, and numbers fluctuated erratically at all sites and in the valley. Birds appeared to be moving from site to site within the valley, or between the valley and neighbouring areas, or both; for example, numbers of some species, such as the Noisy Miner and White-plumed Honeyeater, remained about the same in the valley but fluctuated dramatically at individual sites, suggesting movement between sites within the valley. Other species, however, were usually present in low numbers but were occasionally recorded in large numbers at a couple of sites, suggesting an influx into the valley. There were no seasonal patterns in the movements observed, the birds appearing to move unpredictably, using a range of habitats.

Further, the study did not find a relationship between the abundance of honeyeaters, or of Regent Honeyeaters alone, and the presence of flowering trees, even though large increases in honeyeater numbers were sometimes associated with flowering events. It was suggested that honeyeaters were tracking all food resources, and not just nectar production, as insects are an important resource. Of the 20 species of honeyeater observed in this study, other than the few migratory species, most are, however, otherwise typically considered sedentary, which is not how the populations of these species appear to be behaving in the valley, even though some individuals may be.

In north Australia, J. C. Z. Woinarski and his colleagues examined the complex patterns of spatial and temporal variation in nectar availability across the entire landscape of the Northern Territory. They found a much greater nectar resource in the monsoonal north than in the arid south of the Territory; a peak of nectar production in the dry season associated with extensive tropical eucalypt forests, and a rich but spatially limited nectar resource in riparian and swamp-forests dominated by paperbarks in the wet season; and a peak of invertebrate and fruit resources at times of minimum nectar production in the monsoonal north. Nectarivores seem to persist in the region through the wet season, when nectar is otherwise in short supply, by exploiting the spatially restricted nectar production of paperbark-dominated

In many meliphagids, parental care continues after the chicks have left the nest, usually for a period of several weeks, and in the case of the **Scarlet Myzomela** at least ten days. During this time, the young bird continues to beg for food from its parents while at the same time learning to forage for itself, with the result that independence is a gradual process.

[*Myzomela sanguinolenta*, Australia.
Photo: Ken Griffiths/
NHPA]





Juvenile **Blue-faced Honeyeaters** remain with their parents for several weeks after fledging, most being dependent on their parents for food, although some are capable of foraging just one day after leaving the nest. This species is unusual in that it prefers to breed in or on abandoned nests of Australasian babblers (*Pomatostomus*) or meliphagids such as friarbirds (*Philemon*). The Blue-faced Honeyeater will purloin material from old or active nests, and even evicts other species from their nests. It engages in communal breeding, and there are records of more than one female laying in the same nest.

[*Entomyzon cyanotis cyanotis*, near Brisbane, SE Queensland, Australia. Photo: Brian J. Coates]

forests, and possibly through diet-shifting to utilize the increased seasonal abundance of insects and fruit. The nectarivores in this system may also increase their year-round access to nectar resources by making large-scale movements or by adjusting their local distributions to utilize local-scale variation in vegetation and availability of resources.

The difficulties of ringing studies in Australia are well illustrated by the examples of the Yellow-faced and White-naped Honeyeaters. Yellow-faced Honeyeaters have been the subject of major ringing studies along the Murrumbidgee River and in the Brindabella Ranges of the Australian Capital Territory, and elsewhere. Along the Murrumbidgee, a total of 12,927 individuals ringed during March–May between 1963 and 1977 produced only four recoveries, one at the ringing site and the others at distances of, respectively, 3 km, 18 km and 240 km; five others, ringed elsewhere, were also retrapped. Overall, a total of 66,774 Yellow-faced Honeyeaters was ringed between 1953 and 1997, with 4553 recoveries, most of them at the site where they had first been ringed. In a subset of 1628 recoveries during July 1984 to March 1999, only four were at more than 100 km, these in the range 160–600 km and over a period of 10–109 months; two earlier retraps or recoveries farther than 100 km away were at 240 km and 745 km after, respectively, 36 and 45 months. Similarly, White-naped Honeyeaters were the subject of a major study in the Australian Capital Territory between 1961 and 1983. A total of 7057 individuals was ringed at 34 locations: of 3677 ringed during autumn migration on the Murrumbidgee River, only two were recovered, 22 km and 190 km from the ringing site, and there were no recoveries at more than 10 km for the 3380 ringed at other times or at other sites. The study was abandoned owing to the paucity of data gathered, despite the intensity of the ringing effort.

Hitherto, this discussion has concentrated on Australia, for which most detailed observations and data are available. The problems with analysing avifaunal movements are even more evident through New Guinea, Wallacea and most of the islands of the south-west Pacific. The bird populations in these regions are smaller and more sparsely distributed, ornithologists are scarcer, and bird-ringing has been far more limited and with fewer chances of returns on effort. For most species, there are very few hard data or observations to support any claims of

patterns of movement. Nevertheless, there appears to be no evidence of any large-scale seasonal movements of honeyeaters through these regions, and little or no evidence of any other significant movements. Further, many species restricted to islands cannot undertake any long-distance movements without leaving the island, and they must therefore be regarded as sedentary, with only local or regional movements to be considered. The majority of meliphagids in these parts of the family's range are described variously as resident or sedentary, with local movements or some dispersive movements associated with some species. A few are described as being partly or wholly nomadic, though the true extent and pattern of such movements are not known.

Among New Guinea forest birds in general, there is little migration and only a low rate of dispersal, this lack of movement being reflected in the broken and patchy distributions of large numbers of the island's species, and also in the high degree of speciation and subspeciation seen there. Equally, another important ecological sorting mechanism within the New Guinea avifauna is altitudinal segregation, with many pairs of congeners separated by altitude. Such segregation indicates that there is little, if any, altitudinal movement by such species. For example, in the genus *Ptiloprora*, the Rufous-backed Honeyeater is confined to low altitudes and the Black-backed Honeyeater to higher elevations, with no known vertical movement made by either species.

There is, nevertheless, considerable evidence of at least local movements, in large part to exploit food resources, particularly sources of nectar. It is also possible, for instance, that many *Myzomela* species are fairly mobile and may move over greater distances than those covered by other species, and the possibility that some movements are regularly seasonal cannot be discounted. Much study is needed, however, before conclusions can be drawn. For example, the Orange-breasted *Myzomela* in Fiji is said not to be sedentary but is locally mobile and also locally irruptive, being absent at sites for many months before suddenly reappearing. These small honeyeaters also congregate in large numbers in flowering trees. Conversely, while Red-throated *Myzomelas* are thought to be nomadic, an individual ringed at Brown River, in southern New Guinea, was retrapped one year later at the site where it had been ringed.

Even well-grown fledgling meliphagids can be dependent on adults for food. In the case of the **Black-eared Miner**, the use of the word "adult" rather than "parent" is important, because this species, in common with its three congeners, is an obligate co-operative breeder, nesting in loose colonies where nests may be about 25 m from each other. At least three different Black-eared Miners have been recorded incubating at a single nest, and there is no guarantee that an adult feeding a fledgling is even related to the young bird, let alone its parent.

Further details of the species' system are not known, as this threatened taxon has been little studied. However, the pattern may follow that of commoner congeners, such as the Bell Miner (*Manorina melanophrys*), pairs of which are helped at the nest by up to 20 auxiliaries. Helpers may be juvenile siblings from a previous brood, unpaired immatures a few months old, unpaired adults, or even breeding neighbours that are also raising a brood nearby. The Black-eared Miner breeds in the austral spring and summer and may continue nesting until the autumn. The standard clutch size is two or three eggs, but there are no data available on the proportion that fledge successfully.

[*Manorina melanotis*,
Gluepot Reserve,
South Australia, Australia.
Photos: Peter Fuller]



Finally, there seem to be no regular movements by meliphagids between Australia and New Guinea or New Zealand. Nevertheless, Red Wattlebirds have turned up as vagrants in New Zealand, with historical records of single individuals in the North Island in about 1865 and about 1885, and an unconfirmed report of a singleton in the South Island some time before 1938.

Relationship with Man

As already stated, the honeyeaters are conspicuous and characteristic elements of the avifauna of Australasia, Wallacea and the south-west Pacific, although they seem not to feature prominently in the consciousness of the largely European cultures that colonized the region. Further, they seem not to be significant in the indigenous cultures of the region, beyond any importance as food, although D. Hicks has investigated Indonesian myths involving the Helmeted Friarbird of Timor and how it acquired its helmet. Such aspects of the relationships of honeyeaters with man appear to be little published.

Nevertheless, most honeyeaters are well known, and individual species are distinguished and named in most indigenous cultures. As conspicuous and vocal members of the Australasian and Pacific avifauna, they often have a rich array of colloquial names associated with them. For example, the Little Wattlebird, with its loud, often unmusical vocalizations, has many names that derive from such calls, both Aboriginal names, such as *Goo-gwar-ruck*, *Djung-gung*, *Dun-gur-uk* and *Tur-dal-l*, and the European "Cookay-cock". Throughout New Guinea and the islands of the south-western Pacific, most meliphagids have indigenous names, such as *Éro*, *Koyáge* and *Yoborusuábe* for the Long-billed Honeyeater in the Eastern Highlands of New Guinea, *Delakula*, *Bicibicikula*, *Sommsammatí* and *Matí* for the Orange-breasted Myzomela of Fiji, and *Segasegamau'u* for the Cardinal Myzomela of Samoa. On Manus, in the Admiralty Islands, the local onomatopoeic name for the loud, garrulous endemic White-naped Friarbird, *Chauka*, has been given also to the radio station, "Radio Chauka".

Many species of honeyeater are well established in human environments or, less commonly, have adapted to human activities. Within the cities of eastern Australia, one of the commonest

birds, and arguably the most common native species, is the Noisy Miner. Other commonly encountered species are the Red and Little Wattlebirds, and in the subtropics and tropics the Blue-faced Honeyeater. Whereas these species are all large to medium-large, smaller species are also frequently found in urban environments: the White-plumed Honeyeater is a common inhabitant of cities, and is, for example, ubiquitous in urban Melbourne; and, in Darwin, Rufous-banded Honeyeaters are among the commonest native suburban birds. Honeyeaters are an important element of the urban bird community of Townsville, in the tropics, with eight species recorded and Brown and Yellow Honeyeaters the most abundant. Many species of *Myzomela* are common inhabitants of cities, towns and villages and agricultural land and plantations through New Guinea and on the islands of Wallacea and the Pacific. They are often conspicuous when foraging in gardens and parks in these situations, and readily forage on native and exotic vegetation. The Cardinal Myzomela, for example, is one of the few indigenous species that is common in urban areas in Samoa, and it readily exploits foraging niches created by human modification in urban or agricultural landscapes. The Wattled Honeyeater shares these habitats with the Cardinal Myzomela. Coconut plantations, in particular, appear to provide a significant source of nectar for a number of species throughout the tropics.

This adaptability to modified habitats has also meant that a number of meliphagids, such as Red Wattlebirds, have been or, at least, have been thought to be pests in orchards, vineyards and some other crops, and they were formerly shot, sometimes in large numbers. At Aruluen, in south-east Australia, Red Wattlebirds and Noisy Friarbirds are not, however, considered pests in orchards of nectarines and peaches, as they eat only over-ripe fruit left on the trees. Lewin's Honeyeater was likewise sometimes considered a pest of soft fruits, citrus and bananas, and it sometimes raided orchards in large numbers; in the Hunter region of New South Wales, up to 50 birds of this species still congregate around orchards when fruit is ripe.

Few species of honeyeater are subject to significant hunting pressure of any kind, let alone at levels that have an impact on their populations. Hunting is, however, a potentially threatening process for MacGregor's Honeyeater in the high mountains of the Central Range of New Guinea, a threat exacerbated by the



Many species of honeyeater occur in urban areas and are well known to human residents. Whilst normally inhabiting dry, open woodland, the **Yellow-tufted Honeyeater** sometimes visits gardens where the species' gregarious nature and vibrant coloration command attention. The subspecies featured here, *cassidix*, is sometimes called the **Helmeted Honeyeater** on account of the short crest formed by distinctive, elongated forehead feathers. Being restricted to a single site and adjudged to be a critically endangered taxon, this subspecies is also the subject of conservation activity, which explains the rings on the birds' legs.

[*Lichenostomus melanops cassidix*, Yellingbo Nature Conservation Reserve, Victoria, Australia. Photo: Dean Ingwersen]

Slightly more than half of the 175 members of the Meliphagidae are restricted-range species, each occurring over an area of 50,000 km² or less. Most occur only on single islands or small groups of islands. The **Yellow Wattlebird** is a case in point, being endemic to Tasmania and the Bass Strait Islands. Although the species is not currently considered to be globally threatened, one of the two subspecies is endemic to King Island and would probably qualify as Vulnerable were it a full species. This population of this race is reckoned to number fewer than 1000 mature birds but is probably stable, despite habitat clearance.

[*Anthochaera paradoxa paradoxa*, Mt William National Park, NW Tasmania. Photo: Dave Watts/Lochman Transparencies]

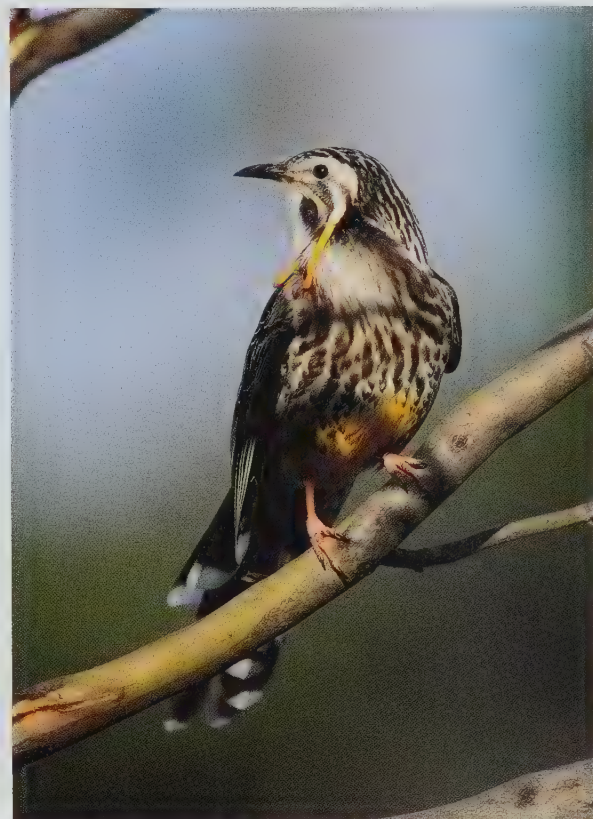
species' small fragmented population. MacGregor's Honeyeater is hunted as game in parts of its range because it is large, confident, conspicuous and site-faithful, and it is therefore fairly easy to find and kill. Hunters visiting the upper fringes of montane forest to hunt wallabies in alpine grasslands will build a hide beneath a favoured fruiting tree, usually MacGregor's preferred food tree, *Dacrycarpus compactus*, and kill one to several as they come to roost or forage. Other large species are similarly hunted for food. At the other extreme, on islands of Sapwuahfik Atoll, the Micronesian Myzomela, despite its tiny size and a weight of only 10.5–18 g, is hunted as game by local people and was found to be less abundant on Ngatik Island, the largest and only permanently settled island in the group, than it was on the other, more sparsely populated islands of the group.

In an exhaustive analysis of the birds of Nokopo, in the Finisterre Range of New Guinea, C. K. Schmid described the species hunted and the methods of capture. All three species of *Myzomela* present, the Red, Mountain and Red-collared *Myzomelas*, were hunted and, despite their small size, were considered good food with much body fat and tender meat, and they could be caught in large numbers in flowering trees. The medium-sized Black-throated Honeyeater and *Meliphaga* species were also hunted, but a *Ptiloprora* species, probably the Rufous-backed Honeyeater, was considered inferior, with the meat watery, in addition to which its feathers were too drab for use as ornaments. A number of different hunting methods were used, depending on the species targeted. During the dry season, parts of small creeks through the forest were covered with leaves and other material, leaving only a small patch of water: when catching Huon Honeyeaters, the hunter built a small conical hut beside these small pools of water, placed a stick across the pool, and then, using a hollow bamboo tube projecting from the hut, shot the birds on the perch; Spangled Honeyeaters were caught in small traps built around these drinking sites, but were also hunted with a bow and arrow and trapped at foodplants. Helmeted Friarbirds were hunted with bow and arrow, the adults lured towards the hunter by presumably captive fledglings; and friarbirds were trapped at their preferred foodplants. Both Hill-forest Honeyeaters and *Myzomela* species were snared with bird-lime.

Formerly, the Tui was hunted by Maori in New Zealand, and a skilful hunter could catch up to 100 in a day. The hunter called in the birds by imitating their vocalizations, and then hit them with a long flexible stick, or he speared or snared them. Tuks were said also to be easily caught on frosty nights, when "their claws were contracted by the cold, and they could not fly". Maori preserved them in their own fat and ate them at feasts. This species was also hunted for food by European explorers and early settlers. Similarly, many Australian species were eaten by early settlers and non-Aboriginal Australians. Yellow Wattlebirds were commonly eaten, and early in the twentieth century they were still being sold in markets. Yellow Wattlebirds were shot during open seasons, and such large numbers were killed that the species was thought to be in danger of extinction; it was afforded full protection in 1902–1903, but it was later returned to the list of game species until at least the 1970s. Red Wattlebirds, another large species, were also shot, both for sport and for food, as they were renowned as being "the best eating bird in the bush".

Honeyeaters at Nokopo, in New Guinea, are used for ornamentation by local people. The feathers of Spangled Honeyeaters, along with those of other birds, are used for feather-poles, or *sekan*, long, slender bamboo tubes with feathers arranged spirally around the tube, stretches of darker feathers alternating with stretches of paler, speckled ones. In this area, the plaintive calls of the Rufous-backed Honeyeater are an omen of mourning and death. While their meat is watery and largely not eaten, the association of this species with death may also be a reason for not eating it. While MacGregor's Honeyeater is hunted over most of its range, it is seemingly common and tame above 3000 m in the Star Mountains, where the Ketengban people protect it for cultural reasons.

The Tui was one of the few honeyeaters to be used for ornamentation by Europeans. Skins were illegally exported for ornamentation on women's hats, one dealer in Wellington sending up to 500 skins to London. Tuks were often kept as pets by early



settlers in New Zealand, and sometimes by Maori, especially as the species is such a remarkable mimic. Captive birds were prized by the Maori for their ability to mimic, and were taught sentences of welcome, platitudes and insults. A compliment to a good orator was "*me he korokoro tui*", meaning "How eloquent he is; he has the throat of a Tui". Owing to their ability to imitate, they were also taken to Australia as cagebirds.

In Samoa, legend had it that hearing the wails and screams of the Mao around a village meant that misfortune or a death was about to happen, and Samoans often shot this bird when they saw it near villages. A further superstitious belief among the native Samoans was that the calling of the Mao heralded rain, or foretold of some calamity.

Status and Conservation

Of the 175 species of the Meliphagidae currently recognized, eight, 4.6% of the total, are listed as globally threatened, four of these being considered Endangered and four Vulnerable. A further five species are considered Near-threatened and two are Data-deficient, and a range of taxa have been identified as regionally threatened in Australia. Although, as a proportion of the total number in the family, relatively few species are threatened at present, there is a wide array of ongoing threatening processes working over the range of the family that, if unchecked, will adversely affect the conservation status of many species in the future.

While on this subject, it should be stressed that five species confined to Hawaii, and until recently considered to be honeyeaters, are believed to be Extinct, although two of these, the Kauai O'o and Bishop's O'o, remain listed as endangered by the US Fish & Wildlife Service. They were described and discussed, as meliphagids, by E. Fuller (see HBW7, pages 48–51). These five species, in the endemic Hawaiian genera *Moho* and *Chaetoptila*, have since been found not to be closely related to the Meliphagidae (see Systematics) and are not considered further here.

Outside Australia, many species of honeyeater have small ranges, often confined to single islands or small island groups or, in the case of New Guinea, isolated montane regions. Of the eight threatened members of the family, four are island species and



No Endemic Bird Area (EBA) has more restricted-range bird species than the Solomon Group. Meliphagidae is strongly represented, with nearly ten per cent of the family's restricted-range species occurring in this EBA. These include the **Scarlet-naped Myzomela**, a Least Concern species that is common or very common on a handful of islands in the north of the Solomons. This species' predilection for small islands means that it is considered a "supertramp"—a species with broad habitat requirements that disperses efficiently, and readily colonizes new areas.

[*Myzomela lafargei*, near Panguna, Crown Prince Range, Bougainville, Solomon Islands. Photo: Don Hadden/Ardea]

two are confined to montane New Guinea, and all except one, the Regent Honeyeater, are restricted-range species. In total, fully 89 species, just over half of the family, are restricted-range species, distributed across 32 endemic bird areas (EBAs) and five secondary areas. The worldwide distribution of the Meliphagidae covers 45 EBAs. One of these, the Solomon Group EBA, has more restricted-range bird species than any other EBA.

In common with most other bird families, the Meliphagidae have suffered previous declines of species primarily and most significantly as a result of the loss, fragmentation and degradation of habitat through human land-use practices, and these remain the greatest threat. Throughout the tropics of Wallacea, New Guinea and the south-western Pacific, loss of forest habitats, primarily rainforest, is the most significant threatening process. To date, the greatest loss has been that of lowland and foothill rainforests, whereas montane forests have largely remained intact owing to their inaccessibility. Logging for industrial timber production, both legal and illegal, is a significant cause of loss and degradation of forest and one of the biggest ongoing threats to the rainforest habitats of these regions. The forests of New Guinea and the south-east Asian islands, including those of Wallacea, have become the world's main source of tropical timber since the 1970s. In Indonesia, while timber is obtained mainly by selective logging, plans and regulations are rarely followed and forests are therefore badly damaged by harvesting, and areas that should be left uncut are often logged.

Even where logging is not currently occurring, huge areas have been allocated in timber concessions for potential future logging. In Wallacea, for example, commercial logging enterprises are now concentrated on islands in the Moluccas, especially Halmahera and Seram, where most remaining forest is covered by such concessions. Further, in some regions of New Guinea and many islands, small-scale but widespread selective logging, which is usually illegal, using portable or "walkabout" sawmills, also results in some loss of or disturbance to forest habitats. Clear-felling and the creation of logging roads also provide access to areas that were previously inaccessible, including highland forests, and the further creation of settlements and cultivation. Road-building for mineral and oil exploration provides similar opportunities. Moreover, as areas are opened up and settled, there is an increased risk of predation from introduced predators, such as rats, cats, dogs and pigs.

Traditional subsistence agriculture is, and has been, widely practised in the region. More recently, however, traditional practices have been replaced by slash-and-burn methods, and the scale of clearance for both shifting cultivation and grazing has increased greatly, in association with growing human populations, and there is also increasing commercial agricultural production. All of these agricultural activities are frequently associated with repeated burning, particularly hot dry-season fires, as a means of augmenting the production of fodder for livestock or to clean up cultivation fields. On New Caledonia, bushfires started on grazing or cultivation lands threaten the remaining native vegetation where they spread unchecked. Further, the fallow period between successive agri-gardens, and thus the age and structure that the regrowth attains, is reduced so as effectively to increase the area of available land for subsistence farming. There has also been much clearing for plantation-cropping, including coconut palms, oil palms (*Elaeis guineensis*), sugar cane, bananas and cacao, and, in some places, exotic timber, including pines (*Pinus*). Other cash crops include cloves and other spices, maize and rice, and, on some Micronesian islands, kava (*Piper methysticum*). In parts of New Guinea, swamp-forests are being cleared for conversion to rice fields, and mangroves and tidal swamp-forest are being cleared for development of shrimp and fish ponds, as, for example, in Bintuni Bay. Unsustainable harvesting of firewood and, in some regions, other forest products also causes loss or degradation of forest habitats.

The government programme of internal transmigration within Indonesia, moving people from the densely populated islands to less developed regions, creates new settlements or greatly increases the size of existing ones. While the immediate area of forest lost for settlements is often not great, it is typically followed by further clearing around settlements, both legal and illegal, the development of roads into formerly undisturbed areas, and the harvesting of timber for firewood and building materials. The risk of introduction of species is also high, and of particular concern is the introduction of taxa that had not naturally crossed Wallace's Line. For example, macaques (*Macaca*) could potentially outcompete frugivorous birds, and other species, that had evolved in the absence of primates.

In combination, these factors commonly result in several adverse situations. These include the persistence of forest only in highlands and inaccessible landforms, such as gorges and steep

The **Orange-breasted Myzomela** is one of a handful of restricted-range family members that occur in the Fiji Endemic Bird Area. This striking bird is generally considered common or abundant and inhabits both of Fiji's main islands as well as many smaller islands. It is found in all habitats, being equally at home in primary forest and mangroves as in roadside scrub and gardens. Its ability to utilize a wide range of habitats, combined with its comparative abundance, means that it is presently at little risk of global extinction.

[*Myzomela jugularis*,
Fiji.

Photo: Michael Gore]



valleys; the fragmentation of remaining areas of lowland forest, which are often small; and the conversion of large areas of the landscape, particularly lowlands and foothills, to grassland or monoculture crops and plantations. Conversely, some plantation crops provide an important source of nectar for many species. Coconut palms in particular, when they are in flower, are frequented by many species of honeyeater. In addition, the frequent use of secondary forest, forest edge and modified habitats such as gardens by many meliphagids reduces the level of threat from loss of primary forest alone.

Several more localized but possibly significant threats can be identified. They include the proposal to construct a large dam in the Mamberamo River gorge in northern Papua; Brass's Friarbird is known only from a few observations in the upper Mamberamo and Wapoga River Basins. In New Caledonia, open-cut nickel-mining has destroyed large areas of forest and maquis habitats, and mining will continue to cause loss and degradation of habitat in many regions.

A major threat in Micronesia is the possible spread of the introduced brown tree-snake (*Boiga irregularis*). This species is a highly effective predator and colonizer, and is considered responsible for the extirpation of many bird species on Guam, including the only honeyeater of the region, the Micronesian Myzomela. Introduced birds may also be responsible for some local declines. In American Samoa, for example, Wattled Honeyeaters appear more common around villages on the Manua Islands, where there are no introduced birds, than on Tutuila, where the introduced Red-vented Bulbul (*Pycnonotus cafer*), Common Myna and Jungle Myna (*Acridotheres fuscus*) are common, although in Fiji, conversely, there is no evidence that introduced species have restricted the distribution of this or any other honeyeater species.

Honeyeaters are often killed by introduced animals, especially mammals such as feral and domestic cats, foxes (*Vulpes vulpes*) and stoats. In addition, they are sometimes killed by cars or by flying against windows of houses. It has been found that birds feeding on refined sugar at artificial feeding stations in gardens sometimes die from thiamine deficiency. Early collectors also took a great many individuals of some species: two such collectors, referring to a single species, the Dark-brown Honeyeater, stated "We have slaughtered so many that our conscience pricks us, though we have faithfully skinned every bird."

Human disturbance can create further imbalances. For example, on Manus, in the Admiralty Islands, the White-naped Friarbird appears to have undergone a population explosion associated with human colonization and clearance. It has been suggested that this population increase has been detrimental to the Manus Fantail (*Rhipidura semirubra*), which is said to persist on the tiny islet of Tong owing to the absence there of the friarbird. In New Guinea, two species of *Melidectes*, Belford's and Yellow-browed Honeyeaters, commonly hybridize wherever they meet. While the two are typically separated altitudinally, hybridization probably occurred to some, albeit probably minor, degree where the species met in undisturbed habitat. Hybridization, however, now occurs extensively, and probably at an accelerated rate, at mid-montane altitudes, where natural forest has been extensively disturbed or modified through human activities, particularly for agriculture.

In Australia, the main cause of species declines, and the single most important ongoing threat, is loss, fragmentation and degradation of habitat, primarily for agricultural production, including grazing, crops and plantations. Australia is reported to have one of the highest rates of clearance of native vegetation in the world. It is estimated that some 82% of all bird taxa from mainland Australia and Tasmania have been affected by land clearance at some stage. Unlike the situation in New Guinea and the islands of Wallacea and the south-west Pacific Ocean, however, over 40% of taxa affected by loss, fragmentation or degradation of habitat occupy subtropical or temperate sclerophyll forests and woodlands, rather than rainforest. For example, it is estimated that some 30% of Australia's woodlands, and 80% of temperate woodlands, have been cleared, with less than 5% of the original vegetation remaining in some areas of southern Australia. Nevertheless, there has been extensive loss also of rainforest in Australia, particularly lowland rainforest in north-eastern Australia, although this, while a threat to many faunal taxa, has not been a significant threat to honeyeaters.

Forest and woodland in Australia are dominated by the eucalypts and, to a lesser extent, some other groups, which provide a major source of nectar and an important resource for honeyeaters. In temperate Australia, this nectar-rich system has been severely disrupted by loss of forests and woodlands throughout eastern, southern and south-western parts. The tropical wooded habitats of northern Australia have not, as yet, been fragmented or degraded to the extent that has occurred in temperate Australia, but



The **Micronesian Myzomela**, seen here at a flowering Java plum (*Syzygium cumini*), is distributed over four Endemic Bird Areas, all of which comprise small islands in the west Pacific. The seven subspecies are generally common or abundant, but density estimates vary considerably between archipelagos. This myzomela's tolerance of disturbed habitats suggests that forest destruction has relatively little impact on overall population numbers, although there is some fear that modified habitats may not provide suitable nesting sites.

[*Myzomela rubratra kobayashii*,
Koror Island, Palau.
Photo: Mandy Etpison]

it is estimated that these habitats are being cleared at an increasing rate. Much of this clearing is of semi-arid tropical forest or woodland for pasture development for cattle grazing. Tropical forests and woodlands are also being degraded by ongoing grazing, and by increased dry-season burning.

The four Endangered meliphagids include two medium-large Australian species, both inhabitants of the temperate eucalypt woodlands of south-eastern Australia. The Black-eared Miner is one of Australia's rarest birds, and almost certainly the rarest meliphagid. This colonial species is confined to semi-arid mallee eucalypt woodlands of the lower Murray–Darling Basin of south-eastern Australia, and was formerly widespread in eastern South Australia, north-west Victoria and south-west New South Wales. It is now lost from most of its former range, with most surviving colonies confined to mallee north-west of Renmark, in eastern South Australia. The decline of the species is a direct result of hybridization with the Yellow-throated Miner. Before European settlement, it is thought that Black-eared Miners occupied dense, continuous and extensive tracts of mallee, whereas the Yellow-throated Miner occupied more open and fragmented habitats within the mallee, such as edge habitats and naturally occurring clearings, as well as a range of other habitats bordering or within extensive stands of mallee. While the mallee regions occupied by Black-eared Miners were settled in the 1860s, widespread clearance for cropping and grazing began in earnest after World War I and greatly accelerated in the 1950s. Further, dams, and drains to fill them, were dug through the mallee to provide watering points, and vegetation around dams was extensively cleared. The clearing and modifications resulted in continuous tracts of mallee being fragmented, creating much suitable habitat for Yellow-throated Miners and extensive zones of overlap between the two species. This was followed by widespread hybridization between them, and genetic swamping of the Black-eared Miner population. The species was at one stage considered Critically Endangered, but its conservation status has now been reassessed as Endangered. The discovery of significant numbers in mallee north of the Murray River in eastern South Australia has greatly enhanced the prospects of survival of this species. The Bookmark Biosphere Reserve, which holds most of the known population of Black-eared Miners, is estimated to support 501 colonies containing 3758 phenotypically pure Black-eared Miners, 2255 hybrid Black-eared × Yellow-throated Miners, and small numbers

of Yellow-throated Miners. A smaller population persists in the Murray-Sunset National Park, in north-west Victoria, consisting of 53 Black-eared Miner or hybrid colonies. The estimated effective population, however, is an order of magnitude smaller, owing to the male-biased sex ratio and the complex colonial and co-operative social organization of the species. The effective population in the Bookmark Biosphere Reserve is estimated to consist of 390 pure Black-eared Miners and 234 hybrids. The species appears to require mallee vegetation unburnt for at least 45 years, and wildfire remains a major threat to the continued survival of Black-eared Miners, given the concentration of the population in a single region. In fact, in late 2006 some 100,000 ha of prime mallee habitat within the Bookmark Biosphere Reserve was burnt. The recovery plan for this species has included translocations of Black-eared Miner colonies to the Murray-Sunset National Park from Bookmark, five translocations having been conducted in 2001 and 2002. These “new” colonies have bred and they persist. In addition, a captive-breeding programme was begun in 1996, and eventually succeeded in breeding the species. In 2003, a trial release of 45 captive-bred individuals, in two groups, resulted in breeding in the wild almost immediately and, over the following years, the establishment of at least three breeding colonies, and some have joined the remnant wild population at the release site.

Equally problematic is the conservation of the Endangered Regent Honeyeater. This species is highly mobile over large areas, but the details of its movements and the habitats upon which it may depend are poorly known; its range in non-breeding periods is not known. It has a small estimated total population of 500–1500 individuals, which appears to be in continuing decline. Regent Honeyeaters were formerly widespread in eastern and south-eastern Australia, but their range and numbers have contracted greatly, probably beginning in about the 1940s. The main reasons for this decline appear to be loss, fragmentation and degradation of its habitat, an estimated 75% of which has been destroyed for agriculture; particularly badly affected have been its preferred high-quality lowland habitats on most fertile and productive soils, which are preferred also for agricultural production. This has, in turn, resulted in poorer and unreliable supplies of nectar. Remaining habitats have also been, and continue to be, degraded by increased dieback and decline of trees in pastoral areas; lack of regeneration of eucalypt through grazing by live-

The Yellow-eared Honeyeater is one of several meliphagids that are exclusively or primarily restricted to the Endemic Bird Area encompassing the islands of Timor and Wetar. This particular species occurs only on Timor, where it is common, if rather patchily distributed.

The honeyeater uses several different wooded habitats, from monsoon forests to riparian and eucalyptus (*Eucalyptus*) woodlands, from the lowlands up to 2000 m. This combination of a wide altitudinal range and broad habitat tastes means that the species is not globally threatened at present.

[*Lichmera flavicans*, Timor, Lesser Sundas. Photo: Morten Strange]



stock and rabbits; silvicultural practices that promote dense, pole regrowth of immature trees and remove large spreading trees in box-ironbark woodlands; and removal of trees for fence posts, firewood and timber. Further, remnants, including much of what currently exists in the conservation reserve system, are highly fragmented and often degraded. Degradation of habitat may also have caused declines of Regent Honeyeaters by facilitating the expansion of populations of large aggressive honeyeaters, such as friarbirds and miners, possibly resulting in interference with Regent Honeyeaters at sources of food and nesting sites. This species was recorded in large numbers in the nineteenth century, and occasionally in very large flocks during influxes, but there are very few current records of large flocks. Regular breeding is concentrated in only four key areas.

Conservation partnerships, involving government agencies, BirdLife in Australia, community groups and landowners, have sought to protect the Regent Honeyeater's habitat and to ensure the species' survival in the wild. Efforts are focused on protecting and restoring habitat at sites regularly used by the species. Moreover, captive-breeding has recently produced some success. In 2008, a total of 27 Regent Honeyeaters, all fitted with radio transmitters, was released in the Chiltern National Park, in Victoria. Very soon thereafter, one was observed next to a wild individual, the first wild Regent Honeyeater seen in the park for 18 months. Since then, several other wild Regent Honeyeaters have been seen in association with the released individuals, and there are hopes that the species will once more breed in the area.

The remaining two Endangered meliphagids are large species of *Gymnomyza* of the south-west Pacific. Both the Crow Honeyeater, of New Caledonia, and the Mao, of Samoa, have very small populations and appear to be continuing to decline. The Crow Honeyeater's population was put at between 1000 and 3000 individuals in 2000–2002, this probably an overestimate, and the species is thought to be in continuing decline. The population is thinly distributed and fragmented and appears to be localized, and the species is uncommon even in its preferred habitat of dense, humid, primary rainforest, usually on ultrabasic soils. It is sometimes recorded in dry forests and in isolated stands of stunted forest within maquis, up to 2 km from more extensive stands. The reasons for its absence from apparently suitable habitat are not understood, but an unknown specialization has been suggested, and continuing loss and degradation of forest from log-

ging, nickel-mining and fires are likely to pose some minor threat. The estimated total population within the Rivière Bleue Park is 160 pairs, this again likely to be an overestimate, and the species is apparently declining, with no successful nests or juvenile birds observed. The Crow Honeyeater is represented also in the Réserve Speciale de Faune et de Flore de la Ni-Kouakoué and Réserve Speciale de Faune et de Flore de Mt Panié.

Why the Crow Honeyeater is continuing to decline is not known for certain. Predation by introduced rats has been suggested as a possible cause, but the congeneric, and smaller, Giant Honeyeater of Fiji appears to be unaffected by rats. The ecology of the species is very poorly known, and basic research on its habitat requirements and breeding biology are needed as a first step in the required conservation measures.

The Mao has an estimated total population of 1000–2500 individuals, which is fragmented and apparently declining. Although its former distribution is not fully known, its range has been dramatically reduced and it appears that it was once more widespread in lowlands than it is at present. It is found mainly in primary rainforest, and is currently confined to foothill and montane forests, with its greatest densities at high altitude in the least disturbed forest. It has been seen in other habitats, including heathland scrub and forest edge, and it sometimes visits coconut trees near the coast, probably in periods of stress after cyclones, but it appears dependent on primary forest. The Mao's decline has been attributed largely to habitat loss and the degradation of remaining forest. The surviving areas of upland forest in Samoa are under threat from slash-and-burn cultivation, with farmers using forestry roads from logged lowland forest as means of reaching formerly inaccessible land. Forest quality has been further reduced by the invasion of aggressive exotic trees, their spread aided by cyclones and by planting. Cyclones are a significant threat also in that they destroy forest habitats, as well as causing deaths of individual birds. During the two most powerful recent cyclones, "Ofa" in 1990 and "Val" in 1991, forest canopy cover was reduced from 100% to 27%, and the Mao's populations were reduced; for example, the species disappeared from lowland forests in O Le Pupu Pu'e National Park, on Upolu, between 1982 and 1991 following the two cyclones. Fires in low-rainfall forests, hunting and introduced rats may also pose a threat to the species. It is a sad fact that the illegal hunting of native birds and bats continues, despite the national bans that have been

The Bismarck Archipelago holds three restricted-range friarbirds (*Philemon*).

The New Ireland Friarbird is endemic to the island of the same name. This monotypic species inhabits montane forests from 750 m upwards to at least 2200 m, and within these altitudinal confines it is considered to be common. As such, it is classified as of Least Concern. In common with many other species on New Ireland, little is known about the ecology of this large, dark honeyeater. Indeed, no information at all is available regarding its diet, foraging preferences or breeding characteristics.

[*Philemon eichhorni*, New Ireland, Bismarck Archipelago. Photo: Len Robinson/FLPA]





in place for more than ten years. The Mao occurs in some proposed and existing protected areas, but these have suffered damage from cyclones. Furthermore, O Le Pupu Pu'e National Park is threatened by logging and cattle-farming.

Montane New Guinea is the home of two of the Vulnerable meliphagids, MacGregor's Honeyeater of the Central Range and the Long-bearded Honeyeater. The other two are island species, the Dusky Friarbird of Morotai, Halmahera and Bacan, in the northern Moluccas, and the Rotuma Myzomela, found on the island of that name north of Fiji. MacGregor's Honeyeater is a poorly known species with small disjunct populations scattered in geographically restricted habitat along the peaks of the Central Range, with little or no interchange between these isolated populations. There are no estimates of its global population, though it is thought to be small and slowly declining. The species' absence from large areas of apparently suitable habitat in montane New Guinea suggests past extirpation of populations in these areas, possibly in part through hunting pressure or changes to the habitat. Its numbers fluctuate periodically and dramatically, however, as a result of movements combined with its apparent dependence on unpredictable fruiting of *Dacrycarpus compactus* for food and, possibly, breeding. MacGregor's Honeyeater is protected by law, but continued hunting in parts of its range is a threat, particularly as it is confiding, conspicuous and site-faithful, making it easy to kill (see Relationship with Man). Conversely, it seems to be common above 3000 m in the Star Mountains, where it is protected for cultural reasons. Its subalpine habitats are also under threat from global warming.

Similarly, the Long-bearded Honeyeater is apparently patchily distributed and very poorly known. There are no estimates of its global population, although it is thought to be small, and confined to a few sites within a small overall range. The species occurs near the tree-line of the Central and Eastern Highlands, which have a dense human population; although cultivation stops below the altitudinal range of the species, there may be some loss and degradation of habitat through fires and possibly other human activities. This honeyeater is, however, considered to be fairly common at most sites within its known range. There are no known conservation measures underway for it.

Another very poorly known, restricted-range species, with few recent records and no estimates of its population, the Dusky

Friarbird appears to be an uncommon meliphagid. Its numbers are small, although it was earlier thought to be widespread and common. All recent records of the species are from Halmahera, whereas most museum specimens, all collected before 1950, come from Morotai, and the occurrence of the species on Bacan needs confirmation. This friarbird is considered Vulnerable owing to potential or actual declines in its populations from past and ongoing habitat loss and degradation. While much forest in the northern Moluccas remains intact, and about 90% of the total area of Morotai, Halmahera and Bacan was still forested at the start of the 1990s, these areas are under increasing threat from continued clearance, particularly in the lowlands, for settlements, agricultural crops and plantations, and timber-harvesting. Recently, the Aketajawe Nature Reserve and Lalobata Protected Forest, on the north-eastern peninsula of Halmahera, were together declared a national park covering some 167,300 ha of hill and lowland rainforest, and the Gunung Sibela Strict Nature Reserve, on Bacan, covers just over 10,000 ha. Both reserves, however, are at risk from mining developments, and Gunung Sibela is also at risk of encroachment of agriculture. Surveys are needed on Morotai and Bacan to assess the status of this species there and to determine further sites that could be targeted for long-term conservation.

The last of the eight globally threatened meliphagids, the Rotuma Myzomela, is restricted to the island of Rotuma and associated offshore islets, in Fiji. Nearly all native forest on Rotuma has been cleared for agriculture and plantations, but the myzomela appears to occupy all habitats found on the island, including remaining primary forest, secondary forest, forest edge and modified habitats, and it is thought to be the most abundant bird on Rotuma. It is nevertheless considered Vulnerable because it has a tiny global range of just 43 km², with most of the population on a single island, and is thus at risk of some catastrophic event, such as the introduction of exotic predators or the occurrence of disease. Pacific rats are already present. The wide range of habitats used by this myzomela, and its abundance, should, however, reduce the risk to the species from cyclone damage to the islands.

In addition to the above, the Chatham Island subspecies *melanocephala* of the New Zealand Bellbird is Extinct. This taxon is treated as a separate species by some authors. It occurred on Chatham, Mangere and Little Mangere, in the Chatham Group, but has not been recorded since 1906. The reasons for its demise are not properly known, but they are probably connected with the destruction of forest on these islands. It has also been suggested



Meliphagids form roughly one-fifth of the restricted-range species present in the New Caledonia Endemic Bird Area, among them the **New Caledonian Friarbird**. This large honeyeater occurs on the main island of Grande Terre and on Lifou and Maré in the Loyalty Islands. While common in forests, it appears to prefer open and disturbed areas, and often forages in gardens. Although scarce on Lifou, its relative abundance on the large island of Grande Terre means that it is probably secure for the present.

[*Philemon diemenensis*, Farino, New Caledonia. Photo: Roger Le Guen]

Five meliphagids are considered Near-threatened: two occur in Wallacea, and one each in New Guinea, the Solomon Islands, and eastern Australia. The last of these is the **Painted Honeyeater**, which has suffered a long-term population decline and may now number as few as 50,000 birds. The major factors behind the decrease are deforestation for agriculture, and subsequent grazing by introduced herbivores, which prevents forest regeneration. The species' apparent need for mature, closed-canopy forest with abundant mistletoes further complicates potential population recovery.

[*Grantiella picta*, Clunes, Victoria, Australia. Photo: Chris Tzaros]

that introduced predators, such as rats and cats, and over-zealous collecting for museums may have contributed to its extirpation.

A further six members of the Meliphagidae are considered Near-threatened. These are Brass's Friarbird, endemic in the upper Mamberamo and Wapoga River Basins in north-west New Guinea; the Bismarck Honeyeater of the mountains of New Britain; the Black-breasted Honeyeater and the Crimson-hooded Myzomela, both of which are confined to Wetar, in Wallacea; the Red-bellied Myzomela of Malaita, in the Solomon Islands; and the Painted Honeyeater of eastern Australia. A further two species, the Tagula Honeyeater and the White-chinned Myzomela, are Data-deficient. A number of other species, however, almost certainly warrant classification as Data-deficient. This applies particularly to some of the forms recently elevated to species rank, such as the Grey Friarbird of Kisar, Leti and Moa, in the eastern Lesser Sundas, and the Tanimbar Friarbird of the Kai and Tanimbar Islands. The range and status of a number of other meliphagids are likewise poorly known.

The *Action Plan for Australian Birds 2000* identified threatened avian taxa of Australia, including a number of honeyeater species, in addition to the globally threatened or Near-threatened species mentioned above. These include the "vulnerable" King Island subspecies *kingi* of the Yellow Wattlebird; and four "near-threatened" taxa, namely the Torres Strait form *saturation* of the Tawny-breasted Honeyeater, the eastern, nominate subspecies of the Black-chinned Honeyeater, and the Torres Strait forms of the Dusky and Red-headed Myzomelas, respectively *fumata* and *infuscata*.

Of significance, however, is the "critically endangered" and morphologically distinctive subspecies *cassidix* of the Yellow-tufted Honeyeater, which is confined to a single site in western Gippsland, in Victoria. A major conservation effort has been made to save the last population of this distinctive subspecies, which has declined markedly as a result of extensive destruction of its habitat. Sometimes treated as a separate species, the "Helmeted Honeyeater", this meliphagid formerly occurred throughout much of south-western Gippsland, over an area of 2000–3000 km², but since 1983 three of the four remaining populations have almost certainly become extinct, with two colonies ultimately extirpated by bushfire, and it is now confined to a small section of creek-line near Yellingbo, an area of about 5 km². The total population in 1999–2000 was estimated to consist of 37 breeding pairs and 36 fledglings. This honeyeater has been adversely affected by a cas-



cading series of processes resulting from clearance of natural habitat for agriculture: clearing of hillside vegetation changed the patterns of runoff, increasing the stress on remaining trees, which in turn left trees more susceptible to infestation by defoliating psyllids and encouraged colonization by Bell Miners. Miners are aggressive towards "Helmeted Honeyeaters", causing them to spend increased amounts of time in defending territories, and possibly leading to reduced breeding success. Conservation actions include revegetation programmes, beginning in 1978, with revegetated areas seen to be used for foraging and breeding; captive-breeding and management, with 15 breeding pairs in captivity in 2000; and reintroduction to another creek-line. The honeyeater, however, remains under threat from the proximity to colonies of Bell Miners, a shortage of high-quality breeding territories near existing colonies, and rapidly spreading dieback of eucalypts.

The declines of the "Helmeted Honeyeater" and the Black-eared Miner highlight two aspects of the ongoing conservation of Australia's woodland and forest avifauna. The first is the major effort that has been put in to the revegetating and regenerating of cleared or degraded temperate woodland and forest habitats, and the creation of habitat corridors between remnant patches. The second is the widespread impact of colonial and aggressive miners on the avifauna of revegetated habitats and of remnant habitats. The miners also dominate many urban habitats. For example, Noisy Miners dominate many areas of remnant vegetation, forest edges and planted wildlife corridors, from which they competitively exclude small birds.

Recent studies have highlighted some ways of dealing with the problem of miners. In one study, whereas Noisy Miners were found to dominate corridors of eucalypts to the virtual exclusion of all small birds, corridors vegetated with native acacias, exotic conifer and exotic deciduous trees had small birds and no resident Noisy Miners. The greatest abundance and richness of small birds occurred in plantings combining eucalypts with at least 15% acacias, and it was recommended that plantings of eucalypts be supplemented with both acacias and a shrubby understorey in order to increase the avifaunal diversity of a site. Another study examined revegetation of slow-growing native buloke woodlands, which usually include faster-growing eucalypts in plantings. The probability of Noisy Miners occurring in buloke woodland increased markedly where eucalypts were present at a density of about five



Of the eight meliphagids that are globally threatened, two Vulnerable and restricted-range species occur only in montane New Guinea: MacGregor's Honeyeater (*Macgregoria pulchra*) and the Long-bearded Honeyeater. The latter species occurs either side of the tree-line, generally at 3000–3800 m. It is patchily distributed, and is known to be present at very few sites. Thus, while it is fairly common, its population is thought to be fairly small. Moreover, its numbers may be declining as a result of human activity in the densely populated Central and Eastern Highlands.

[*Melidectes princeps*,
Mt Hagen,
EC New Guinea.
Photo: William S. Peckover]

The **Mao** is a restricted-range honeyeater that occurs only on Upolu and Savai'i in the Samoan Islands Endemic Bird Area. This species is also one of four honeyeaters classed as Endangered. The Mao is thought formerly to have been widespread in Samoa's lowland forests, but to have been forced by forest destruction and degradation to retreat upslope into remaining habitat enclaves. Cyclones, fires and hunting pose additional threats to a population that is already as low as 1000–2500 birds, and thought to be declining and ever more fragmented.

[*Gymnomyza samoensis*,
Samoa.
Photo: Patricio Robles Gil/
Oxford Scientific Films]



The **Black-eared Miner** is a restricted-range species that occurs only in the South-east Australia Endemic Bird Area. This Endangered honeyeater has vanished from most of its range due to two potent and interrelated pressures: anthropogenic habitat modification; and hybridization. Widespread clearance and fragmentation of the Black-eared Miner's mallee habitat opened up areas for the congeneric Yellow-throated Miner (*Manorina flavigula*), a species of edge and open habitats. The ranges of the two species soon overlapped, and subsequent extensive hybridization has diluted the rarer species' genetic purity.

[*Manorina melanotis*, Gluepot Reserve, South Australia, Australia. Photo: Peter Fuller]

per hectare, the presence of miners changing both the structure and the composition of the avifaunal assemblage of the woodland. Small insectivorous birds were recorded much more often where Noisy Miners were absent. Thus, a small difference in the composition of the habitat of these revegetated woodlands can result in substantial changes in the conservation value of the woodland.

The Noisy Miner seems to be the only meliphagid to have been introduced outside its country of origin. The species was recorded as breeding on the Three Sisters Islands, in the eastern Solomons, probably in the 1930s, but details of its introduction there are not known. It was not observed in 1990 and appears to have died out. Noisy Miners were also introduced, again unsuccessfully, in New Zealand. Bell Miners were imported into New Zealand in 1874, but it is not known if any were released into the wild; if they were, they certainly did not become established.

On a somewhat more positive note, it is worth mentioning here the newly described species of meliphagid, the Wattle Smoky Honeyeater. This was discovered by Beehler and his colleagues in a 2005 expedition to the Foja Mountains, in north-western New Guinea, although observations of a *Melipotes* species in the remote and little-visited region some 24 years earlier probably represent the first sightings of this new species (see Systematics). There are many other isolated regions of New Guinea where the discovery of new forms of honeyeater are likely to be made. For example, in 1992, D. Gibbs made what was only the second ornithological visit to the Fakfak Mountains in the twentieth century. There, he observed a *Melipotes* apparently unlike the three described species known at the time. The relationships of these Fakfak *Melipotes* with *M. fumigatus*, *M. gymnops*, *M. ater* and the recently described *M. carolae* are not known, and await further investigation.

The sole species of bird discovered in northern Melanesia since 1937 is the Bismarck Honeyeater, collected in the mountains of New Britain in 1958. In Australia, the most recently described bird species is the Eungella Honeyeater, formally named in 1983 after its initial discovery in a collection of museum skins of Bridled Honeyeaters at the Australian Museum, and subsequent observations of live individuals in Queensland in 1978. In 1989, Schodde separated the Kimberley populations of the White-lined Honeyeater as a subspecies, *fordiana*, distinct from populations of the Northern Territory. More recently, however,

molecular analyses have indicated that the two forms warrant specific status, with *fordiana* now recognized as the Kimberley Honeyeater.

General Bibliography

Adam (1992), Allen & Saunders (2002, 2006), Anon. (2006b, 2006c), Armstrong (1990a, 1990b, 1991a, 1991b, 1992a, 1992b, 1996), Armstrong & Pyke (1991), Ashwell (1980), Astheimer & Buttemer (2002), Baker *et al.* (1995), Barker, F.K., Barrowclough & Groth (2002), Barker, F.K., Cibois *et al.* (2004), Barker, R.D. & Vestjens (1990), Bayley & Blumstein (2001), Beehler (1981, 1983, 1985, 1991a, 1991b, 1993), Beehler & Finch (1985), Beehler, Pratt & Zimmerman (1986), Beehler, Prawiradilaga *et al.* (2007), Beichle & Maelzer (1985), Bell (1964, 1979, 1980a, 1980b, 1982a, 1982e, 1983a, 1983b), Blaber (1995), Bock (1963, 1985, 1994), Bock & Morioka (1971), Boles (2005), Boles & Longmore (1985), Bonnin (1989), Bowler & Taylor (1989b), Bowman *et al.* (1990), Bregulla (1992), Bridgewater (1987), Brown & Hopkins (1996), Bruce (1984, 1988a, 1988b), Buckingham *et al.* (1995), Buden (1999), Campbell (1900), Carpenter (1978), Casotti & Richardson (1992, 1993), Catterall (2004), Catterall *et al.* (2002), Chan (2001), Christidis (1991), Christidis & Schodde (1991, 1993), Christidis *et al.* (1993), Clapp (1979a, 1986a, 1992), Clarke, M.F. (1984a, 1984b, 1988, 1989, 1997, 2007), Clarke, M.F. & Fitz-Gerald (1994), Clarke, M.F. & Oldland (2007), Clarke, M.F. & Schedvin (1997, 1999), Clarke, M.F., Grey *et al.* (1995), Clarke, M.F., Schipper *et al.* (2003), Clarke, M.F., Taylor *et al.* (2007), Clarke, R.H. & Clarke (1999, 2000), Clarke, R.H., Boulton & Clarke (2002, 2005), Clarke, R.H., Gordon & Clarke (2001), Clarke, R.H., Oliver *et al.* (2003), Cleland *et al.* (1918), Clunie (1972), Coates (1990), Coates & Bishop (1997), Coates & Peckover (2001), Cockburn (1998), Collar, Andreev *et al.* (2001), Collar, Crosby & Stattersfield (1994), Collins (1980, 1985), Collins & Briffa (1983), Collins & McNee (1991), Collins & Morellini (1979), Collins & Paton (1989), Collins, Cary & Packard (1980), Collins, Cary & Payne (1980), Colston (1974), Conrad *et al.* (1998), Cooney *et al.* (2006), Cowan (2006), Cracraft & Feinstein (2000), Craig (1984, 1985), Craig & Douglas (1986), Crome (1978), Davis & Recher (2002a, 2002b), Day (1995), Deignan (1958), Diamond (1969, 1971, 1972a, 1972b, 1975a, 1982, 1985), Diamond & LeCroy (1979), Diamond & Marshall (1976, 1977a, 1977b), Diamond & Terborgh (1968), Diamond *et al.* (1989), Dickinson (2003), Dingle (2004), Donald (2007), Doughty *et al.* (1999), Dow (1973, 1975, 1977a, 1977b, 1980a, 1980b), Dow & Whitmore (1990), Draffan *et al.* (1983), Driskell & Christidis (2004), Driskell *et al.*

The **Regent Honeyeater** was formerly widespread in eastern and south-eastern Australia, and was clearly once common, given the flocks of thousands that were recorded during the nineteenth century. However, since the 1940s in particular, its range and population have decreased markedly, and it is now listed as *Endangered*. Three-quarters of the species' Eucalyptus woodland habitat has been destroyed for agriculture, and only 500–1500 birds now remain. Conservation efforts are hindered by the mobile nature of the species, with its poorly understood movements thought to be in search of the nectar of flowering Eucalyptus trees.

[*Anthochaera phrygia*,
Capertee Valley,
230 km W of Sydney,
New South Wales,
Australia.

Photo: Nevil Lazarus]



(2007), Dunning (1993), East & Williams (1984), Egan (1997), Ekstrom *et al.* (2002), Engbring & Ramsey (1989), Ericson, Christidis, Cooper *et al.* (2002), Ericson, Christidis, Irestedt & Norman (2002), Evans *et al.* (1992), Ewen, Clarke *et al.* (2001), Ewen, Flux & Ericson (2006), Farmer *et al.* (2004), Filardi & Moyle (2005), Fisher, A.M. (2001), Fisher, C.D. *et al.* (1972), Fleming (1939), Ford, H.A. (1976, 1979, 1980, 1981a, 1983, 1985a, 1985b, 1989, 1991, 1998a, 1999), Ford, H.A. & Forde (1976), Ford, H.A. & Paton (1976a, 1976b, 1977, 1982, 1985), Ford, H.A. & Pursey (1982), Ford, H.A. & Trémont (2000), Ford, H.A. *et al.* (1985), Ford, J.R. (1978b, 1983b, 1986), Forth (1992), Franklin & Noske (2000a), Franklin & Wilson (2003), Franklin, Menkhurst & Robinson (1987, 1989), Franklin, Smales *et al.* (1999), Freifeld *et al.* (2001), French (1957), French *et al.* (2005), Frith & Beehler (1998), Fulton (2006), Gadow (1884), Galbraith & Galbraith (1962), Gannon (1953), Gardner (2005), Garnett & Crowley (2000), Gartrell (2000), Gaze & Clout (1983), Geering & French (1998), Gibbs (1994), Gill (1999), Gilmore (1985), Gilmore *et al.* (2007), Green, K. (2006), Green, K. & Sanecki (2006), Green, R.H. (1995), Greenway (1966), Grey *et al.* (1997, 1998), Griffioen & Clarke (2002), Hall (1974), Hannah *et al.* (2007), Hartshorne (1973), Hastings & Beattie (2006), Hicks (1997, 2006), Higgins (1992, 1999), Higgins *et al.* (2001), Hindwood & McGill (1951), Holdaway *et al.* (2001), Holmes & Recher (1986a, 1986b), Hopper & Burbidge (1982a), Immelmann (1961), Iredale (1950, 1956), Johnstone (2001), Johnstone & Burbidge (1991), Jones (1983), Jones & Wieneke (2000), Jordan (1987), Jurisevic & Sanderson (1994a, 1994b), Kavanagh & Stanton (2003), Kavanagh *et al.* (2007), Keast (1968a, 1968b, 1976, 1981, 1984, 1985a, 1985b, 1985c, 1993, 1994a, 1994b, 1996), Koopman (1957), Kratter, Steadman, Smith, Filardi & Webb (2001), Lambert & Collar (2002), Lambert & Kleindorfer (2006), Laurance *et al.* (1996), Law *et al.* (2000), Layard & Layard (1880), Lea & Gray (1936), Leach (1928), Ley *et al.* (1997), Long (1981), Low (1994), Loyn (1985a, 1985b, 1985c, 1987a, 1987b), Loyn *et al.* (1983), Mackay (1981), Major (2003), Major & Gowing (1994), Major, Christie & Gowing (2001), Major, Christie, Gowing & Ivison (1999), Major, Gowing & Kendal (1996), Major, Pyke *et al.* (1994), Maron (2007), Maron *et al.* (2005), Marsden *et al.* (1997), Martin *et al.* (2004), Matthew (1999), Matthews *et al.* (1999), Mayr (1932, 1944a), Mayr & Diamond (1976, 2001), McCann (1964), McCarthy (1995), McFarland (1984a, 1986c, 1995, 2002), McFarland & Ford (1991), McLean *et al.* (2005), McMahon & Franklin (1993), Medway (1976), Menkhurst *et al.* (1999), Milledge & Recher (1985), Mitchell & Paton (1990), Morioka & Sakane (1978), Morris & Wooller (2001), Munro & Munro (1998), Munro & Wiltshko,

R. (1993), Munro & Wiltshko, W. (1992), Munro *et al.* (1993), Murphy & Kelly (2001), Myers (2004), Nix (1976), Norman *et al.* (2007), North (1906, 1907), Noske (1983, 1996, 1998, 2003), Noske & Franklin (1999), Oliver, D.L., Chambers & Parker (2003), Oliver, D.L., Ley & Williams (1998), Oliver, D.L., Quin *et al.* (1998), Oliver, W.R.B. (1955), Olsen *et al.* (2005), Osborne & Green (1992), Painter (1997), Parker (1971a, 1973), Parkes (1980), Parsons & Major (2004), Parsons, French & Major (2003), Parsons, Major & French (2006), Paton (1979, 1980, 1982a, 1982b, 1982c, 1982d, 1985a), Paton & Collins (1989), Paton & Ford (1977, 1983), Paton & Turner (1985), Pearce *et al.* (1995), Peterson (1996), Piper & Catterall (2006), Poiani (1992c, 1993a, 1993b, 1993c, 1993d, 1993e, 1995, 1997), Poiani & Jermiin (1994), Poiani *et al.* (1990), von Polanen Petel & Lill (2004), Pöldmaa *et al.* (1995), Pratt *et al.* (1987), Pyke (1980, 1981a, 1981b, 1983, 1985, 1988, 1989, 1995), Pyke & O'Connor (1989, 1993), Pyke & Recher (1986, 1988), Pyke, Christy & Major (1996), Pyke, O'Connor & Recher (1993), Pyke, Recher & O'Connor (1989), Ramsey (1989), Rand (1940b, 1942a, 1967a), Recher (1971, 1975, 1977, 1981, 1985, 2007), Recher, Gowing *et al.* (1983), Recher, Holmes *et al.* (1985), Recher, Kavanagh *et al.* (1991), Reid (1989), Rheindt & Hutchinson (2007a), Richardson & Wooller (1986), Richardson *et al.* (1991), Riley & Mole (2001), Robertson (1985), Rogers *et al.* (1990), Rooke (1972, 1979), Rooke & Knight (1977), Rose (1999), Roshier & Reid (2003), Rothschild & Hartert (1907), Rowley & Russell (1991), Salomonsen (1967b), Salomonsen & Ford (1985), Saunders & Burgin (2001), Saunders *et al.* (2003), Scharnke (1933), Schmid (1993), Schodde (1975, 1982), Schodde & Mason (1975, 1999), Secomb (1995), Serventy (1984), Shields (1984), Sibley (1996), Sibley & Ahlquist (1985b, 1990), Sibley & Monroe (1990, 1993), Smith, A.J. & Robertson (1978), Smith, C.E. & Filardi (2007), Smith, P. (1985a, 1985b, 1989), Springer *et al.* (1995), Stattersfield *et al.* (1998), Steadman *et al.* (1999), Stokes (1979), Stone (1917), Storr (1977, 1991), Stresemann & Heinrich (1940b), Sujatnika *et al.* (1995), Szabo *et al.* (2007), Tennyson & Millener (1994), Tokue & Ford (2006, 2007), Tracey *et al.* (2004), Tullis *et al.* (1982), Turbott (1967), Veerman (1992, 1994), Veltman *et al.* (1996), Verheijen (1964), Vitali *et al.* (1999), Wardell-Johnson *et al.* (2006), Watling (2001), Watson *et al.* (2000), White & Bruce (1986), Whitmore, T.C. (1986), Wiles *et al.* (2003), Woinarski (1993, 2006), Woinarski & Ash (2002), Woinarski, Brock *et al.* (2000), Woinarski, Connors & Franklin (2000), Woinarski, Fisher *et al.* (2001), Woinarski, Press & Russell-Smith (1989), Woinarski, Tidemann & Kerin (1988), Wolters (1979), Wooller (1984), Wooller & Calver (1981a, 1981b, 1988), Wooller & Wooller (1998), Wykes (1982, 1985), Yom-Tov (1987).



PLATE 38

inches 3
cm 8

Family MELIPHAGIDAE (HONEYEATERS) SPECIES ACCOUNTS

Genus *ACANTHORHYNCHUS* Gould, 1837

1. Eastern Spinebill

Acanthorhynchus tenuirostris

French: Méléphage à bec grêle **German:** Rotnacken-Honigfresser **Spanish:** Picoespina Oriental
Other common names: (Victorian) Spinebill, Slender-billed/Spinebill/Spine-billed Honeyeater; Tasmanian Honeyeater (*dubius*)

Taxonomy. *Certhia tenuirostris* Latham, 1801, Nova Hollandia = region of Port Jackson, New South Wales, Australia.

Forms a superspecies with *A. superciliosus*. Proposed races *trochiloides* (from Bunya Mts, in SE Queensland) and *loftyi* (Mt Lofty, in S Australia) considered synonyms of nominate, and *regius* (King I, in Bass Strait) synonymized with *dubius*. Four subspecies recognized.

Subspecies and Distribution.

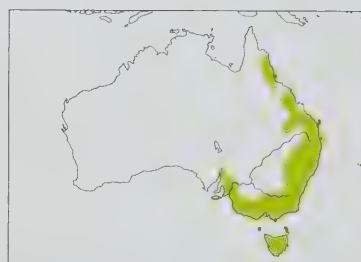
A. t. cairnsensis Mathews, 1912 – NE Queensland (uplands of Atherton, Carbine and Windsor Tablelands), in NE Australia.

A. t. tenuirostris (Latham, 1801) – coastal and subcoastal E & SE Australia from Queensland (Clarke Range) S, inland to W slopes of Great Divide, to Victoria and SE South Australia.

A. t. halmaturinus A. G. Campbell, 1906 – Mt Lofty Ranges and S Flinders Ranges, Adelaide Plain and Kangaroo I, in South Australia.

A. t. dubius Gould, 1837 – Tasmania and islands in Bass Strait.

Descriptive notes. 13–16 cm; male 4–24 g, female 7–16 g. Distinctive, small honeyeater with long, slender decurved bill and moderately long tail. Male nominate race has glossy black forehead to nape, black mask (lores and ear-coverts) joining broad, bold, black crescent at side of breast, isolating dark rufous-brown hindneck-collar and sharply demarcated from white lower face, side of throat and centre of breast, which enclose bold rufous-brown patch on chin and centre of throat that becomes darker, almost black, on lower edge; upperbody largely dark grey-brown, faint rufous wash on mantle, merging to dark greyish rump and uppertail-coverts; upperwing and uppertail blackish, glossy grey secondary coverts and tertials and prominent white corners of tail (largely or wholly concealed when tail folded); underbody pale to dark rufous-brown; underwing largely whitish, with dark brown-grey trailing edge and tip, undertail largely white when closed, with dark



brown-grey base; iris dark red or orange-red; bill black; legs black, grey-black or dark red-brown. Female is like male but slightly smaller, cap much duller, dark grey, typically contrasting with black mask (effects of light can make contrast appear less obvious). Juvenile is more uniform above than adult, with top and side of head and upperbody dark olive, merging to dark olive-grey on uppertail-coverts, whole underbody uniformly light yellow-brown, indistinct light brown fringes on secondary coverts, bill sometimes paler, grey-black, and basal half of lower mandible yellow, gape yellow and swollen, iris black-brown (lacks red colour),

legs paler, greyish-pink; immature like adult. Race *cairnsensis* is similar to nominate in size, male differs in paler and less rufous hindneck, and very pale and diffuse brown centre of lower throat; *dubius* is significantly smaller, male has smaller and much darker throat patch confined to centre of throat (chin white) and grading from dark brown on upper throat to black-brown on lower throat, also slightly broader black crescent at side of breast, stronger rufous-brown on lower underbody; *halmaturinus* is significantly smaller than nominate, male cap slightly paler, grey-black, throat patch paler, white tips of outer rectrices slightly narrower, some variation in size, birds on Kangaroo I smaller but with longer bill than adjacent mainland populations. **VOICE.** Song, from perch and in flight, heard sporadically throughout day (said to sing more often on wet days), fairly loud: a rapid, shrill but musical series of piping notes, “ting, ting, ting...”, usually lasting 4–5 seconds, sometimes longer (20 seconds or more), up to 4–5 songs per minute; varies from rather explosive to soft and wavering. Subdued song during courtship chases. Rapidly repeated 4-note call, last note rather longer than first, apparently given only when breeding; soft metallic call during threat display. Wingbeats make “thirup” sound.

Habitat. Mainly dry, open, sclerophyll forests and woodlands dominated by *Eucalyptus* and with well-developed shrub understorey, often of *Banksia* or other heath species; also dense heath or shrub associations, including shrub-heath, heath-woodland, dense coastal *Leptospermum*-*Banksia* shrubland, and coastal and subcoastal mallee shrubland. Commonly in wet sclerophyll forest in some regions. Often found in orchards, and parks and gardens in cities and urban and regional areas. Occasionally in littoral, subtropical or temperate rainforest and remnant patches of vine forest; often in temperate rainforest dominated by Antarctic beech (*Nothofagus cunninghamii*) in

Tasmania, more rarely so on mainland. Occasionally in subalpine forest or woodland, but rarely in alpine areas (only during snow-free months). Sometimes in introduced pine (*Pinus*) plantations. Sea-level to c. 1200 m, but confined to coastal lowlands in NE.

Food and Feeding. Diet nectar and arthropods (mainly insects) in roughly equal proportions. In two studies, recorded ratios of nectar-foraging to insect-foraging 54:46 and 53:47, though in latter study ratio changed from 80:20 during Feb–Apr to 20:80 in May and to 90:10 in Jun; on Kangaroo I, ratio from smaller and possibly biased sample 20:80. Forages mostly in low shrubs or understorey to middle-storey trees, less often in crowns of tall trees, e.g. at flowering mistletoe (*Loranthaceae*) and profusely flowering eucalypts; in SE New South Wales, mean foraging height 2.2 m, with 99% in shrub layer (up to 4 m) and 1% in subcanopy (4–10 m); very occasionally on ground. Much foraging at flowers, exploiting wide variety, frequently proteaceous shrubs such as *Banksia* and *Lambertia*, and *Amyema* mistletoes. Nectar obtained by probing and sally-hovering. Insects gleaned from foliage, twigs, branches and loose bark, obtained also by sallying, including sally-striking in air and at foliage. When taking nectar from *Epacris* or *Fuchsia* flowers, probes while sally-hovering. Will puncture holes at bases of tubular flowers to reach nectar. Usually singly or in twos (probably pairs), sometimes in loose groups of 3–5 birds, rarely in mixed-species feeding flocks; sometimes associates with Silvereyes (*Zosterops lateralis*), other honeyeaters and gerygones (*Gerygone*).

Breeding. Recorded Aug–May, mainly Oct–Dec; eggs Aug–Feb and rarely May (mostly Sept–Nov), and at site in SE Australia clutches started mid-Sept to mid-Dec; up to four broods. Both sexes collect nesting material but only female builds, construction takes 4–7 days, nest a small, deep cup, usually made of twigs, grass, bark and leaves, bound with spider web, lined with feathers, fine grass and sometimes other soft materials, external diameter 5–8.9 cm, depth 5.1–8 cm, internal diameter 4–5.5 cm, depth 3.8–4 cm, usually suspended by rim from forked branch, occasionally supported, 0.9–18 m (mean 3 m) above ground in dense foliage in upper or outer part of living shrub or tree, often one with prickly foliage, occasionally in dead foliage or vines; new site used for subsequent and replacement clutches. Clutch 1–4 eggs, usually 2 (mean throughout range 2.2); incubation by female alone, male once observed to incubate in Tasmania, period 13–16 days (average 14.4 days); both adults feed nestlings and fledglings and remove faecal sacs; nestling period 12–15 days (average 13.7 days); young fed by both parents for several days, can begin to feed themselves within 8 days of fledging; juveniles disperse from natal territory before adults renest.

Movements. Resident, or partly so, with some local movements. In Blue Mts (New South Wales), winter influx possibly of migrants; occurrence also seasonal or numbers change at some sites. Partial altitudinal migrant in highlands of SE Australia, possibly also in Tasmania, leaving higher country in autumn–winter. Conversely, apparently a partial migrant in high country of New England Tableland, where more numerous in winter and only small resident population present in summer; ringing shows that birds tend to return at similar times of year.

Status and Conservation. Not globally threatened. Locally common. S race *dubius* widespread in Tasmania but rare on King I. No estimates of global population, recorded at densities of up to 0.5 birds/ha. Usually absent from small degraded patches of woodland. Found to be adversely affected by logging at one site in SE Australia, though elsewhere regularly found in dense regrowth 0–6 years after clear-felling and common in regrowth 20–30 years old. Sometimes killed by cats or dogs. Birds feeding on refined sugar at artificial feeders in gardens sometimes die from thiamine deficiency.

Bibliography. Barrett, Ford & Recher (1994), Barrett, Silcocks *et al.* (2003), Baxter (1989, 1995), Bedgood (1970, 1980), Blakers *et al.* (1984), Bonnin (1989), Bravery (1970), Campbell (1900), Colston (1984), Cooney *et al.* (2006), Cooper (1975b), Dowling *et al.* (1994), Emison & Porter (1978), Emison *et al.* (1987), Farrell & Hardy (1993), Ford, H.A. (1976, 1979, 1983, 1991), Ford, H.A. & Paton (1977, 1982), Ford, H.A. & Pursey (1982), Ford, H.A., Bridges & Noske (1985), Ford, H.A., Noske & Bridges (1986), Friend (1982), Frith, C.B. & Frith (2005), Frith, D.W. (1984), Frith, H.J. (1969), Gannon (1962), Gibson (1977), Gosper, C.R. (1999), Gosper, D.G. (1992), Green (1989, 1995), Griffioen & Clarke (2002), Hermes (1981), Higgins *et al.* (2001), Hindwood (1943, 1944), Kavanagh *et al.* (1985), Keast (1968a, 1993), Keast & Condon (1968), Kikkawa *et al.* (1965), Laurance *et al.* (1996), Lavery (1986), Leishman (1994), Loyn (1980, 1985a, 1985b, 1993), Mac Nally (1997), Marchant (1992), Mathews (1924a), McFarland (1983b, 1986a, 1986b, 1994b), McFarland & Ford (1987), McFarland & Sale (1986), McGill & Lane (1955), McLean *et al.* (2005), Mitchell *et al.* (1996), Morris (1975a, 1989), Morris *et al.* (1981), North (1906), Officer (1971), Osborne & Green (1992), Passmore (1982), Paton *et al.* (1994), Pizzey (1980), Price (1977), Pyke (1980, 1983, 1985), Pyke & Recher (1988), Recher & Holmes (1985), Recher *et al.* (1985), Reilly (1991a), Ridpath & Moreau (1966), Rose (1975), Salter (1957), Schodde & Mason (1999), Schodde & Tidemann (1986), Schulz & Kristensen (1994), Scole & Clarke (2006), Slater (1995), Smith, L.E. & Chaffer (1987), Smith, P. (1984), Stanley & Lill (2002c), Storr (1973), Taylor, M. (1992), Taylor, R. *et al.* (1997), Templeton (1992), Thomas (1979, 1980), Traill (1985), Vaughton (1990), Weathers *et al.* (1996), Wheel (1996), Wheeler (1967a), Wolstenholme (1929), Wood (1995).

2. Western Spinebill

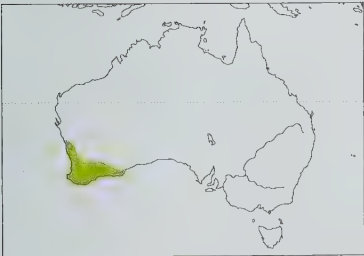
Acanthorhynchus superciliosus

French: Méliphage festonné **German:** Buntkopf-Honigfresser **Spanish:** Picoespina Occidental
Other common names: (White-browed) Spinebill, Western Spinebilled Honeyeater

Taxonomy. *Acanthorhynchus superciliosus* Gould, 1837, Van Diemen’s Land; error = district of Perth, Western Australia.

Forms a superspecies with *A. tenuirostris*. Monotypic.

Distribution. SW Western Australia mainly in coastal and subcoastal regions, from Eneabba S to Pingelly and Fitzgerald R, thence E to Israelite Bay and Cape Arid National Park.



Descriptive notes. 12.5–15.5 cm; male 9–11.5 g, female 8–11 g. Small honeyeater with long slender, decurved bill and moderately long tail. Male is largely olive-grey above and cream below, with bold black facial mask bordered by short, narrow white supercilium (starting from just above eye) and narrow white submoustachial stripe and white chin; broad rufous hindneck-collar joins with rufous bib on throat and upper breast, which in turn bordered below by narrow white band and broader black band across lower breast; upperwing blackish-brown, with dark grey secondary coverts and tertials, fine pale edges of remiges;

uppertail grey-black, bold white corners conspicuous when spread (normally concealed when tail closed); underwing white with dark brown trailing edge and tip; undertail appears mostly white with dark grey base; iris dark red or orange-red; bill black; legs grey-black or black-brown. Female is smaller and much duller than male and lacks distinctive dark mask (lores and ear-coverts as top of head), has supercilium and submoustachial stripe duller, light grey-brown, and more diffuse than male’s, bib duller and less sharply demarcated, chin concolorous with throat, no white and black bands below bib, rufous hindneck-collar slightly duller and less sharply demarcated, and sometimes base of lower mandible paler, greyish. Juvenile is like female but plainer and duller, slightly browner above, especially on rump, no rufous hindneck-collar, faint narrow brown fringes on secondary coverts, slightly paler and more yellowish from lower breast to undertail-coverts, bill black with yellowish base of lower mandible and swollen orange-yellow gape, iris dark red-brown; immature resembles adult of corresponding sex. **Voice.** Song, throughout day when nesting, described as fluted, metallic whistles and twitterings, or squeaky excited whistling; single song or bursts of song given during display-flights. Also loud, repeated “kleat”. Wingbeats in some rapid flights produce audible cracking “purrrr”; clattering sound thought to be made by bill.

Habitat. Mainly habitats dominated by or supporting *Banksia* but also with other Proteaceae, e.g. *Dryandra*, *Grevillea* and *Hakea*. Commonly in heathland, including low open heathland, sandplain heathland, coastal heathland, and montane heathland; also open woodlands dominated by *Banksia* or *Eucalyptus* or both, usually with shrub or heath understorey. Sometimes in mature open *Eucalyptus* forest with diverse shrub or heath understorey; riparian forest or woodland dominated by *Eucalyptus* or paperbark (*Melaleuca*) or both; and in mallee *Eucalyptus* or other scrub. Rarely in urban gardens.

Food and Feeding. Mainly nectar, also small invertebrates (insects). Forages at all levels from ground to canopy (to 30 m or more above ground), mainly in understorey to c. 15 m. Nectar taken by probing from flowers, often *Banksia*, *Dryandra* or other Proteaceae, and *Eucalyptus*; probes tubular flowers. Insects taken by sallying, also gleaned from foliage, branches and trunks. Forages also by sally-hovering, probably for both nectar and insects. When feeding on nectar from *Banksia menziesii*, birds landed on unopened florets at distal end of inflorescence, and leaned forward to probe between most recently opened florets. Usually singly or in pairs, occasionally in small parties; sometimes in mixed flocks with other, predominantly insectivorous, species.

Breeding. Mainly spring–summer, eggs early Aug to late Oct and mid-Dec, nestlings mid-Aug to late Nov and fledglings mid-Sept to early Dec; unspecified breeding noted late Jul and fledglings Jan and Mar. Nest built by female, male once observed to build, a small rounded cup made of grass, bark, and occasionally rootlets, lichen, tendrils and other plant material, bound together with spider web, lined with feathers, plant down or, sometimes, wool or fur, external diameter 7–7.6 cm, depth 5.1 cm, internal diameter 3.2–3.8 cm, depth 3.2 cm; 1–7.6 m (mean 4.1 m) above ground, but recorded also to 12 m, usually among foliage near end of leafy vertical or horizontal branch of shrub or small tree. Clutch 1–2 eggs, mean 1.6 (suggested that early clutches usually of 1 egg and later ones of 2 eggs, but study needed); incubation usually by female, one male observed to incubate, no information on duration; chicks fed by both parents, nestling period 15 days or more; fledglings fed by both sexes. Nests parasitized by Pallid Cuckoo (*Cuculus pallidus*).

Movements. Mainly resident, with some local movements; scattered records N of main range. Some seasonal patterns in abundance, e.g. at one site numbers highest Jan–Mar. In study at Gooseberry Hill, records in all months and maximum numbers usually May–Aug, but much annual variation.

Status and Conservation. Not globally threatened. Reasonably common. No estimates of global population; density 0.004 birds/ha at one site. Has suffered from clearing of native vegetation for agriculture in Wheatbelt, and some indication that adversely affected by fire. In karri (*Eucalyptus diversicolor*) forests near Pemberton, most abundant in mature forest that had not been burnt for at least 3 years. Sometimes killed by flying against windows.

Bibliography. Abbott (1976, 1981), Abbott & van Heurck (1985), Barrett *et al.* (2003), Blakers *et al.* (1984), Campbell (1900), Collins (1980), Collins & Clow (1978), Collins & Newland (1986), Collins *et al.* (1984), Colston (1974), Cooney *et al.* (2006), Cooper (1995), Ford (1971), Gannon (1962), Halse (1978), Higgins (1999), Higgins *et al.* (2001), Immelmann (1960, 1961), Job (1969), Johnstone & Storr (2004), Keast (1968a, 1985a), Lamont & Collins (1988), Loaring & Serventy (1952), Longmore (1991a), Masters & Milhinch (1974), McEvey & Middleton (1968), Newland & Wooller (1985), North (1906), Officer (1971), Ramsay (1989), Recher & Davis (1998), Saunders & Ingram (1995), Schodde & Tidemann (1986), Sedgwick, E.H. (1949a, 1955, 1973a, 1984), Sedgwick, L.E. (1964), Serventy (1948), Serventy & Whittell (1976), Slater (1962), Tingay & Tingay (1983), Tullis *et al.* (1982), White (1940), Whittell (1938), Wilson & Hamilton (1986), Wooller (1981).

Genus PYCNOPYGIUS Salvadori, 1880

3. Plain Honeyeater

Pycnopygius ixoides

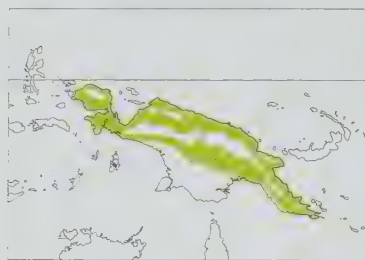
French: Méliphage ocré **German:** Bülbülhonigfresser **Spanish:** Mielero Bulbul
Other common names: (New Guinea) Brown/New Guinea/Nondescript/Olive-brown Honeyeater

Taxonomy. *Ptilotis ? ixoides* Salvadori, 1878, Sorong, Vogelkop Peninsula, New Guinea. Closest to *P. cinereus*. Distributional limits and validity of races poorly known, and listed ranges tentative. Race *cinereifrons* possibly better synonymized with nominate. Proposed race *simplex* (from middle Sepik region, in N New Guinea) considered inseparable from *proximus*. Five subspecies provisionally recognized.

Subspecies and Distribution.

- P. i. ixoides* (Salvadori, 1878) – NW New Guinea E to head of Geelvink Bay and, in S, to about Mimika R and including Weyland Mts.
- P. i. proximus* (Madarász, 1900) – N New Guinea from Mamberamo R E to Astrolabe Bay.
- P. i. unicus* Mayr, 1931 – NE New Guinea (Huon Peninsula and slopes of Herzog Mts).
- P. i. cinereifrons* Salomonsen, 1966 – S New Guinea from Mimika R E to upper reaches of Fly R (absent from S Trans-Fly), and apparently also to Port Moresby district.
- P. i. finschi* (Rothschild & E. J. O. Hartert, 1903) – SE New Guinea on N watershed of ranges from Kumusi R E to Milne Bay and on S watershed E of Port Moresby (usually absent from S coast).

Descriptive notes. 18 cm; male 28–33 g and female 22–31 g (nominate), unsexed 26–34 g (*proximus*). A medium-sized nondescript honeyeater with rather small head, and medium-small and only slightly decurved bill. Nominate race has top of head and neck dark olive-grey, fine blackish-brown mottling or streaking on forehead and forecrown becoming broader and bolder on



brown to reddish-brown; bill black to greyish-black or brownish-black; legs light grey. Sexes alike in plumage, male larger than female. Juvenile undescribed; immature apparently like adult, probably inseparable in field. Race *proximus* is like nominate but darker olive-brown above; *unicus* has more obvious olive tone in grey of top of head and neck, and margins of tail feathers and remiges more buff; *cinereifrons* differs from nominate in having top of head greyer, upperparts less olive-brown, chin and throat rich buff, merging into more grey-buff of breast, underwing darker rufous-buff; *finshi* is distinctive, with bright buff-rufous underbody and slightly more rufous-brown upperparts. Voice. Typically quiet or silent. Calls include "petrt" or "peetrt", similar to call of *P. cinereus*; also distinctive "chi-chup", and hollow "tup". Song described as short burst of loud melodious notes.

Habitat. Forest, including hill forest, also forest edge and tall secondary growth; mainly in old secondary growth in Crater Mountain Wildlife Management Area, and at Brown R always seen in roadside vegetation. Sea-level to c. 1200 m; locally to 1400 m at Mengino, in Eastern Highlands. In Eastern Highlands, altitudinal range overlaps with that of *P. cinereus* at c. 1060–1370 m, around Karimui present species common up to 1190 m, *P. cinereus* extending down to 1110 m.

Food and Feeding. Diet small fruits (including of *Pipturus*) and nectar, and almost certainly small arthropods; described as primarily frugivorous. Swallows fruit of *Pipturus* whole. Mainly in lower canopy and middle and lower levels of vegetation, occasionally descending to understorey, but forages also in upper canopy. Usually in flowering and fruiting trees, particularly sago (*Metroxylon*) in some areas, and in vines. Typically quiet, inconspicuous; rather slow-moving. Usually singly or in twos (probably pairs); occasionally in small parties, e.g. up to twelve in flowering sago, with up to four on same flowering head. Sometimes associates with other species. In Eastern Highlands, commonly displaced by similarly sized *Xanthotis flaviventer* when feeding in flowering trees but seen to forage in large groups with that species on *Pipturus* in garden.

Breeding. No information.

Movements. Probably largely resident throughout range.

Status and Conservation. Not globally threatened. Generally rare, uncommon or sparse to locally common, but said to be easily overlooked. Described as abundant at Baiyer River Sanctuary and in Maprik area; common in lowland forest of E Sepik District, and uncommon in Crater Mountain Wildlife Management Area.

Bibliography. Anon. (1978a), Beehler (1978a), Beehler, Pratt & Zimmerman (1986), Beehler, Sengo *et al.* (1995), Bell (1982c, 1984b), Berggy (1978), Coates (1990), Coates & Peckover (2001), Diamond (1972a), Finch (1980b, 1981c, 1983), Fletcher (2000b), Gilliard & LeCroy (1967a), Gregory (1995b), Gyldestolpe (1955b), Hicks (1988b), Mack & Wright (1996), Mackay (1980), Ogilvie-Grant (1915), Pearson, D.L. (1975), Rand (1942a, 1942b), Rand & Gilliard (1967), Richards & Suryadi (2002), Ripley (1964), Stein (1936), Terborgh & Diamond (1970).

4. Marbled Honeyeater

Pycnopygius cinereus

French: Méliphage marbré **German:** Marmorhönigfresser **Spanish:** Miclero Jaspeado
Other common names: Grey/Grey-fronted/Greyish-brown Honeyeater

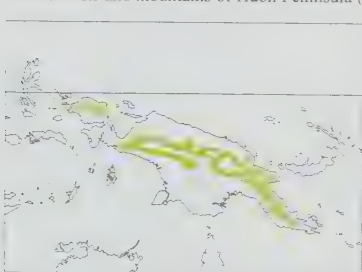
Taxonomy. *Ptilotis cinerea* P. L. Selater, 1874, Hatam, Arfak Mountains, north-west New Guinea. Closest to *P. ixoides*. Three subspecies recognized.

Subspecies and Distribution.

P. c. cinereus (P. L. Selater, 1874) – mountains of Vogelkop Peninsula, in NW New Guinea.

P. c. dorsalis Stresemann & Paludan, 1934 – Weyland Mts and S slopes of W Nassau Mts, in W New Guinea.

P. c. marmoratus (Sharpe, 1882) – Central Ranges of New Guinea E from Weyland Mts, also Adelbert Mts and mountains of Huon Peninsula (including Herzog Mts).



whitish malar streak; upperbody rich dark brown (some with olive tinge), feathers of mantle, back and scapulars with pale grey to olive-grey fringes (giving diffusely mottled or streaked pattern); uppertail and upperwing rich brown, fine buff fringes on alula and median and greater secondary coverts, strongly tinged olive on greater primary coverts; fine olive-buff edges on remiges, more strongly tinged olive on secondaries (forming pale panel on folded wing); chin and throat dusky grey, mottled or barred off-white, underbody dusky brownish-grey with faint paler scaling, becoming brownish-grey and diffusely darker-mottled in ventral region; undertail brown-grey to dark olive-brown, underwing largely orange-buff with brownish-grey trailing edge and tip; iris brown, bare postocular skin blue-grey; bill black; legs light blue-grey. Sexes alike in plumage, male slightly larger than female. Juvenile differs from adult in having crown greyer, upperwing-coverts duller brown than rest of upperparts, lacking conspicuous edges on most wing-coverts and primaries (but primary coverts and secondaries have rather bright brownish-olive edges), largely light grey below, with dark grey breast, buff vent and undertail-coverts; immature very similar to adult but with stronger olive tinge, also retains juvenile rectrices and remiges. Race *dorsalis* is very like nomi-

hindcrown to hindneck, diffuse whitish supercilium from above rear of eye to side of nape; lores grey with fine blackish speckling; upperbody olive-brown, diffusely mottled or streaked darker on mantle and back; uppertail and upperwing dark olive-brown, brighter olive edges on rectrices, fine buff tips on lesser and median secondary coverts, fine buff fringes on greater coverts, fine olive-buff edges on remiges (forming large pale panel on folded wing); chin, throat and underparts grey, faint and diffuse dusky streaks on upper breast; undertail dark grey, underwing dull pale rufous with dark grey trailing edge and tip; iris pale

nate, but darker; *marmoratus* has heavier off-white to pale grey scaling across breast and belly, merging into largely pale brownish-grey and diffusely darker-mottled lower underbody, iris light grey to blue-grey. Voice. Largely silent; occasionally a downslurred "tyert", repeated at intervals of 2 seconds.

Habitat. Hill forest and lower and middle montane forest, forest edge and secondary growth, also gardens; on Mt Edward Albert occurs in remnant oak forest and in patch of secondary growth in grassland; in Eastern Highlands mainly at forest edge and in secondary growth, but recorded also in forest interior. Mainly at 1000–2000 m, locally as low as 500 m; tends to be more common at lower levels of altitudinal range, e.g. in Telefomin region upper limits at 1220–1520 m and very uncommon above this.

Food and Feeding. Diet includes nectar, small fruits (2–7 mm in diameter), insects, and parts of flowers. In Eastern Highlands foraged mainly in upper storey in trees with flowers or fruits; on Mt Edward Albert, seen to feed on berries in patch of secondary growth. Usually solitary and typically silent, inconspicuous and rather sluggish. In Eastern Highlands, repeatedly driven from fruiting tree and generally prevented from feeding by *Melidectes torquatus*.

Breeding. Very poorly known. Nestling recorded in Mar, and female with enlarged ovary in Nov. No further relevant information available, although eggs have been described.

Movements. No information; probably sedentary.

Status and Conservation. Not globally threatened. Poorly known; considered patchily common, or generally sparse to locally common; uncommon on Mt Mengam, in Adelbert Range. No estimates of global population.

Bibliography. Beehler (1978a, 1980b), Beehler *et al.* (1986), Bell (1971a), Coates (1990), Coates & Peckover (2001), Diamond (1972a), Gilliard (1950b), Gilliard & LeCroy (1961), Gyldestolpe (1955a, 1955b), Heron (1977a), Mayr & Gilliard (1954), Mayr & Rand (1937), Ogilvie-Grant (1915), Pratt (1982), Rand & Gilliard (1967), Ripley (1964), Stein (1936), Terborgh & Diamond (1970), Tolhurst (1991).

5. Streak-headed Honeyeater

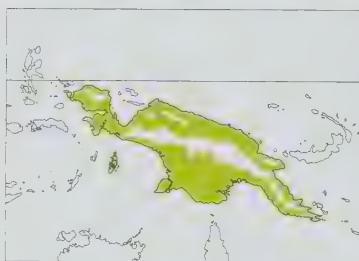
Pycnopygius stictocephalus

French: Méliphage à tête rayée **Spanish:** Miclero Cabecirrayado
German: Strichelkopf-Hönigfresser
Other common names: Streak-capped/Spangle-crowned Honeyeater

Taxonomy. *Pycnonotus* (?) *stictocephalus* Salvadori, 1876, Naiabui, Hall Sound, south-east New Guinea.

Monotypic.

Distribution. Salawati (in West Papuan Is), Aru Is and throughout lowland New Guinea.



Descriptive notes. 21 cm; two males 38 g and 39 g. Medium-sized rather drab honeyeater, with rather small and only slightly decurved bill; appearance much affected by plumage wear and fading. Top of head is blackish-brown with fine and short off-white to greyish-white streaking or speckling; side of head and neck, and chin and upper throat dark brown, conspicuous pale buff to off-white malar streak; upperparts dark brown, slightly darker on wing and tail, and becoming slightly paler with wear; lower throat and underbody buff-brown, underwing rich buff with dark grey trailing edge and tip; iris brown to dark brown or reddish-brown; bill blackish-brown to black, at least some having purplish tinge at base of lower mandible; legs dark grey. Sexes alike in plumage, male larger than female. Juvenile has underbody paler, buff, with grey tinge on breast, rectrices conspicuously edged and tipped pale brown to pale rufous; immature nondescript, differs from adult mainly in having top of head blackish with grey tinge or faint greyish mottling or spotting (not white spotting or streaking), merging to dull black on side of head and dull greyish-black on chin and throat, much less distinct malar stripe, duller brown upperparts and underbody, and (at least when plumage fresh) upperwing-coverts conspicuously edged rufous, also retained juvenile wing and tail with more conspicuous pale edging on rectrices. Voice. Distinctive, loud and rather musical and pleasant. Most frequently heard calls are mimicry of song phrases of Brown Oriole (*Oriolus szalayi*), e.g. "tudi-tudi-tuhifew" (duration c. 1 second), but mimicked phrases weaker and higher-pitched than original. Song described as attractive "tickety-tickety-tickety-teeuw", first and penultimate syllables alike, second a tone lower, final syllable a descending slur, and lasting c. 3 seconds; given during song flight. Also described as bubbling series of 3–12 fairly high-pitched notes, "wchw-wchw-wchw...", c. 4 notes per second, at intervals of a few seconds; or liquid "wheeta wheeta where" or "whita-tea whita-teer" repeated at intervals of c. 2 seconds; subdued "weut-teuk ... weut" (from Manokwari, in Vogelkop) probably also song. Squeaking notes heard at nest on arrival of second bird, but not known if calls of unseen young or quiet calls by one or both adults.

Habitat. Generally a forest-edge specialist. Inhabits mainly disturbed and often open habitats, including tall secondary growth and partly cleared forest, forest edge, gallery vegetation in savanna, dense eucalypt (*Eucalyptus*) savanna woodland, swamp-forest and monsoon woodland or scrub, and gardens; found in rubber plantations around Veimauri-Kuriva (SE New Guinea). Recorded also in primary lowland forest (e.g. E Sepik District), primary hill forest (Ok Menga) and lower levels of dense forest (e.g. at Manokwari). Mainly sea-level to 500 m, locally to 640–750 m (Ok Tedi area) and 1000 m (Adelbert Mts).

Food and Feeding. Diet nectar, small fruits including figs (*Ficus*), insects. Often gleans from foliage, but also probes flowers for nectar. Seen in top branches of tall secondary growth, in upper storey and canopy of lowland forest, also in lower levels of primary forest. Usually singly, sometimes perched conspicuously atop a dead branch; sometimes in twos (possibly pairs) or threes. In flowering or fruiting trees, will drive off other species of similar size or smaller; during 4–5 hours of observation (over two days) of a fruiting tree, repeatedly drove off four species that had same diet, i.e. similarly sized White-bellied Cuckoo-shrike (*Coracina papuensis*) and smaller *Lichenostomus flavescens*, *Myzomela obscura* and *Myzomela adolphinae*, but ignored five species with quite different diets, as well as five larger species (including *Philemon buceroides* and Brown Oriole) with dietary overlap. Visual and vocal similarity to *Philemon buceroides* (especially juvenile) and to latter's visual mimic (Brown Oriole) may allow it to forage in same trees as these other, more pugnacious species without suffering aggressive interactions.

Breeding. Active nest near Finschhafen in early Sept and another near Port Moresby 9th Mar (latter apparently abandoned 4–6 days later). Nest a finely woven cup or basket of fine stems, suspended by rim from fine fork in foliage, near Port Moresby a deep cup of dried material (possibly grass), with exterior an even latticework, appeared to be suspended by two edges and was

overhung by two large leaves, one nest c.12 m above ground near top of tree, another 8 m up in small tree. No other information.

Movements. Poorly known. Resident at Moroka (SE New Guinea). Some indication of at least local movements, apparently associated with flowering: numbers suddenly increased in mid-1978 in Veimauri area, where absent earlier in year; around Veimauri–Kuriva common throughout wet season but absent in dry season. Vagrant at Brown R.

Status and Conservation. Not globally threatened. Poorly known; considered generally scarce to rare but locally common. Fairly common in Veimauri–Kuriva area; uncommon in lowland forest of E Sepik District. No estimates of global population.

Bibliography. Anon. (1978c), Bailey (1992), Beehler & Dumbacher (1996a, 1996b), Beehler, Pratt & Zimmerman (1986), Beehler, Sengo *et al.* (1995), Bell (1970c, 1984b), Coates (1990), Diamond (1982), Finch (1980b, 1983), Gregory (1995b), Gregory *et al.* (1996), Gyldestolpe (1955b), Hoogerwerf (1971), Isles & Menkhurst (1976), Mack & Wright (1996), Mackay (1991), Mayr & Rand (1937), Mees (1982), Murray (1988b), Ogilvie-Grant (1915), Pearson, D.L. (1975), Rand (1942a, 1942b), Rand & Gilliard (1967), Ripley (1964), Schönwetter & Meise (1981), Seale (1980), Stein (1936), Tolhurst (1991).

Genus *CERTHIONYX* Lesson, 1830

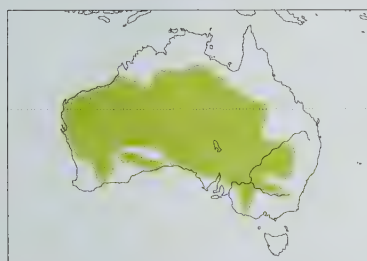
6. Pied Honeyeater

Certhionyx variegatus

French: Méliophage varié **German:** Elsterhonigfresser **Spanish:** Mielero Pio
Other common names: Black-and-white/Western Pied Honeyeater

Taxonomy. *Certhionyx variegatus* Lesson, 1830, Timor; error = Shark Bay area, Western Australia. Monotypic.

Distribution. Western Australia (S of S Kimberley Division) E to S Northern Territory, SW Queensland and W New South Wales, S to coastal South Australia and W Victoria.



Descriptive notes. 15–20 cm; male 22–34 g, female 22–29 g. Medium-sized honeyeater with fairly long decurved bill. Male is mostly black on head, neck, upperparts and side of breast, except for small pale blue crescent of bare skin below eye, white lower rump and uppertail-coverts, and uneven long, tapering white stripe down folded wing (formed by white marginal, median and central greater secondary coverts, and white edges of outermost tertial and adjacent few secondaries); uppertail black, broad white bases of all except central feather pair; centre of breast and rest of underbody white, underwing blackish-brown,

undertail white with broad black tip; in flight, white rump patch prominent and upperwing appears largely black with prominent white shoulder patch; iris dark red-brown; bill blue-grey; legs blue-grey to grey-black. Female is much duller than male, head and neck brown, grading to grey-white on chin and throat, with small area of light blue skin below eye (smaller and less conspicuous than male's), diffuse black-brown streaking on top of head and neck, sometimes a weak buff supercilium; upperbody pale brown, flecked and mottled black-brown anteriorly, grading to darker brown with paler brown scaling on rump and uppertail-coverts, broad white scalloping on outer uppertail-coverts; folded wing dark brown, broad white patch on central greater secondary coverts joining narrow white strip on secondaries, and with coarsely marked black-and-white shoulder patch; uppertail dark brown with paler brown edges; breast dirty white, dark brown teardrops on upper

breast grading into dark brown streaks on lower breast, rest of underparts white, underwing with coverts dark brown and remiges grey-brown, undertail grey-brown with paler edges; bare parts as male, or bill paler. Juvenile is like female but less boldly marked, top of head and upperparts plainer, pale brown, with buff rump, breast less strongly marked, also pale margins of wing-coverts tinged yellow-brown to buff, iris brown, small patch of skin below eye yellow, bill brownish or with hint of blue, base of lower mandible and gape yellow. **Voice.** Song a repeated, plaintive, drawn-out piping, e.g. “te-titee-tee-tee” or “titi-te-te”, often of 4–7 (but up to 11) notes, given in display-flight and when perched (possibly more piercing in flights, more plaintive when perched); sings much on arrival in breeding area, largely silent after breeding starts. Female sings from a shrub in response to male's aerial song. Reported as giving single weak piping note.

Habitat. Mainly arid and semi-arid shrublands, often including or dominated by *Eremophila* and *Grevillea*, and with or without sparse overstorey of *Eucalyptus* trees; less often in mulga (*Acacia aneura*) shrublands or woodlands. Occasionally in spinifex (*Triodia*) hummock grassland with scattered shrubs and casuarina trees, or in chenopod shrublands. On inland plains, sandhills, ranges and rocky outcrops; occasionally in coastal regions in W Australia.

Food and Feeding. Mainly nectar, also small arthropods (insects), occasionally fruit and seeds. Forages mainly among foliage and flowers of trees and shrubs, occasionally by sallying; once seen to forage on ground. Forages at flowers, particularly of *Eremophila* and *Eucalyptus*, also other species such as *Grevillea* and *Hakea*; eat fruits of mistletoes (Loranthaceae) and *Rhagodia*. Usually singly, in twos (probably pairs), or in small groups of 6–8 individuals, but gathers in larger numbers in flowering trees or shrubs, e.g. up to 100 feeding on flowering *Grevillea*. Often associates with other species, especially with *Sugomel nigrum* and woodswallows (*Artamus*), and seen in mixed feeding flocks with *Sugomel nigrum* and *Purnella albifrons*.

Breeding. Usually breeds in austral winter–spring, also at other times if conditions suitable; eggs recorded Jul–Nov (once late Jun in W Australia and early Feb in Northern Territory) and nestlings and fledglings late Jul to Oct; unspecified breeding reported Jun–Mar, mainly Aug–Sept. Both sexes collect material and build nest, a shallow cup made of small sticks, grass, plant stalks, rootlets and spider web, lined with similar but finer material as well as woolly seedheads, flowers, wool and feathers, and plant down (sometimes thin-walled and unlined), external diameter 7.6–14 cm, depth 4.7–5.7 cm, internal diameter 4.4–6 cm, depth 2.5–5.1 cm; usually suspended by rim from horizontal or vertical fork low down in live or dead shrub or small tree, up to 4.6 m above ground (21 nests 0.6–2.4 m up, mean 1.28 m). Clutch usually 3 eggs, less frequently 2, occasionally 1, mean throughout range 2.38 (mean in W of range 2.62), once 4 eggs but not known if all laid by same female; incubation by both sexes, period no more than 14 days at one nest; chicks fed by both sexes (male more than female at one nest), nestling period once 12 or 13 days, and a chick 11–12 days old left nest when nest approached; fledglings fed by parents, but roles of sexes not known; both adults perform distraction displays if nest or fledglings threatened.

Movements. Largely erratic, with no obvious pattern in most areas. Occurrence often correlated with flowering of foodplants (especially *Eremophila*) or, in parts of W, reported from some sites only after recent rains; at Broome, in coastal NW, tends to occur only during extended dry periods elsewhere. Occasional irruptions, e.g. large numbers (including flocks of more than 30 individuals) in SW New South Wales Sept–Nov 1995, and large numbers observed SW New South Wales and NW Victoria Sept 1999–Feb 2000. Irregular at or beyond edge of normal range. Resident in L. Frome area of South Australia.

Status and Conservation. Not globally threatened. Locally common. Regarded as “vulnerable” in New South Wales, where considered an ecological specialist with small population. No estimates of global abundance; recorded densities of 0.19–0.72 birds/ha. While broad distribution well known, details of use of its range over time, and movements within that range, poorly known and warrant study.

Bibliography. Barrett *et al.* (2003), Black & Badman (1986), Blakers *et al.* (1984), Brooker & Estberg (1976), Burbidge & Fuller (2007), Burgess (1947a, 1947b), Campbell (1900), Carter (1902, 1903), Chenery (1924), Cody (1991b), Collins (1995), Cooney *et al.* (2006), Davies *et al.* (1988), Ford (1974, 1987c), Gannon (1962), Gibson (1986), Griffiths & Clarke (2002), Higgins *et al.* (2001), Hobbs (1961, 1967), Howard (1983), Johnstone & Storr (2004), Johnstone *et al.* (1979), Keast (1968a), Le Souëf (1903), Lunney *et al.* (2000), MacGillivray (1910a, 1924), Mack (1970), Mathews (1924b), McGilp (1923, 1932, 1949), Morgan *et al.* (1926), North (1906), Pianka & Pianka (1970), Robinson *et al.* (1992), Saunders & Ingram (1995), Schmidt (1978), Schrader (1981), Sedgwick (1952), Serventy & Whittell (1976), Start & Fuller (1983), Storr (1977, 1984), White (1916), Whitlock (1910), Whittell (1951).



Genus *PROSTHEMADERA* G. R. Gray, 1840

7. Tui

Prosthemadera novaeseelandiae

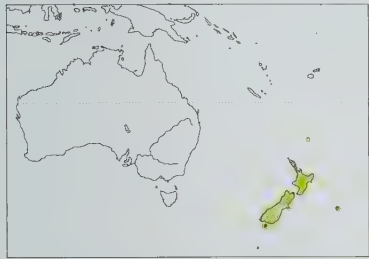
French: Méléphage tui **German:** Tui **Spanish:** Mielero Tui
Other common names: Chatham Island Tui

Taxonomy. *Merops novaeSeelandiae* J. F. Gmelin, 1788, Nova Seelandia = Queen Charlotte Sound, South Island, New Zealand. Described race *kermadecensis* (from Kermadec Is) considered inseparable from nominate. Two subspecies recognized.

Subspecies and Distribution.

P. n. novaeseelandiae (J. F. Gmelin, 1788) – Kermadec Is (Raoul I); New Zealand and many inshore islands, including (around North I) Hen and Chickens Group, Mokohinau Group, Great Barrier, Little Barrier, Noises and Tiritiri Matanga and Kapiti I and (around Stewart I) Ruapuke I and Muttonbird Group.

P. n. chathamensis E. J. O. Hartert, 1928 – Chatham Is (Pitt, Mangere, Rangatira).



Descriptive notes. 27–32 cm; male 62–150 g and female 58–105 g (nominate), male 89–240 g and female 89–170 g (*chathamensis*). Large honeyeater with sturdy, slightly decurved bill. Male nominate race is mostly glossy black to black-brown, with strong iridescence on head, neck, upperparts and breast and upper belly (which appear iridescent dark blue, green-violet or even golden, colour varying with light), and with conspicuous pair of white ball-like tufts on side of throat (usually appear as single tuft) and white lacy hindneck-collar extending to side of neck and upper mantle; bold white patch on leading edge of inner wing; lower belly, thighs

and vent black-brown, often with yellowish-brown wash (but no iridescence) on lower belly and vent, flanks dark grey, undertail-coverts iridescent dark green to dark blue, undertail black, underwing blackish with slight dark green to dark blue iridescence on leading edge; iris black-brown; bill black or black-brown; legs black to grey-black. Sexes alike in plumage, male larger than female. Juvenile is much duller than adult, mostly black-brown to grey-black, with greyish throat, often pale patch where white throat-tufts present in adult, frequently faint dark green to dark blue iridescence on scapulars and upperpart-coverts and fine pale streaking on head to upperbody and breast, gape yellowish and swollen (up to c. 5 weeks of age). Race *chathamensis* is larger and heavier than nominate, otherwise separable (in direct comparison) by slightly bluer iridescence overall (never any straw-yellow sheen).

VOICE. Both sexes utter loud, complex and highly varied songs, including rich, liquid warbling notes, bell-like “bong” sounds, chimes, cries, gurgles, whistles, coughs and wheezes. Also soft whisper-song, interspersed with normal song. Duets, in unison or alternating; song conveys individual, group and locality information, varies temporally and geographically. Some notes indistinguishable from those of *Anthornis melanura*. Alarm and distress calls vary, include petulant whine, high-pitched plaintive “ke-e-e-e”, loud piercing shriek, and scolds and guttural squawks. Male gives high-pitched call during pre-copulatory display. Mimics (often with embellishments) almost every bird species with which in contact. Loud whirring “whurrup” wing noise in flight appears to be produced by slots in wing formed by notch in primary P8 (larger in males than in females, lacking in juveniles and immatures); heard during aerial chases and displays. Clicks bill during chases and distraction displays.

Habitat. Mainly mixed, often dense podocarp–broadleaf, podocarp–broadleaf–beech or podocarp–beech forest, often with tall emergents and sometimes with dense understorey, in large tracts and in remnant patches. Also mixed beech forest, though only occasionally in forest dominated by single species of beech; tall kanuka (*Kunzea ericoides*) forest with dense secondary cover; and coastal shrubland and manuka (*Leptospermum scoparium*) scrub; sometimes in rainforest. Often in urban parks and gardens, especially in N of North I, and sometimes in orchards. Occasionally in regrowth forest, and in remnant patches of native vegetation; widely in non-native vegetation, including areas planted with such exotics as privet (*Ligustrum*), oaks (*Quercus*), willows (*Salix*) and eucalypts (*Eucalyptus*). Once in mangroves. On Pitt and Rangatira I (race *chathamensis*) in all habitat types except paddocks, including mixed broadleaf forest. Mostly at lower altitudes, but recorded to nearly 1500 m.

Food and Feeding. Mainly nectar or honeydew, also invertebrates (mainly insects) and fruit seasonally; occasionally seeds and pollen. On Tiritiri Matangi I, nectar major component throughout year, and proportion of arthropods highest summer–autumn and that of fruit highest during autumn; in spring and autumn males took more nectar and females more arthropods, although both foraged in same patches. Honeydew a major food source in most South I forests. On Rangatira I, nectar from New Zealand flax (*Phormium tenax*) was most important food for breeding birds. Forages mostly in canopy and subcanopy, less often in understorey, only occasionally on ground or aerially. Takes nectar by probing flowers, sometimes while hanging upside-down; perches above kowhai (*Sophora microphylla*) flowers and lifts each one by probing deep into it with bill; not seen to probe pendant flowers. Insects usually gleaned, or caught in aerial sallying. When foraging on honeydew, hops up tree trunks, often spiralling. Forages singly or in pairs, sometimes in small family groups; occasionally congregates at abundant sources of food, e.g. flocks of up to c. 200 individuals on Kapiti I. Defends feeding territories.

Breeding. Season spring–summer, onset of breeding likely influenced by flowering of nectar-producing plants, e.g. on Tiritiri Matangi I building coincided with start of nectar production by New Zealand flax and rewarewa (*Knightsia excelsa*); in North I eggs Oct to mid-Jan and nestlings Dec–Jan, with unspecified breeding and records of fledglings Aug–May, and in Kermadec Is eggs late Sept and nestlings Nov, with unspecified breeding or fledglings Sept–Nov; in Chatham Is eggs mid-Nov to early Dec, nestlings late Nov to late Dec and fledglings late Dec to late Jan; sometimes two broods in a season. Both sexes involved in nest-building, but most (sometimes all) work by female; nest a large, untidy shallow cup of twigs, leaves, plant stems, grass and rootlets, sometimes with moss or other soft material, lined with finer twigs, grass, roots, ferns, lichen, sometimes with feathers, external diameter 17.8–30 cm, depth 7.6–30 cm, internal diameter 6–11.4 cm, depth 5.1–7.6 cm; placed 1.5–24.4 m (nominate race) or 1.5–6 m (*chathamensis*) above ground, usually in sheltered site in fork in shrub,

atop sapling, in crotch of branch and main stem in small tree, or in fork near end of branch in canopy of larger tree. Clutch 2–4 eggs, rarely 5; incubation by female, from last egg, period 12–15 days; chicks brooded by female, both sexes feed nestlings but most work done by female, and she is occasionally fed at nest by male; nestling period varies greatly, 11–23 days (mean c. 14–15 days); fledglings fed by both sexes, sometimes by male alone if female lays second clutch, for several weeks, but usually independent 8–14 days after leaving nest. Success variable; for 41 family groups of race *chathamensis* mean minimum number of fledglings per group 2.25.

Movements. Apparently resident, but described also as partly migratory; movements possibly largely local. Seasonal changes at many sites, e.g. movement into some urban areas in winter, and dispersal from other sites during summer. In Chatham Is, most of those breeding Rangatira I winter on nearby Pitt I; often move between Rangatira and Pitt during spring before breeding, and males and non-breeders continue to do so through summer. Leaves Tiritiri Matangi I after breeding; some return briefly during winter whereas others do not, and many return to same home range in each breeding season. Local movements on some islands, e.g. gathers at flowering pohutukawa (*Metrosideros excelsa*) around coast of Little Barrier I during summer.

Status and Conservation. Not globally threatened. Widespread on North I, in N & W of South I and on Stewart I; more scattered elsewhere in New Zealand. Abundant in Kermadec Is (Raoul I). Fairly common in Chatham Is; adult population on Rangatira I in 1998–1999 estimated at 278 individuals. Nominative race recorded Auckland Is in 1972–1973, but not found on main island in Dec 1976; single immature seen Snares Is in 1961. Declined throughout New Zealand in 19th century, and numbers in Kermadecs fell soon after human settlement; formerly widespread on major islands of Chathams, but uncommon on main Chatham I and Pitt I by 1970s, and last seen on Chatham in mid-1990s. Declines probably result of clearing of lowland forest and, on Chatham I, clearance of coastal vegetation for agriculture, but possibly due also to persecution and hunting. Has adapted to foraging in exotic nectar-bearing plants. Introduced predators, e.g. stoats (*Mustela erminea*), cats, possibly rats (*Rattus*), can be a problem; several other introduced species, especially Common Myna (*Acridotheres tristis*), sometimes compete for food, displacing present species, and other possible competitors include Common Blackbird (*Turdus merula*), Common Starling (*Sturnus vulgaris*), Eastern Rosella (*Platycercus eximius*) and Common Chaffinch (*Fringilla coelebs*). Formerly hunted for food, and skins illegally exported for ornamentation. Often kept as pets by early settlers, and sometimes by Maori, and captives much prized for their mimicry; taken to Australia as cagebirds.

Bibliography. Andersen (1909, 1910, 1912, 1926), Baker (1992), Bartle & Paulin (1986), Bell, B.D. (1975), Bergquist (1985a, 1985b, 1986, 1987), Bergquist & Craig (1988), Blackburn (1963, 1967), Bull (1958), Bull *et al.* (1985), Buller (1888), Butler & Merton (1992), Castro & Robertson (1997), Challies (1966), Clout & Gaze (1984), Craig (1984, 1985), Craig & Douglas (1984b), Craig, Douglas *et al.* (1981), Craig, Stewart & Douglas (1981), Daniel (1982), Dawson (1964), Dawson *et al.* (1978), Dilks (2004), East & Williams (1984), Edgar (1978), Falla *et al.* (1981), Fitzgerald *et al.* (1989), Franklin & Wilson (2003), Freeman (1994), Gaze & Clout (1983), Gaze & Fitzgerald (1982), Gibb (2000a, 2000b), Gill (1989), Gill & Veitch (1990), Gravatt (1969, 1970, 1971), Guest & Guest (1993), Heather & Robertson (1997), Iredale (1910), Kikkawa (1964), Ladley & Kelly (1995, 1996), McCann (1952), McEwan (1977), McKenzie (1979), McKinlay (2001), McLean, I.G. *et al.* (1987), McLean, J.C. (1912), Medway (1976), Merton (1966, 1970), Merton & Bell (1975), Moffatt & Minot (1994), Moncreiff (1928), Murray (1947), Nilsson *et al.* (1994), Norton (1980, 1982), O'Donnell & Dilks (1993, 1994), Oliver (1955), Onley (1980, 1983), Owen & Sell (1985), Rasch (1985), Robertson, C.J.R. (1985, 1996), Robertson, C.J.R. *et al.* (2007), Smith & Westbrooke (2004), St Paul, R. & McKenzie (1975), Stewart (1980), Tennyson & Millener (1994), Turbott (1967), Turbott & Buddle (1948), Veitch (2003), Veitch *et al.* (2004), Ward (1969), Warham (1967), Wilkinson & Wilkinson (1952), Wilson *et al.* (1988).

Genus *ANTHORNIS* G. R. Gray, 1840

8. New Zealand Bellbird

Anthornis melanura

French: Méléphage carillonneur **German:** Maori-Glockenhonigfresser **Spanish:** Mielero Maori
Other common names: The Bellbird, New Zealand Bell; Three Kings Bellbird (*obscura*); Chatham (Island) Bellbird (*melanocephala*)

Taxonomy. *Certhia melanura* Sparman, 1786, Promontorium Bonae Spei (= foothills Cape of Good Hope); error = Queen Charlotte Sound, New Zealand.

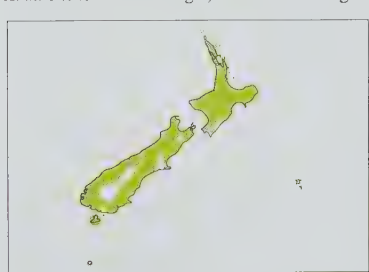
Distinctive Chatham Is race *melanocephala* (large, dark, yellow-eyed), sometimes treated as a separate species, is extinct. Nominative race exhibits slight clinal variation, becoming darker from N to S. Proposed races *dumerilii* (from Bay of Islands, on North I, in New Zealand) and *incoronata* (Auckland Is) considered inseparable from nominate. Three extant subspecies recognized.

Subspecies and Distribution.

A. m. melanura (Sparman, 1786) – New Zealand, including many offshore islands; Auckland Is.

A. m. obscura Falla, 1948 – Three Kings Is, NW of N North I (New Zealand).

A. m. oneho Bartle & Sagar, 1987 – Poor Knights Is, E of N North I.



Descriptive notes. 17–20 cm; male c. 31 g, female c. 24 g. Medium-sized honeyeater with rather long tail fairly narrow at base and flaring widely and deeply notched at tip. Male nominate race is olive-green above and below, slightly darker and with iridescent purple sheen on head and neck, black loreal area; upperpart black-brown with narrow iridescent blue-black edges, upperwing-coverts dark olive-green, remiges black with bluish sheen; pale yellow patch on anterior flanks, grey thighs, pale yellow to off-white vent and undertail-coverts; undertail dark brown; underwing brownish-grey with dark olive leading edge, pale yellow wash on

secondary coverts; iris red; bill black; legs blue-grey. Female is slightly smaller than male, dark olive-brown above and slightly paler below, with weak blue sheen on head and neck (strongest on forehead

On following pages: 9. Orange-cheeked Honeyeater (*Oreornis chrysogenys*); 10. Guadalcanal Honeyeater (*Guadalcanaria inexpectata*); 11. Lewin's Honeyeater (*Meliphaga lewinii*); 12. Yellow-spotted Honeyeater (*Meliphaga notata*); 13. Puff-backed Honeyeater (*Meliphaga aruensis*); 14. Hill-forest Honeyeater (*Meliphaga orientalis*); 15. Mimic Honeyeater (*Meliphaga analoga*); 16. Scrub Honeyeater (*Meliphaga albonotata*); 17. Tagula Honeyeater (*Meliphaga vicina*); 18. Graceful Honeyeater (*Meliphaga gracilis*); 19. Elegant Honeyeater (*Meliphaga cinereifrons*); 20. Spot-breasted Honeyeater (*Meliphaga mimikae*); 21. Forest Honeyeater (*Meliphaga montana*); 22. Yellow-gaped Honeyeater (*Meliphaga flavivictus*).

and crown), uppertail dark brown with olive edges (no iridescence), upperwing as male but all feathers browner and edges of remiges olive, lacking iridescence; thin white moustachial stripe; chin buffish, very pale yellow patch on fore flanks (less prominent than on male), pale olive to off-white vent and undertail-coverts; undertail brownish-grey, underwing much as male; bare parts as male. Juvenile male is duller and greyer than adult, dark grey above and grey below, with olive tinge on head, neck, breast and belly, black lores, short pale yellow moustachial stripe, off-white to pale grey-brown vent and undertail-coverts, no pale patch on flanks, uppertail black-brown with little or no iridescence, upperwing-coverts olive-brown, remiges with little or no iridescence, iris brown, gape yellowish for at least 14 days after fledging; juvenile female like juvenile male but slightly paler and greyer, with brown lores, and uppertail and upperwing as adult female. Race *oneho* is slightly larger than nominate, male has iridescence on head violet-blue, female head sheen greenish-blue; *obscura* is larger than nominate, also slightly darker and less yellow overall, male head sheen violet, female slightly paler underparts. VOICE. Notes simple, like sound of distant bell. Sings all year, less in winter. Song of male fuller and louder, distinguishable in field. Dawn song of 2–6 pure bell-like notes, occasionally interspersed with quieter notes, repeated monotonously for 10–40 minutes throughout day, more so at dawn. Full song includes bell-like notes as well as “chonk”, “clonk” and harsh “jarr” sounds, and quiet notes. Quiet song (whisper-song) audible only to 10 m, of quiet and mellow high-pitched notes, occasionally broadening to bell-like sound, interspersed with “tlank” or “kwak”. Female song of 7–15 fairly pure notes, preceded by tittering phrase. Birds may sing in perfect unison, and partners duet; both members of pair countering with neighbours. Appears to mimic *Prothemadera novaeseelandiae* to some extent. Alarm call of staccato notes or repeated scolding “tink-tink-tink” or chattering; other calls include continuous whistling, also squeaks, and plaintive cry. Loud wing noises in flight.

Habitat. Dense native forest with diverse and dense understorey of shrubs and young canopy trees. Mainly lowland mixed podocarp–hardwood forests, e.g. northern rata (*Metrosideros robusta*) forest, especially dense and diverse stands; often in coastal broadleaf forest, e.g. pohutukawa (*Metrosideros excelsa*) forest; also in mixed beech forests, including at high altitudes, e.g. low forests of bog pine (*Halocarpus bidwillii*), yellow-silver pine (*Lepidothamnus intermedius*) and mountain beech (*Nothofagus solandri*). Persists in small remnants of native forest. In South I, found mainly in coastal forest dominated by rimu (*Dacrydium cupressinum*), northern rata and kamahi (*Weinmannia racemosa*) with closed canopy, abundant epiphytes and dense shrub layer; least often in areas of regenerating forest. Also occupies subalpine shrub and scrub above tree-line; also flax (*Phormium*) and tall grass such as *Festuca arundinacea* near swamps. Common in some urban areas, including parks, gardens and golf courses, and in farmland and orchards. Sometimes in exotic plantations of *Eucalyptus*, *Acacia*, *Pinus* or *Salix*. From coast to at least 1220 m.

Food and Feeding. Mainly nectar, fruit, insects; also insect products, e.g. honeydew from kamahi and southern rata (*Metrosideros umbellata*). Nectar taken throughout year, forming high proportion of diet in spring–summer; insects also all year, forming high proportion in autumn–winter; fruit mainly summer–winter; honeydew in most months, but often only small proportion of diet, though a major food item in much of South I forests. Fruit usually eaten whole, though sometimes squashed to extract juice. Forages at all levels, from upper canopy to ground; among flowers and foliage, on twigs, bark of branches and trunks, in holes and fissures, and on ground. Foraged more on ground in introduced *Pinus* forest than in native forest. Nectar taken by probing flowers; often grasps stems with feet, and hangs while probing. Insects and honeydew usually gleaned from leaves or bark, but also probes crevices in bark, and gleans on ground; also picks insects from substrate by sally-striking and sally-hovering. Forages alone during breeding; at other times usually solitary and, although several may forage in one tree, each defends its own territory within tree. On Tiritiri Matangi I, access to food determined by social hierarchy, with males dominant over females. Often in mixed-species flocks, and often associates with *Prothemadera novaeseelandiae* and Stitchbirds (*Notiomystis cincta*); on Little Barrier I, females join mixed flocks of insectivores.

Breeding. Mainly Sept–Jan, but nestlings as late as early May and fledglings early Apr, sometimes two broods in season or may lay replacement clutch after failure; in Poor Knights Is (race *oneho*) breeds Sept–Dec (peak laying mid-Oct to mid-Nov), and in Three Kings Is (*obscura*) probably similar, with breeding finished by Dec. Female collects material and builds nest, an untidy outer cup of twigs, leaves, rootlets, grass and moss, inner cup of finer grass, moss and tree-fern scales, lining of feathers or moss, diameter c. 15 cm, placed on or close to ground or to 16 m above it (on Poor Knights Is 21–4% of nests on ground), well concealed and sheltered among foliage of tree or dense shrub or creepers, occasionally in crevice in rock, or against trunk or in hole or notch in trunk. Clutch usually 3 eggs, sometimes 4, rarely 5 (mean in Poor Knights Is 2.87, on Tiritiri 3.6); incubation from completion of clutch, by female, fed on nest by male, period 13–15.5 days; chicks brooded by female, fed by both sexes about equally for first 12 days, much more by female thereafter, nestling period c. 14–19 days; fledglings fed by both sexes, for at least 7 days and up to several weeks (e.g. still fed occasionally after 16–17 days), but begin to forage for themselves 3 days after leaving nest. Nests possibly parasitized by Long-tailed Koel (*Eudynamis taitensis*).

Movements. Resident in most of range. Some apparent movements in North I and South I, with seasonal occurrence or increase in lowlands, coast and urban areas in winter; e.g. Buller Valley (South I) may be wintering site for birds from higher altitudes in Ohikanui Valley. Some changes in numbers may be result of juvenile dispersal (e.g. in Dunedin). Claimed that males more mobile than females, but in Poor Knights Is males defend territories all year and females non-territorial after breeding; both sexes move locally to utilize food or water sources. Occasionally visits offshore islands, and scattered records in N North I possibly vagrants.

Status and Conservation. Not globally threatened. Locally common. Widespread New Zealand, including many offshore islands, e.g. Hen and Chickens, Little Barrier and Tiritiri Matangi, and (off Stewart I) Ruapeke, Muttonbird, Codfish, Solander and Little Solander; generally absent from far N (Northland, Auckland and N Waikato regions) despite presence on nearby offshore islands, and in South I largely absent W of Inland Kaikoura Range, lowlands of Canterbury and C Otago. Widespread Auckland Is. Reported Snares I in 1888, but no records since. Formerly occurred throughout Chatham Is, but last recorded in 1906, on Little Mangere I; extinction possibly result of clearing and degradation of forests. Densities on islands can be high, e.g. 16 birds/ha on Three Kings Is and c. 71 birds/ha on Poor Knights Is; 7.41 birds/ha on Cuvier I, with estimated total population c. 600 individuals. Declined rapidly in N North I and on several nearby large islands after c. 1860, and probably locally extinct by 1866, with some declines elsewhere in North I; in South I, declined in Canterbury in late 19th century but began to recover after 1910. Declines possibly due to disease or spread of rats (*Rattus*). Main ongoing threats are logging of native forest and clearance of remnant native vegetation on farms; also degradation of native forests by common brush-tailed possums (*Trichosurus vulpecula*), which destroy emergent rata trees. Several unsuccessful attempts to reintroduce this meliphagid in parts of former range: 22 birds captured Tiritiri Matangi I and Cuvier I and released E Whangaparaoa Peninsula in 1983, and species still present in 1995; failed releases on Waiheke I, near Auckland, in 1988–1991. Recently reintroduced around Wellington city, although appears also to have re-established populations independently, following effective control of possums and rats. Formerly hunted by Maori.

Bibliography. Andersen (1910, 1918, 1926), Anderson & Craig (2003), Anon. (1990), Baker (1992), Bartle & Paulin (1986), Bartle & Sagar (1987), Bull *et al.* (1985), Castro & Robertson (1997), Clout & Gaze (1984), Craig (1984, 1985), Craig & Douglas (1984a, 1984b), Craig, Douglas *et al.* (1981), Craig, Stewart & Douglas (1981), Cunningham (1966), Dawson *et al.* (1978), East & Williams (1984), Falla *et al.* (1981), Fegley (1988), Fegley & McLean (1987),

Fitzgerald *et al.* (1989), Franklin & Wilson (2003), Gaze (1984), Gaze & Clout (1983), Gaze & Fitzgerald (1982), Gill (1983), Gill & Veitch (1990), Gravatt (1969, 1970, 1971), Guest & Guest (1987), Hailman & Hailman (1991), Heather & Robertson (1997), Higgins *et al.* (2001), Kikkawa (1966), Lee (2005), Lovegrove (1975), Marples (1944b), McKinlay (2001), McLean *et al.* (1987), Merton (1966), Miskelly *et al.* (2005), Moffatt & Minot (1994), Murphy & Kelly (2001), O'Donnell & Dilks (1994), Oliver (1955), Onley (1980, 1983), Pierce (1980), Robertson (1985), Robertson *et al.* (2007), Sagar (1985), Scofield *et al.* (2005), Sparrow (1982), St Paul & McKenzie (1975), Stead (1932), Steer & van Horik (2006), Tennyson & Millener (1994), Wilkinson & Wilkinson (1952), Wilson *et al.* (1988).

Genus *OREORNIS* van Oort, 1910

9. Orange-cheeked Honeyeater

Oreornis chrysogenys

French: Méléphage des Maoke

Spanish: Mielero Carinaranja

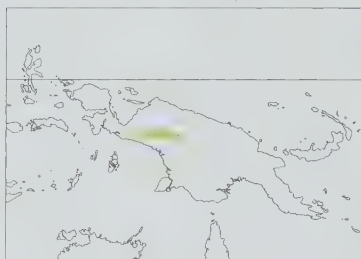
German: Goldwangen-Honigfresser

Other common names: Small Mountain Honeyeater

Taxonomy. *Oreornis chrysogenys* van Oort, 1910, Oranje Mountains (4150 m), New Guinea.

Sometimes placed in genus *Lichenostomus* or *Meliphaga*. Monotypic.

Distribution. Upper slopes of Snow Mts and Oranje Mts (including Mt Carstensz and Mt Wilhelmia), in W New Guinea.



Descriptive notes. 24–26 cm; one male 77 g, one female 62 g. Has head and neck dark olive to olive-grey with dark brown to blackish mottling on top, black fore supercilium and lores enclosing small patch of silvery grey in front of eye, short narrow black streak behind eye, conspicuous golden-yellow to orange-yellow cheek patch extending from beneath eye to rear ear-coverts, finely edged below by diffuse blackish malar area and fine blackish line beneath and behind rear of patch (partly divided by notch of black extending down from eyestripe); silvery grey chin washed olive; upperparts dark olive to olive-grey, paler and greyer on rump and paler olive on uppertail-coverts, diffuse dusky mottling on mantle and back; greater upperwing-coverts dusky, dark yellow-olive outer edges and tips of outer coverts, remiges blackish-brown with conspicuous yellow-olive outer edges (forming largely olive lower wing, contrastingly paler than upperparts); uppertail brownish-olive with dark olive centre, yellow-olive outer edges of rectrices; underbody greyish-olive, paler than upperparts, grading to pale olive-grey on flanks, belly and vent, faintly mottled or streaked slightly darker on throat, breast and fore flanks; undertail-coverts buff with olive wash, thighs yellowish-olive, undertail olive-grey; underwing pale buff, chestnut-orange patch at angle of wing and dark trailing edge and tip; iris red-brown to dark brown or grey-brown; bill black, fine and indistinct yellow gape-line; legs yellow. Sexes alike in plumage, male larger than female. Juvenile undescribed. VOICE. Calls include single bubbling note that rises in pitch, and wheezy downslurred “nnyau”.

Habitat. Subalpine forest and shrubland bordering alpine grassland, and commonly in ecotone between these, also patches of these habitats within grassland. In Mt Carstensz Range, one seen on ground in wet swamp-meadow dominated by tussock grasses and sedge at edge of subalpine forest of *Dacrycarpus compactus*, *Rapanea* and other low moss-covered trees. Recorded at 3225–4000 m, mainly above 3250 m; occasionally as low as 2450 m.

Food and Feeding. Takes fruit, arthropods (insects), and seeds of sedges. Often forages in low shrubland or thickets away from closed forest, and on ground in wet tussock grassland–sedgeland.

Breeding. Poorly known. Male in breeding condition and nest with egg in Aug. Single nest found, a basin-like cup, loosely made outer layer mainly of coarse moss and lichens, firm inner layer mainly of grass stems and some fern stems, thick lining of scales and plant down from fronds of tree-ferns and a few feathers, external diameter 20 cm, depth 11 cm, internal diameter 9.5 cm, depth 5 cm, supported on bases of several fronds of tree-fern 1.5 m above ground in scattered clump in alpine grassland (c. 150 m from forest); contained 1 egg (not certainly known to be complete clutch). No other information.

Movements. Probably sedentary.

Status and Conservation. Not globally threatened. Restricted-range species: present in Central Papuan Mountains EBA. Very poorly known, and no estimates of global population. Described as fairly common at high altitudes.

Bibliography. Beehler *et al.* (1986), Coates (1990), Coates & Peckover (2001), Eastwood (1996a), Rand (1942b), Ripley (1964), Schodde *et al.* (1975), Schönwetter & Meise (1981), Temple (1969).

Genus *GUADALCANARIA* E. J. O. Hartert, 1929

10. Guadalcanal Honeyeater

Guadalcanaria inexpectata

French: Méléphage de Guadalcanal

Spanish: Mielero de Guadalcanal

German: Guadalcanalhonigfresser

Taxonomy. *Guadalcanaria inexpectata* E. J. O. Hartert, 1929, Guadalcanal, Solomon Islands.

Relationships uncertain. Has in the past been placed variously in *Meliphaga* and in *Lichenostomus*, and may belong within *Meliphaga*; sometimes considered close to *Glycifolia*. Retained in present monotypic genus pending resolution of relationships. Monotypic.

Distribution. Guadalcanal, in SE Solomon Is.

Descriptive notes. 18–20 cm; male 41.5–48.5 g, female 37.5–44.5 g. Plumage is slate-grey above, tinged brown on rump and uppertail-coverts, with dark grey lores, silvery grey ear-coverts, conspicuous bright yellow plumes extending from rear malar area and broadening at side of throat; tail brownish-grey with broad yellowish-olive feather edges; upperwing slate-grey, prominent broad yellowish-olive outer edges and tips of remiges and coverts (folded wing largely yellowish-olive);



chin and throat off-white, merging to pale grey on breast, prominent dark grey streaking on lower throat and breast; rest of underbody grey, brownish tinge on vent and undertail-coverts, faint diffuse streaking or mottling; underwing-coverts brownish-grey, diffusely barred darker; iris light to dark brown, sometimes reddish-brown; bill black; legs bluish-grey. Sexes alike in plumage, male noticeably larger and with broader rectrices than female. Juvenile is similar to adult, but throat-tufts paler yellow, streaking below less distinct, iris dark grey-brown, legs tinged brown. VOICE. Usually quiet. Call a loud musical “per-twee per-twee”; once heard to utter single croaky but sonorous “techook” in flight.

Habitat. Montane forest, particularly high moss forest; 950–1565 m, mainly above 1450 m.

Food and Feeding. Diet includes small to medium-sized soft-bodied insects (maximum size noted 17 mm); almost certainly takes nectar, as seen to feed at flowers of trees and epiphytes. Singles and pairs forage unobtrusively in canopy; agile, and can be conspicuous, but usually wary and retiring.

Breeding. No information.

Movements. No information; probably sedentary.

Status and Conservation. Not globally threatened. Restricted-range species: present in Solomon Group EBA. Moderately common to common; fairly common at 1450–1565 m in mountains S of Betilonga. **Bibliography.** Cain & Galbraith (1956), Doughty *et al.* (1999), Dutton (2007a), Galbraith & Galbraith (1962), Gibbs (1996b), Hartert (1929), Mayr (1932, 1945b), Mayr & Diamond (2001), Stattersfield *et al.* (1998).

Genus *MELIPHAGA* Lewin, 1808

11. Lewin’s Honeyeater

Meliphaga lewinii

French: Méléphage de Lewin **German:** Goldohr-Honigfresser **Spanish:** Mielero de Lewin
Other common names: (Greater) Yellow-eared Honeyeater, Lewin’s Meliphaga

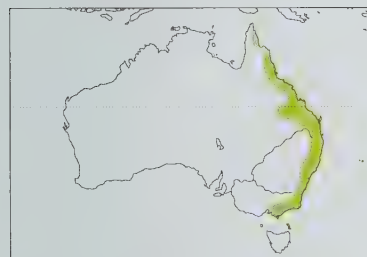
Taxonomy. *Ptilotis lewinii* Swainson, 1837, region of Port Jackson, New South Wales, Australia. Molecular evidence suggests that genus consists of two clades; present species forms a group with *M. notata* and *M. aruensis*. Proposed race *nea* (from Dandenong, in Victoria) synonymized with nominate. Three subspecies recognized.

Subspecies and Distribution.

M. l. amphochlora Schodde, 1989 – McIlwraith Range (E Cape York Peninsula), with outliers on summits S to Cooktown, in NE Queensland.

M. l. mab (Mathews, 1912) – coastal NE Queensland from Cooktown S to Dawson–Mackenzie Basin, extending inland to summits of Great Divide.

M. l. lewinii (Swainson, 1837) – coastal E & SE Australia, from Dawson–MacKenzie Basin (Dawes Range) S to Victoria (W Gippsland and Dandenong Ranges), extending inland to summits of Great Divide, with apparently isolated population farther W in North West Slopes and Plains Region of New South Wales.



Descriptive notes. 19–21.5 cm; male 27.5–49.5 g and female 27.3–41.5 g (nominate), male 28–39 g and female 29.6–36.5 g (*mab*), male 31.5 g and female 29 g (*amphochlora*). Nominat race is dark olive above, becoming dark grey on forehead, and with diffuse blackish loreal stripe, prominent yellow crescent-shaped spot on rear ear-coverts (shape varies with posture), short off-white or pale yellow gape-flange (usually paler and duller than ear-spot) joining short yellow rictal streak to form prominent narrow gape-stripe extending back to level with rear of eye; grey anterior ear-coverts continue in diffuse line through malar area (below

gape-stripe), merging into greyish-olive on chin and throat; remiges and edges of tail yellowish-olive, brighter than upperparts; underbody slightly paler than upperparts, olive-grey, with narrow dusky streaking and faint yellowish mottling, strongest on belly; undertail olive-grey, underwing brownish-grey; iris blue-grey to darker grey-brown; bill black; legs pinkish-brown, merging to dark grey on front of tarsus and top of toes. Sexes alike in plumage, male larger than female. Juvenile is very like adult, but browner above, especially forehead, plain dull yellow-olive below (without streaked and mottled appearance of adult), undertail-coverts uniformly straw-yellow, iris dark brown, bill of newly fledged bird has diffuse pale tip. Race *mab* is slightly smaller and slightly paler above than nominate, with more distinct yellow wash on belly; *amphochlora* also is slightly smaller, upperparts and underparts slightly paler, with distinct pale yellowish-olive tone. VOICE. Calls throughout day. Most common call a highly distinctive rapid rattle of staccato notes, duration e.g. 2–30 seconds or longer (typically 2–5 seconds) and e.g. c. 11 notes per second, calling can last for up to 5 minutes (once c. 10 minutes), given in variety of circumstances, including possibly in alarm or as contact. Also repeated loud harsh scolding “schwep” or loud emphatic and somewhat rasping “week” in alarm; occasionally “toc” or “chot”, repeated rather slowly and monotonously at regular intervals (c. 2–2.5 notes per second), usually for several minutes, sometimes longer.

Habitat. Mainly rainforests and wet sclerophyll forests, also dense vegetation at edge of rainforest and in secondary growth. Common also in other vegetation, including tall open sclerophyll forests or woodlands with sparse, patchy or dense and continuous understorey. Often in modified habitats, such as parks and gardens in urban and semi-urban areas, especially if with remnant native vegetation. Occasionally in heathland, mangrove fringes, thickets of paperbarks (*Melaleuca*) and plantations of hoop pine (*Araucaria cunninghamii*) with *Lantana* thickets; visits orchards, particularly in autumn and winter. From coast (where generally common) to 1000 m; mainly above c. 600 m in wet tropics of NE Queensland, though small numbers move to lower altitudes in winter.

Food and Feeding. Mainly fruits, of wide variety of plants, and nectar; also insects, some spiders (Araneae) and molluscs. Forages at all levels, occasionally on ground. Searches among foliage and flowers, less often on bark and trunks. Fruit taken from trees or from ground, or sometimes snatched

in flight from tree, then carried in bill to be eaten at perch. Large soft fruits, particularly figs (*Ficus*), pecked and pierced and small pieces eaten; small fruits swallowed whole, or crushed in bill and all or part swallowed. Nectar obtained by probing flowers. Insects mainly gleaned from foliage, under loose bark and on trunks of trees, obtained also by sally-striking in air. On New England Tableland (NE New South Wales), foraging rates on both nectar and arthropods varied with availability of nectar, lowest on days when nectar availability high. Often utilizes feeding stations in gardens. Usually singly, less often in twos (probably pairs) or in small groups of 6–12 individuals. Sometimes with other birds in fruiting trees, and with other meliphagid species in flowering plants; can feed in same tree without interspecific aggression, but also defends feeding or breeding territories or both, and can be very aggressive to conspecifics and others.

Breeding. In NE of range recorded Jul–Mar, with estimated start of laying Aug–Mar, and in S (SE Queensland S to Victoria) eggs Sept–early Feb, mostly Nov–Jan; possibly double-brooded. Both sexes collect material, nest a large deep cup made of strips of bark, leaves, vine tendrils, grass and epiphytic moss, sometimes scraps of paper, plant and artificial materials, bound with spider web, usually lined with plant down and seeds, external diameter 8.9–11.4 cm, depth 6.4–7.6 cm, internal diameter 5.7–7.6 cm, depth 3.8–5.1 cm; placed 0.2–2.5 m above ground (mean of 57 nests 3.3 m), usually suspended from thin horizontal fork (attached by sides or rim to 2–3 branches or leaves), often among dense foliage in tree or tall shrub, or among vines, rarely beneath house, and often near water (may be linked with denser riparian vegetation, rather than with water itself). Clutch usually 2 eggs, once 4 (mean 2.15); up to four replacements in a season if clutch lost; no information on role of sexes in incubation, period 14–15 days; chicks fed usually by both adults, nesting period at one nest c. 15 days; fledglings fed usually by both parents for at least 1 week and up to 22 days or more after leaving nest. Nests parasitized by Fan-tailed Cuckoo (*Cacomantis flabelliformis*) and Pallid Cuckoo (*Cuculus pallidus*). From 45 eggs (22 clutches), 0.55 fledged young per nest.

Movements. Resident, with some local movements. In NE Queensland, small numbers descend to lower altitudes in winter. Local movements or fluctuations in numbers at some sites, mainly in autumn–winter, e.g. at Wollomombi (NE New South Wales) moves into eucalypt woodland from adjacent gorge in autumn and winter; in Sydney, where generally resident in wetter vegetation, sometimes moves into nearby habitats, including drier forests and woodlands and gardens, in autumn–winter. At some sites recorded only sporadically.

Status and Conservation. Not globally threatened. Uncommon to locally common. Recorded densities of 0.05–0.2 birds/ha. Race *amphochlora* has apparently small population estimated at fewer than 5000 breeding birds (but estimate of low reliability), confined to single location. Seems to have adapted well to widespread habitat clearance by incorporating exotic fruits into diet, and by occupying dense remnant or regrowth vegetation along watercourses; near Sydney, more abundant in plantations 8–12 years old and with about ten retained habitat trees per hectare than in similar plantations with no retained trees or in forest formerly selectively logged; able to live in small rainforest remnants (2.5 ha or smaller). Sometimes considered a pest in cultivated crops of soft fruits; large numbers can gather when fruit ripe, and cause much damage.

Bibliography. Barrett *et al.* (2003), Blakers *et al.* (1984), Campbell (1900), Christidis & Schodde (1993), Clancy (1982), Colston (1974), Cooney *et al.* (2006), Emison *et al.* (1987), Ford & Pursey (1982), Frith, C.B. & Frith (2005), Frith, C.B. & McGuire (1996), Frith, D.W. (1984), Gannon (1962), Garnett & Crowley (2000), Gosper, C.R. (1999), Gosper, D.G. (1992), Green (1993), Griffiths & Clarke (2002), Higgins (1999), Higgins *et al.* (2001), Howe *et al.* (1981), James (1995), Jurisevic & Sanderson (1994a), Kavanagh & Turner (1994), Keast (1985a), Kutt (1996), Laurance *et al.* (1996), Lavery *et al.* (1968), Leach (1988), Leach & Hines (1987), Leishman (1994), Longmore (1978), Loyn (1980, 1985a, 1985b, 1993, 1998), McFarland (1984b, 1986b, 1986c, 1994b, 1996), Norman *et al.* (2007), North (1907), Roberts (1993), Schodde (1989), Schodde & Mason (1999), Schönwetter & Meise (1981), Slater (1995), Smedley (1977), Smith (1984), Storr (1953, 1984), Templeton (1992), Vaughton (1990), Waterhouse (1995), Wolstenholme (1929), Wood (1995).

12. Yellow-spotted Honeyeater

Meliphaga notata

French: Méléphage marqué **German:** Torreshonigfresser **Spanish:** Mielero Marcado
Other common names: Lesser Lewin/Little Lewin Honeyeater, Yellow-spotted Meliphaga

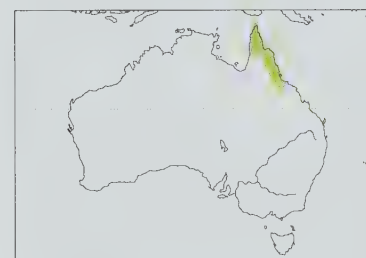
Taxonomy. *Ptilotis notata* Gould, 1867, Cape York, north Queensland, Australia.

Molecular evidence suggests that genus consists of two clades; present species forms a group with *M. lewinii* and *M. aruensis*. Races intergrade in narrow zone from Cooktown S to about Ayton. Two subspecies recognized.

Subspecies and Distribution.

M. n. notata (Gould, 1867) – islands of C & S Torres Strait; N Queensland S to Archer–Mitchell rivers and Princess Charlotte Bay, with outliers S to around Cooktown–Ayton area.

M. n. mixta (Mathews, 1912) – coastal NE Queensland from Cooktown S to Paluma Range, Townsville and Cape Cleveland, inland to Atherton Tableland; isolated population at Mt Elliot and records farther S (at Haughton R).



Descriptive notes. 16.5–20 cm; male 23.3–33.5 g and female 20.5–26.5 g (nominate), male 23–32.3 g and female 21–30 g (*mixta*). Nominat race has head and neck olive (forehead sometimes faintly darker than crown), grading to paler greyish-olive on chin and throat, with diffusely darker lores, prominent yellow spot on rear ear-coverts (rounded to diamond-shaped, but never crescentic), yellow gape-flange (usually slightly brighter than ear-spot) meeting short pale yellow rictal streak to form prominent gape-stripe; upperparts dark olive, remiges and edges of tail slightly brighter yellow-olive; olive-grey below (slightly paler than upperparts), faint and diffuse

darker streaking and faint yellowish mottling on underbody, diffuse straw-yellow patch on belly; undertail olive-grey, underwing pale grey; iris dark brown; bill black; legs dark grey, pink-brown or yellow-brown at rear tarsus, soles yellow-brown. Sexes alike in plumage, male larger than female. Juvenile apparently undescribed. Race *mixta* is very similar to nominate, but wing shorter, head, neck and most of upperparts slightly darker olive (olive of remiges contrasts less with upperparts), chin and throat duller, breast and belly darker with less distinct yellow mottling, smaller yellow suffusion on belly. VOICE. Most common call loud, petulant, high-pitched, staccato and descending, syllables slow and deliberate, earlier notes with somewhat disyllabic quality, “plisk plisk plisk twik twik...” or “ee-yeu, ee-yeu, ee-yeu, ear ear ear...”; usually 3–10 notes per call, often starting slowly and accelerating slightly. Other calls include monotonous repetition of “plick” 6–12 times at c. 2 notes per second, occasionally preceded by soft chattering “tritch tritch”; harsh scolding rasp or sharp “queak-queak-queak...” in alarm; series of loud ascending notes; repeated clear piercing whistle. Once heard to repeat “tok” slowly and monotonously at regular intervals for more than 15 minutes.

Habitat. Mainly lowland tropical rainforest, including monsoon forest and vine thickets at some sites. Also mangrove forests and woodlands, mixed woodlands and semi-deciduous dune-woodland; open eucalypt (*Eucalyptus*) forests and woodlands adjacent to rainforest, and riverine eucalypt forest with depauperate rainforest understorey; swamp-woodland of *Melaleuca*, *Eucalyptus* and *Banksia*; *Lantana* thickets, especially bordering wetlands or at edges of rainforest. On islands in Torres Strait sometimes in dense dry littoral scrub dominated by casuarina. Often in urban parks and gardens, and in orchards. Occasionally extends into semi-arid areas along rivers. Mainly lowlands and foothills below 600 m, less often in ranges and on tablelands above 600 m.

Food and Feeding. Nectar, fruit and insects. Usually forages in mid-canopy or in shrub layer, at 3–12 m. Searches at flowers and fruits of trees, vines and shrubs, and in foliage; sometimes enters sheds to feed on stored bananas. Probes flowers for nectar; gleans insects from foliage or fruits, sally-hovers to take items from foliage, and sallies for aerial prey. Usually singly, in twos (probably pairs) and occasionally in small parties. Active, aggressive and confiding.

Breeding. Season Aug–Apr. Nest a deep cup, usually of strips of bark and plant fibre and moss, sometimes covered with lichens or large pieces of *Melaleuca* bark, lined with plant down, external diameter 8.9–10.2 cm, depth 4.4–7.6 cm, internal diameter 6.4–7.6 cm, depth 3.8–5.1 cm, suspended from fork in branch 1.5–1.8 m (once 45 cm) above ground and usually well concealed among dense foliage of tree or shrub, often near water. Clutch usually 2 eggs, sometimes 3 (mean 2.04); incubation period c. 15 days, once 14 days; chicks fed by both parents, nestling period at one nest 14–15 days.

Movements. Apparently resident, with some local movements; occasionally visits top of Paluma Range, where usually at lower altitudes.

Status and Conservation. Not globally threatened. Restricted-range species: present in Cape York EBA and in Queensland Wet Tropics EBA. No estimates of abundance; seems to be fairly common. Reported sighting at Wau, in SE New Guinea, considered dubious.

Bibliography. Barrett *et al.* (2003), Beruldsen (1990), Blakers *et al.* (1984), Boles & Longmore (1989), Campbell (1900), Cassels (1961), Christidis & Schodde (1993), Colston (1974), Cooney *et al.* (2006), Crome (1978), Draffan *et al.* (1983), Forshaw & Muller (1978), Garnett & Bredl (1985), Garnett & Cox (1983), Gill, H.B. (1970), Griffin (1995), Griffiths & Clarke (2002), Higgins *et al.* (2001), Ingram (1976), James (1995), Johnson & Hooper (1973), Keast (1968a), Kikkawa (1975, 1982), Lavery (1986), Lavery *et al.* (1968), Le Souëff (1903), MacGillivray (1910b), Marshall (1933, 1934a), McLean (1995), Mosey (1956), Nielsen (1996), Norman *et al.* (2007), North (1907), Pizzey & Knight (1997), Rand (1936a), Schodde & Mason (1999), Schönwetter & Meise (1981), Stattersfield *et al.* (1998), Storr (1953, 1984).

13. Puff-backed Honeyeater

Meliphaga aruensis

French: Méléphage bouffant **German:** Aruhonigfresser **Spanish:** Mielero de las Aru
Other common names: Large-tufted Honeyeater, Puff-backed/Large-tufted Meliphaga

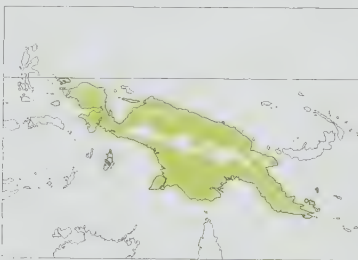
Taxonomy. *Ptilotis aruensis* Sharpe, 1884, Aru Islands.

Molecular evidence suggests genus consists of two clades; present species forms group with *M. lewinii* and *M. notata*. Population in SE New Guinea genetically distinct, and may constitute a separate species; taxon as yet undescribed. Detailed analysis of geographical variation currently in progress, to determine affinities, status and distribution of component forms; E limits of nominate race and W limits of SE form not currently known. Two subspecies currently recognized.

Subspecies and Distribution.

M. a. sharpei (Rothschild & E. J. O. Hartert, 1903) – West Papuan Is (Waigeo, Batanta, Misool), NW & N mainland New Guinea E, including Yapen I and nearby Keboi I (in Geelvink Bay), to at least Kumusi R, and D'Entrecasteaux Archipelago (including Goodenough I and Fergusson I) and Trobriand Is (including Kiriwani).

M. a. aruensis (Sharpe, 1884) – Aru Is, and SW & S New Guinea (E to about Karema and Hall Sound). Also (unnamed form, possibly a separate species) SE New Guinea, in S watershed and lowlands from about Karema and Hall Sound E to Milne Bay.



Descriptive notes. 16.5–18.5 cm; two males 27 g and 29 g and three females 23–27 g (nominate), male 22–30.5 g and female 21–31 g (*sharpei*). Large, rather thickest honeyeater with dense tuft of stiff feathers on rump. Nominative race dark olive-brown to greyish-olive above, crown deeper olive than upperparts, blackish subterminal zone on rump feathers (can appear as indistinct dusky blotching in field); blackish-olive lores, feathers around eye and diffuse streak behind eye, large lemon-yellowish ear-patch (mostly yellow ear-coverts); rich yellow or orange-yellow gape-line merging with distinct pale yellow

rietal streak, which often extends to meet pale ear-patch; upperwing-coverts and alula dark brown with olive fringes, remiges dark brown with yellow-olive outer edges and pale yellowish inner edges; tail feathers dark brown with olive outer edges; mostly grey below, pale olive-yellow tinge on chin to breast, merging into paler grey with yellowish wash on lower belly, and often with brown wash across upper breast; underwing-coverts buff-yellow; iris brown to dark brown or grey-brown; bill greyish-black to black; legs grey or brownish-grey. Sexes alike in plumage, male on average slightly larger than female. Juvenile undescribed. Race *sharpei* has much more elongated ear-patch and tends to be brighter greenish-olive above than nominate, some variation, birds from Batanta darker greyish-olive above than those from mainland, birds from Trans-Fly region have ear-patch more rounded than nominate and not connecting with rictal streak. Voice. Song a rapid low, rising and decelerating trill lasting up to 2 seconds, repeated several times, resembling call of Yellow-billed Kingfisher (*Syma torotoro*); also piping series of short, liquid, upslurred notes, “lip, lip-ki-ki-ki-ki...” (given also by congeners in New Guinea); other calls include short “chup” or “chap”, and low whistled note like call of Spot-winged Monarch (*Monarcha guttula*).

Habitat. Variety of forest habitats, including primary rainforest and low plains forest, also disturbed habitats such as forest edge, secondary forest and tall or old growth; possibly also gardens. Mainly lowlands and foothills, from sea-level to c. 1250 m, locally to 1400 m (e.g. Epe Valley); specimen record at 1580 m in Wahgi Valley, on Batanta, recorded to 450 m.

Food and Feeding. Diet includes fruit, seeds (probably ingested with fruit), and arthropods (mainly insects); probably also nectar, and known to visit inflorescences of *Poikilospermum* and *Syzgium*. Mainly in understorey, lower middle storey and subspaces of forest. Forages mainly by gleaning. Typically shy, and usually singly or in twos (probably pairs); occasionally associated with mixed-species flocks. Once caught together with both *M. gracilis* and *M. analoga* in same mist-net in Varirata National Park.

Breeding. Recorded in most months: eggs mid-Aug and Oct and nestlings mid-Oct, nests or breeding females late Jul and Aug, Oct–Jan, Mar–Apr (egg ready to be laid) and May. Nest a neat cup made of dead leaves (including bamboo), grass and grass-like stems, and fine plant fibres or flakes

of bark, woven with spider web and plant fibres, thickly lined with fine grass-like stems, fibres or rootlets, sometimes untidily covered on outside with dead leaves, one had external diameter 8 cm, depth 8 cm, internal diameter 4.5 cm, depth 4 cm; suspended by rim or edges 0.3–1.2 m above ground in horizontal fork or branches of shrub or sapling. Clutch 1–2 eggs; incubation by female only, young fed by both sexes; no information on duration of incubation and nestling periods.

Movements. Probably largely sedentary, with some local movements.

Status and Conservation. Not globally threatened. No estimates of total population; generally fairly common to common; uncommon at Crater Mt. Retiring and difficult to observe.

Bibliography. Bailey (1992), Beehler (1978a), Beehler, Pratt & Zimmerman (1986), Beehler, Sengo *et al.* (1995), Bell (1970c, 1970d, 1982a, 1982d, 1984b), Bowman *et al.* (1990), Brown & Hopkins (1996), Christidis & Schodde (1993), Coates (1990), Coates & Peckover (2001), Diamond (1972a), Finch (1980b, 1983), Fletcher (2000b), Gilliard & LeCroy (1967a, 1968), Greenway (1966), Gregory (1995b), Gregory *et al.* (1996), Gyldenstolpe (1955b), Hartert (1930), Hicks (1992), Hicks & Burrows (1992), Hoogerwerf (1971), Isles & Menkhurst (1976), LeCroy & Peckover (2000), Mack & Alonso (2000), Mack & Wright (1996), Mayr & Rand (1937), Norman *et al.* (2007), Ogilvie-Grant (1915), Palliser (1989), Pearson, D.L. (1975), Rand (1936a, 1942a, 1942b), Rand & Gilliard (1967), Richards & Suryadi (2002), Ripley (1964), Rothschild *et al.* (1932b), Rowland (1995), Schönwetter & Meise (1981), Wahlberg (1988).

14. Hill-forest Honeyeater

Meliphaga orientalis

French: Méléphage montagnard **German:** Schlankschnabel-Honigfresser **Spanish:** Mielero Montesino

Other common names: Mountain Honeyeater, Mountain Yellow-eared/Small Spotted Honeyeater, Hill-forest/Mountain (Yellow-eared) Meliphaga, Lesser/Small Spot-breasted Honeyeater/Meliphaga

Taxonomy. *Ptilotis flavirictus orientalis* A. B. Meyer, 1894, south-east New Guinea.

On basis of molecular evidence, genus consists of two clades; present species is part of group which contains also *M. analoga*, *M. albonotata*, *M. vicina*, *M. gracilis*, *M. cinereifrons*, *M. mimikae*, *M. montana*, *M. flavirictus*, *M. albilineata*, *M. fordiana* and *M. reticulata*. Race *citreola* originally considered an altitudinal variant of *M. analoga*. Racial identity of populations of Fakfak Mts, Kumawa Mts, Wandammen Mts and Foja Mts not certain; possibly all belong in *facialis*, or Foja birds possibly in *citreola*, or some or all may represent undescribed races. Also, birds of this species recorded in Adelbert Mts of uncertain racial identity, tentatively included in *becki*. Four subspecies currently recognized.

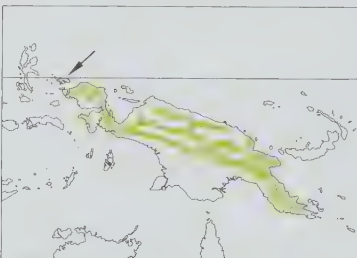
Subspecies and Distribution.

M. o. facialis Rand, 1936 – mountains of Waigeo (West Papuan Is), and of Vogelkop, Fakfak, Kumawa and Wandammen Mts and Central Range of New Guinea (from Weyland Mts and S slopes of Snow Mts) E to Okapa region of Eastern Highlands.

M. o. citreola Rand, 1941 – N slopes of Snow Mts and C North Coastal Range (Bewani Mts, Torricelli Mts and Prince Alexander Mts).

M. o. becki Rand, 1936 – Adelbert Mts and mountains from Huon Peninsula S to Wau region, in NE New Guinea.

M. o. orientalis (A. B. Meyer, 1894) – mountains of SE New Guinea E from Mambere R and, in S, from at least Angabunga R and including Aseki area (Morobe Province).



Descriptive notes. 14–16 cm; 16–20 g, male average 18.6 g and female average 17.6 g (*facialis*), male 17.5–20 g and female 14.8–20 g (*citreola*). Nominative race is dark greyish-olive above, forehead darker olive, dusky blackish-olive lores continued as dusky stripe behind eye, yellow lower ear-coverts forming small rounded patch, and orange-yellow gape merging with narrow and indistinct pale yellow rictal streak (not meeting pale ear-patch); upperwing-coverts and alula dark brown with yellowish-olive outer edges or fringes; remiges dark brown with yellowish-olive outer edges and pale-yellowish or buff-yellow inner edges; tail feathers dark

brown with yellowish-olive outer edges; greyish-olive below, diffuse pale yellow streaking on belly and lower breast, faint dusky mottling on breast and belly; underwing-coverts olive-yellow or buff-yellow; iris brown to grey; bill black; legs leaden or pale bluish. Differs from *M. mimikae* in smaller size, shorter and more slender bill, smaller ear-patch, narrower rictal streak, richer olive (less brown) upperparts, less uniform underparts (with faint dusky mottling). Sexes alike, male averages larger. Juvenile undescribed. Race *facialis* has less dusky lores and postocular area than nominate, less distinct mottling below; *becki* greener above than nominate, with more olive lores and postocular area, less distinct yellow streaking on belly, less distinct dusky mottling on underparts, and yellowish-white (less buff) underwing-coverts; *citreola* lacks obvious dusky mottling below, has stronger yellow wash on upperparts, underparts and underwing-coverts. Voice. Call notes include bright monosyllabic staccato “tup” or “tuck”, probably same as call described as nasal “chup” (more musical than corresponding call of *M. analoga*); short upwardly inflected disyllabic or upslurred note and similar but thinner and downward-inflected disyllabic call (both with more snapped quality than similar calls of *M. analoga*); and repeated querulous piping note. Call described as cheerful “cheeyur” or “weet” or “weeyurt” may or may not refer to one of preceding calls. All calls much quieter than in *M. analoga*.

Habitat. Primary forest (including *Castanopsis* oak forest), forest edge, tall secondary growth, sometimes gardens; mainly in forest interior, rarely in disturbed habitats. Mostly lower and middle mountains, from 550 m to c. 2100 m, and only member of genus common (or present) above 1400 m. Recorded at 1000–1350 m in Foja Mts, 1000–1400 m in Wandammen Mts, 900–1200 m or above in Fakfak Mts, and 800–1450 m in Kumawa Mts; in Eastern Highlands 1110–1890 m, with maximum abundance at 1350–1700 m, and altitudinal range generally above that of congeners; seen at 1000 m in Adelbert Mts (Ilebaguma and Kowat). In lower parts of range co-exists with *M. aruensis*, *M. analoga*, *M. mimikae*, *M. flavirictus* and either *M. albonotata* or *M. montana*.

Food and Feeding. Diet nectar, arthropods (mainly insects), sometimes fruit. Known to feed at inflorescences of *Schefflera* (Araliaceae). Typically forages in outer foliage of canopy; less often in lower storeys, but appears to use these more at forest edges. Active, agile. Usually singly, less often in twos (probably pairs); often feeds with other honeyeaters, at lower altitudes especially with congeners.

Breeding. One nest described, at Crater Mt in mid-May; tightly made, slightly oval cup of plant fibre, twigs and vines, covered externally with live moss and dead bamboo leaves, lined thickly with fluffy plant down, external diameter 7.5 cm, depth 7.5 cm, internal diameter 5.5 × 4.5 cm, depth 4.5 cm; contained 2 eggs, both of which hatched by 13th May, but nest empty on 19th. No other information.

Movements. Resident at Crater Mt and probably at Moroka; probably resident, with some local movements, throughout range.

Status and Conservation. Not globally threatened. Generally common at middle altitudes. No estimates of total population.

Bibliography. Beehler (1978a), Beehler *et al.* (1986), Bell (1984b), Christidis & Schodde (1993), Coates (1990), Coates & Peckover (2001), Diamond (1969, 1972a, 1985), Eastwood (1996a), Finch (1983), Gregory (1995b), Mack (1994), Mack & Alonso (2000), Mack & Wright (1996), Mackay (1991), Mayr & Rand (1937), Murray (1988b), Norman *et al.* (2007), Ogilvie-Grant (1915), Pratt (1982), Rand (1936a, 1941, 1942a, 1942b), Rand & Gilliard (1967), Schönwetter & Meise (1981), Tolhurst (1991).

15. Mimic Honeyeater

Meliphaga analoga

French: Méliphage sosie **German:** Papuahonigfresser **Spanish:** Mielero Imitador
Other common names: Mimic/Yellow-spotted Meliphaga, Mimetic/Allied/Yellow-spotted(!) Honeyeater

Taxonomy. *Ptilotis analoga* Reichenbach, 1852, “Oceanien”; error = Triton Bay, south-east New Guinea. On basis of molecular evidence, genus consists of two clades; present species is part of group which contains also *M. orientalis*, *M. albonotata*, *M. vicina*, *M. gracilis*, *M. cinereifrons*, *M. mimikae*, *M. montana*, *M. flavirictus*, *M. albilineata*, *M. fordiana* and *M. reticulata*. Name *stevensi* (from N watershed of SE New Guinea) has been used for a race variously of present species or of *M. cinereifrons*, and it is not certain at present to which (if either) the type specimen applies; recent genetically based investigations indicate that specimens attributed to *stevensi* include cryptic variants of both species; further study currently in progress. Populations in Baiyer Valley (E New Guinea) probably constitute an as yet unnamed race. Race *citireola* of *M. orientalis* originally treated as an altitudinal variant of present species. Birds from N lowlands (Wewak E to Huon Gulf) described as race *connectens* (from Madang, in Astrolabe Bay) appear indistinguishable from *flavida*; birds from Fly R district E to Hall Sound proposed as race *papuae* (Wuroi, on Oriomo R), but inseparable from nominate. Three subspecies currently recognized.

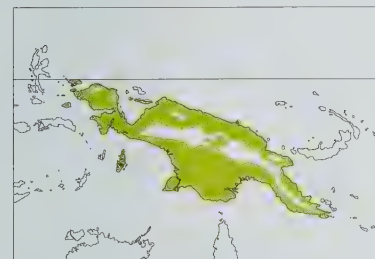
Subspecies and Distribution.

M. a. analoga (Reichenbach, 1852) – West Papuan Is (Waigeo, Batanta, Salawati, Misool) and most of mainland New Guinea.

M. a. flavida Stresemann & Paludan, 1932 – Yapen I and Meos Num (in Geelvink Bay), and N New Guinea E, including Kairiru I and Mushi I (off Wewak), to Astrolabe Bay.

M. a. longirostris (Ogilvie-Grant, 1911) – Aru Is.

Also (racially distinct, identity uncertain) N watershed of SE New Guinea.



Descriptive notes. 15.5–19.5 cm; male 18.5–30 g and female 18–24 g (nominate), male 18–28.7 g and female 17.8–26 g (*flavida*). Nominate race is generally brownish-olive above, browner on top of head, with blackish-olive lores and vaguely diffuse streak running through eye to above ear-coverts, pale yellow lower ear-coverts forming fairly large, roughly triangular patch; yellow to orange-yellow gape merges with rather narrow pale yellow rictal streak (which does not extend to meet pale ear-patch); upperwing-coverts and alula dark brown with yellowish-olive outer edges or fringes, remiges dark brown with yellowish-olive outer edges and pale yellowish

inner edges; tail feathers dark brown with yellowish-olive outer edges; rather uniformly pale greyish-yellow below, sometimes light grey-brown wash on side of breast; underwing-coverts pale olive-yellow; iris brown to grey-brown or dark grey; bill black, possibly sometimes brownish-black (may be juvenile character); legs blue-grey to brownish-grey, dark olive-grey or fleshy grey. Differs from very similar *M. gracilis* and *M. cinereifrons* in generally slightly larger size, slightly longer and less slender bill, and less dusky side of head (streak behind eye), from latter also in less buff underwing-coverts. Sexes alike in plumage, male on average slightly larger than female; iris reported as green-brown in one female. Juvenile not properly described, said to be like adult but paler. Race *flavida* is brighter yellowish-olive above and has more yellow tinge below than nominate, also greyer iris; *longirostris* has slightly longer bill than nominate. **VOICE.** Call notes include shrill or staccato “tup”; short, bright disyllabic or upslurred note and similar but thinner and downwardly inflected disyllabic call; repeated querulous piping note. Calls much louder than those of *M. orientalis*.

Habitat. Primary forest and forest edge, secondary forest, tall secondary growth, scrub and scrub-forest, riparian and roadside vegetation, in some areas also coffee plantations, gardens and garden trees at forest edge, and tidal mangroves. In lowland Madang Province, seen in swamp island in savanna and grassland in Ramu Valley; in canopy of open woodland in lowland Western Province. Sea-level to 1250 m, to 1450 m near Telefomin; recorded to 990 m in Eastern Highlands; on Batanta, at 300–460 m on slopes of Mt Besar.

Food and Feeding. Diet includes arthropods (insects), fruit (including of *Symplocos*), seeds (probably ingested with fruit), and nectar from flowering trees (including *Syzygium*). Seen to feed on small caterpillars in a poinciana tree (*Delonix*). Gleans from branches, twigs and foliage in lower and middle storeys, often in understorey at forest edge; sometimes in canopy. Usually singly, in twos (probably often pairs) or in small groups of 5–6 individuals; sometimes with other honeyeaters. Once caught together with both *M. gracilis* and *M. ariensis* in same mist-net in Varirata National Park.

Breeding. Breeding birds Aug–Dec and (race *flavida*) Mar–May. Described nest claimed as being of present species considered more likely that of *M. albonotata*. No other information.

Movements. Probably largely sedentary, with some local movements.

Status and Conservation. Not globally threatened. Generally common, especially in S. No estimates of total population. Probably the easiest member of genus to observe in New Guinea.

Bibliography. Bailey (1992), Beehler, Pratt & Zimmerman (1986), Beehler, Sengo *et al.* (1995), Bell (1970c, 1982a, 1982d, 1984b), Bellchambers *et al.* (1994), Bowman *et al.* (1990), Brown & Hopkins (1996), Burrows (1993), Christidis & Schodde (1993), Clapp (1987b, 1992), Coates (1990), Coates & Peckover (2001), Diamond (1969, 1972a, 1985), Finch (1980b, 1993), Fletcher (2000b), Gilliard & LeCroy (1961, 1966, 1967a, 1968), Greenway (1966), Gyldestolpe (1955b), Hartert (1930), Hicks & Burrows (1992), Hoogerwerf (1971), Iova (1993), Mack & Wright (1996), Mayr & Rand (1937), Mees (1982), Norman *et al.* (2007), Ogilvie-Grant (1915), Pratt (1982), Rand (1936a, 1942a, 1942b), Rand & Gilliard (1967), Richards & Suryadi (2002), Rothschild *et al.* (1932b), Rowland (1995), Salomonsen (1966a), Schodde & Hitchcock (1968), Schönwetter & Meise (1981), Tolhurst (1991).

16. Scrub Honeyeater

Meliphaga albonotata

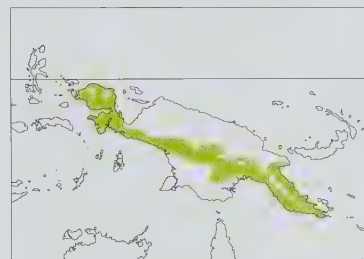
French: Méliphage buissonnier **German:** Schneehor-Honigfresser **Spanish:** Mielero Matorralero

Other common names: (Scrub/Southern) White-eared/(Scrub) White-marked Honeyeater/Meliphaga, Scrub White-eyed/Southern/Diamond Honeyeater, Scrub Mountain-honeyeater/-meliphaga

Taxonomy. *Ptilotis albonotata* Salvadori, 1876, Naiabui, Hall Sound, south-east New Guinea.

On basis of molecular evidence, genus consists of two clades; present species is part of group which contains also *M. orientalis*, *M. analoga*, *M. vicina*, *M. gracilis*, *M. cinereifrons*, *M. mimikae*, *M. montana*, *M. flavirictus*, *M. albilineata*, *M. fordiana* and *M. reticulata*. Formerly treated as conspecific with *M. montana*. Proposed races *setekwa* (from upper Setekwa R, in Nassau Range), *auga* (Mafulu, in Central Division) and *gretae* (Nondugl, on Wahgi R, in Central Highlands), all considered insufficiently differentiated from birds in rest of species’ range to warrant recognition. Treated as monotypic.

Distribution. Mainly hills and lower mountains, less often lowlands, of Vogelkop, Weyland, Nassau and Oranje Mts, Huon Peninsula, and SC & SE New Guinea.



Descriptive notes. 17–19 cm; male 27–34 g, female 20–29 g. Has top and side of head and neck and entire upperbody greyish-olive, with blackish lores, white lower ear-coverts forming small rounded ear-patch, and bright yellow or orange-yellow gape merging with narrow and contrastingly paler (pale yellow or cream) rictal streak (which does not meet pale ear-patch); upperwing-coverts and alula dark brown with yellowish-olive fringes, remiges dark brown with yellowish-olive outer edges and pale yellowish-buff inner edges; tail feathers dark brown with yellowish-olive outer edges; rather uniform light olive-grey below, pale yellow tinge or diffuse streaking on breast and belly; underwing-coverts olive-yellowish or buff; iris grey to grey-brown or dark brown; bill black to brownish-black (descriptions as greyish-brown may represent juvenile character); legs grey to grey-brown or dark olive-grey. Differs from similar *M. montana* mainly in brighter green crown and upperparts, yellowish or creamy (not white) rictal streak, yellowish or yellowish-olive fringes and edges on upperwing and tail, plainer underparts, and richer yellow gape. Sexes alike in plumage, male on average larger than female. Juvenile differs from adult in having yellow tinge in ear-patch, dark olive-brown upperparts, and irregular darker olive-brown band across breast. **VOICE.** Song of 10–12 rapidly uttered thin notes (c. 5 per second), often rising in pitch and then becoming lower towards end; described also as slow trilling “wheel”. Call a brief, fairly loud and musical cheery “chip, tup, chop” or “chirrup” with sucked-in quality, similar to that of several congeners (but “chop” said to be more musical), and similar loud disyllabic note; call described as loud, rather sharply whistled “kit” or “kit kit” may refer to one of these calls.

Habitat. Typically in disturbed habitats, including secondary growth and forest edge, forest remnants along creeks, marginal primary forest, mid-montane scrub, anthropogenic grasslands, plantations, and town and village gardens; apparently absent from interior of forest. Mainly foothills and lower mountains, less often in lowlands; sea-level to c. 1950 m, with possible records at 2900 m (between Laiagam and Kanep).

Food and Feeding. Diet includes insects, nectar and some fruit. Usually forages in understorey (e.g. frequently up to 5 m above ground), but visits flowering and fruiting trees. Forages by gleaning, including hover-gleaning; seen to forage at flowers of *Rhus taitensis* (Anacardiaceae), and to hover at papayas (*Carica*) partly eaten by fruit-bats (Pteropodidae) to feed on pulp. Usually singly or in twos (probably pairs); seen to feed in flowering tree with other species, including three species of *Myzomela*.

Breeding. Recorded in dry season and middle of wet season: eggs in early Mar and Sept, nestlings late Jul, late Sept and late Oct, and fledglings late Aug, Sept, Feb and May. Nest a neat cup of fine fibres, moss, grasses, bark and much animal silk, lined with thread-like woody fibres, plant down and fluffy cotton-like seed material, external diameter c. 8 cm, depth 6.4–8 cm, internal diameter 5–7 cm, depth c. 3.5 cm, suspended 1–5 m (sometimes higher, to 11 m) above ground from horizontal fork in small tree, in shrub or in bamboo thicket. Clutch 1–2 eggs; no information on incubation and nestling periods; chicks fed by both parents.

Movements. Resident at Crater Mt, in Tabubil region and around Brown R, and probably at Moroka; probably resident throughout range.

Status and Conservation. Not globally threatened. Fairly common to abundant at higher altitudes, and uncommon in lowlands; scarce on Sogeri Plateau. A species of disturbed habitats, has successfully invaded highland areas where there has been extensive destruction of original forest habitat; appears to have invaded Wau Valley since 1932.

Bibliography. Beehler (1978a, 1978c, 1980b), Beehler, Pratt & Zimmerman (1986), Beehler, Sengo *et al.* (1995), Bell (1970c, 1982a, 1982d, 1984b), Christidis & Schodde (1993), Coates (1990), Coates & Peckover (2001), Diamond (1972a, 1985), Finch (1980b, 1983), Gilliard & LeCroy (1967a), Gregory (1995b), Gyldestolpe (1955a), Hoogerwerf (1971), Isles & Menkhurst (1976), Mack & Wright (1996), Mayr & Rand (1937), Murray (1988b), Norman *et al.* (2007), Ogilvie-Grant (1915), Rand (1936a, 1942a), Schodde & Hitchcock (1968), Stein (1936), Symes & Marsden (2005), Wahlberg (1988), Weston (1976b).

17. Tagula Honeyeater

Meliphaga vicina

French: Méliphage de Tagula **German:** Tagulahonigfresser **Spanish:** Mielero de la Tagula
Other common names: Tagula/Louisiades/Sudest Meliphaga, Louisiades/Sudest Honeyeater

Taxonomy. *Ptilotis analoga vicina* Rothschild and E. J. O. Hartert, 1912, Sudest Island = Tagula Island, Louisiade Archipelago, New Guinea.

On basis of molecular evidence, genus consists of two clades; present species is part of group which contains also *M. orientalis*, *M. analoga*, *M. albonotata*, *M. gracilis*, *M. cinereifrons*, *M. mimikae*, *M. montana*, *M. flavirictus*, *M. albilineata*, *M. fordiana* and *M. reticulata*. Appears to be close to, and may be conspecific with, either *M. analoga* or *M. gracilis*. Monotypic.

Distribution. Tagula I, in Louisiade Archipelago, off SE New Guinea.



Descriptive notes. 16.5–17 cm. Mostly olive above, with greyish forehead, small pale yellow rictal streak, rounded yellow ear-patch; soft rump-tuft of greyish feathers with olive tips; yellowish-white inner edges of remiges; light greyish-buff below, yellower on belly, buff underwing-coverts; iris dark brown to grey-brown; bill black or blackish (possibly blackish-brown); legs slate-blue. Sexes apparently alike in plumage, male larger than female. Juvenile undescribed. **VOICE.** Undescribed.

Habitat. Thought to inhabit forest and forest edge; lowlands and hills, to 600–800 m.

Food and Feeding. No information.

Breeding. No information.

Movements. Not known; probably sedentary.

Status and Conservation. Data-deficient. Restricted-range species; present in Louisiade Archipelago EBA. Very poorly known; nothing known of ecology and adaptability to habitat alteration. Over half of the forest on Tagula already degraded, and logging remains a threat to remaining lowland forest.

Bibliography. Anon. (2007a), Beehler (1993), Beehler *et al.* (1986), Butchart & Stattersfield (2004), Christidis & Schodde (1993), Coates (1990), Coates & Peckover (2001), Norman *et al.* (2007), Ogilvie-Grant (1915), Rand (1936a), Rand & Gilliard (1967), Schodde (1978b), Stattersfield & Capper (2000), Stattersfield *et al.* (1998).

18. Graceful Honeyeater

Meliphaga gracilis

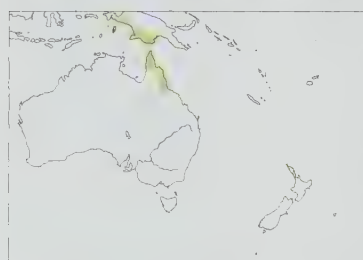
French: Méléphage gracie **German:** Feenhonigfresser **Spanish:** Mielero Grácil
Other common names: Graceful/Slender-billed Meliphaga, Southern Graceful/Slender-billed/Grey-breasted/Lesser Yellow-spotted/Little Yellow-spotted/Eastern Graceful Honeyeater

Taxonomy. *Ptilotis gracilis* Gould, 1866, Cape York, north Queensland, Australia.

On basis of molecular evidence, genus consists of two clades; present species is part of group which contains also *M. orientalis*, *M. analoga*, *M. albonotata*, *M. vicina*, *M. cinereifrons*, *M. mimikae*, *M. montana*, *M. flavivirctus*, *M. albilineata*, *M. fordiana* and *M. reticulata*. Sometimes treated as conspecific with *M. cinereifrons*. In NE Australia (N Queensland) races possibly intergrade in narrow zone roughly between Cooktown and Ayton. Two subspecies recognized.

Subspecies and Distribution.

M. g. gracilis (Gould, 1866) – Aru Is, S New Guinea (Triton Bay E to Purari Delta), Bristow I (off Daru, in extreme N Torres Strait), and coastal and subcoastal NE Australia (N Queensland from Cape York S to Archer–Mitchell rivers and, in E, to Princess Charlotte Bay and Cooktown–Ayton region). *M. g. imitatrix* (Mathews, 1912) – coastal NE Queensland from around Princess Charlotte Bay and Cooktown S to Halifax Bay and S Paluma Range, and inland to Atherton Tableland.



Descriptive notes. 15–17 cm; male 14–17 g and female 12.5–16.5 g (n nominate), male 14–17 g and female 12.5–17 g (*imitatrix*). N nominate race is mostly dark olive above, sometimes faintly darker on forehead, grading across side of head to paler greyish-olive on chin and throat (in best views yellow tinge on chin may be visible), with diffusely darker lores, prominent yellow spot on rear ear-coverts (varying from rounded to diamond-shaped, never crescentic), short yellow to orange-yellow gape (usually brighter and more orange than ear-spot) that meets short, thin pale yellow rictal streak; remiges and edges of tail brighter yellow-olive than upperparts; underparts pale olive-grey, slightly paler than upperparts, with narrow and inconspicuous yellowish stripe in centre of belly; undertail olive-grey, underwing pale grey; iris grey-brown or bluish-grey; bill black; legs pale to dark grey or greyish-brown. Sexes alike in plumage, male slightly larger than female. Juvenile is very like adult, but mantle, back, scapulars and rump washed brown, moustachial stripe less distinct. Race *imitatrix* is very like nominate, but top of head and most of upperbody slightly darker, yellow of chin and throat richer, breast darker and area of yellow on belly smaller, also male has shorter wing. **Voice.** Rather noisy. Throughout range, “chip” appears to be most common call: in Australia a soft, melodious “plit” or “chip” (occasionally sharper-sounding variant, “plik”), uttered once or at intervals (e.g. every c. 20 seconds); in New Guinea and Aru Is as sharp or staccato “kip”, “tchick”, “tick”, “tuk”, “tup” or “chup”. Also high-pitched ascending whistled “wip-wip wip...” or “whit-whit-whit...” series of 4–12 notes (c. 4 per second), common in Cape York Peninsula but not heard in wet tropics of NE Queensland; in New Guinea as “ki-ki-ki...” or as series of clear querulous piping notes; on Aru Is as up to 8 identically repeated whistled upslurs. Other vocalizations include slightly harsh series of 4–8 “pick” notes at c. 2 per second (again, heard Cape York Peninsula but not wet tropics), rapid series of up to 7 identical snapped notes from Aru Is probably same call; peevish, whining scolding note; slow “reet-reet-reet...” of c. 5 notes; quicker “preep-preep-preep...”, also of c. 5 syllables (common Cape York, rare in wet tropics); series of notes similar to “chuck” call of Slender-billed Cuckoo (*Coracina tenuirostris*); high-pitched rapid chattering sometimes heard Cape York; repeated “tswee” in Aru Is; and thin trill ending in upward note, heard in New Guinea but only rarely.

Habitat. In Australia, rainforest or forest edge, including vine scrubs and regrowth rainforest, and in adjoining open forests and woodlands of *Eucalyptus* and *Melaleuca* with sclerophyllous, grassy or rainforest understorey; also *Melaleuca* swamp-woodland, semi-deciduous dune-woodland, and sometimes mangroves or *Lantana* thickets, especially beside wetlands or rainforests. In New Guinea, mangroves, secondary growth, forest edge, primary forest, monsoon forest, savanna woodland, riverine forest and lightly timbered country; also sago (*Metroxylon*) scrub. Often in gardens and orchards in towns and villages. Lowlands in New Guinea; in Australia from coast to foothills and ranges, occasionally tablelands, mostly below 500 m, rarely to c. 800 m.

Food and Feeding. Nectar, fruit and insects. Forages in canopy, mid-canopy (including in crowns of substage trees) and understorey shrubs, usually 2–18 m above ground. Searches at flowers, twigs and small branches, fruit and foliage, tangles of vines, and on epiphytes; sometimes at flowers of exotic trees and shrubs in gardens and at flowers of *Amyema* mistletoe; probably also on tree trunks occasionally. In New Guinea, forages at flowering sago. Nectar obtained by probing flowers; insects obtained mainly by gleaning, less often by sally-striking in air, sally-hovering at outer foliage or at spider webs, probably also by flutter-chasing. Usually singly or in twos (probably pairs); occasionally in small parties or associated with other honeyeaters in flowering trees or other food sources. Once caught together with both *M. aruensis* and *M. analoga* in same mist-net in Varirata National Park, in New Guinea.

Breeding. In NE Australia breeds Sept–Feb, with estimated start of laying Oct–Nov and Jan–Feb and nestlings late Oct to early Jan; one active nest late Aug in New Guinea. Nest a neat cup typically of moss, vines, roots, bark fibre, thin strips of paperbark or other plant material, covered with moss, lichen, small pieces of bark or occasionally insect cocoons or bound with spider web, lined with plant down or other fibres or vines, external diameter 6–4–7–6 cm, depth 4–4–7–6 cm, internal diameter 5–7–6–4 cm, depth 3–8 cm, usually suspended by rim from small forked branch in outer foliage of live plant, sometimes overhanging water, generally 0.75–3 m (mean 1–5 m) above ground but up to 15 m in Australia and once at 21 m in New Guinea. Clutch usually 2 eggs; estimated incubation period at one nest 15 days, and two estimates of nestling period c. 10 days and c. 11 days; no information on roles of sexes.

Movements. Apparently resident, but some local movements.

Status and Conservation. Not assessed. Probably not globally threatened. Considered generally common in New Guinea. Recorded density of 0–16 birds/ha in NE Queensland. No information on current status in Torres Strait islands; historical record on Moa I.

Bibliography. Anon. (1978a, 1978b), Barrett *et al.* (2003), Beehler, Pratt & Zimmerman (1986), Beehler, Sengo *et al.* (1995), Blakers *et al.* (1984), Boles & Longmore (1989), Burrows (1993), Campbell (1900), Campbell & Barnard (1917), Christidis & Schodde (1993), Coates (1990), Coates & Peckover (2001), Colston (1974), Cooney *et al.* (2006), Crome (1978), Diamond & Bishop (1994), Draffan *et al.* (1983), Finch (1983), Fisher & Fisher (1996), Forshaw & Muller (1978), Frith & Frith (1993a), Gannon (1962), Garnett & Bredl (1985), Gill, H.B. (1970), Griffiths & Clarke (2002), Hicks & Burrows (1992), Higgins *et al.* (2001), James (1995), Johnson & Hooper (1973), Keast (1968a, 1985a), Kikkawa (1975), Lavery *et al.* (1968), MacGillivray (1917), Mayr (1937), McLean (1995), Mees (1982), Nielsen (1996), Norman *et al.* (2007), North (1907), Rand (1936a, 1942a), Rand & Gilliard (1967), Schodde & Mason (1999), Schönwetter & Meise (1981), Storr (1984), Weston (1983), Wheeler (1967b).

19. Elegant Honeyeater

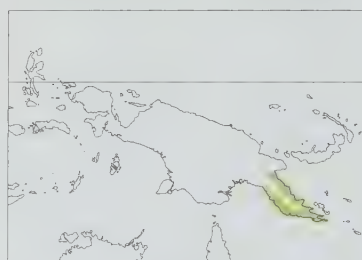
Meliphaga cinereifrons

French: Méléphage de Rand **German:** Graustirn-Honigfresser **Spanish:** Mielero Elegante
Other common names: Eastern Graceful/Stevens’s Honeyeater

Taxonomy. *Meliphaga gracilis cinereifrons* Rand, 1936, Rona, south-east New Guinea.

On basis of molecular evidence, genus consists of two clades; present species is part of group which contains also *M. orientalis*, *M. analoga*, *M. albonotata*, *M. vicina*, *M. gracilis*, *M. mimikae*, *M. montana*, *M. flavivirctus*, *M. albilineata*, *M. fordiana* and *M. reticulata*. Sometimes considered conspecific with *M. gracilis*. Name *stevensi* (from N watershed of SE New Guinea) has been used for a race variously of present species or of *M. analoga*, and it is not certain at present to which (if either) the type specimen applies; recent genetically based investigations indicate that specimens attributed to *stevensi* include cryptic variants of both species; further study currently in progress. Temporarily treated as monotypic, pending identification of northern form.

Distribution. Foothills and coasts of SE New Guinea E to Milne Bay (including Sariba I), in N from at least Goodenough Bay (Nowata), and in S from Malalaua. Also (racially distinct, identity uncertain) N watershed of SE New Guinea.



Descriptive notes. 14–18 cm; 22 g. N nominate race is generally dark olive above, somewhat darker on forehead and top of head, and with diffusely darker blackish-olive lores and vaguely diffuse crescent behind and behind rear lower quadrant of eye, extending as diffuse streak above pale ear-coverts and behind ear-plate; fine pale grey eyering around rear of eye, pale yellow rear ear-coverts forming fairly large prominent patch (typically rounded but usually extending in lobe upwards behind eye, often curving slightly towards rear of eye), and yellow to orange-yellow gape that merges with rather thin, contrastingly paler yellow rictal streak; upwrepping-coverts and alula dark brown with yellowish-olive outer edges or fringes, remiges dark brown with yellowish-olive outer edges (slightly brighter olive than upperparts) and pale yellowish inner edges; tail feathers dark brown with yellowish-olive outer edges; pale yellowish-grey below (yellowish tinge strongest at side of upper breast); underwing-coverts strongly buff-yellow, tinged olive; iris brown to grey; bill black; legs blue-grey to grey or fleshy grey. Sexes alike in plumage, male on average larger than female. Juvenile undescribed. **Voice.** Usual call a sharp “tchick”, “tick” or “tuk”; also thin trill ending in upwardly inflected note, and a repeated high “ki-ki-ki-ki...” in alarm.

Habitat. Mainly lowland rainforest edge and secondary growth; also monsoon rainforest, including patches in savanna woodland and gallery forests, scrubby swamp-forest with sago (*Metroxylon*), dense savanna woodland, mangroves; often in gardens. Mainly lowlands to 600 m, locally to 900 m. Unidentified race from N watershed frequently in hill forest, up to 1200 m.

Food and Feeding. Nectar, fruit and insects. Forages from canopy to shrub layer, mainly in understorey and middle storey; apparently mainly by gleaning. Active. Usually singly or in twos (probably pairs), sometimes in small parties.

Breeding. Eggs in Oct and early Feb, fledglings in late Mar, and female with enlarged gonads early Sept. Nest a deep cup of grass, leaves and spider web, lined with down from seed pods, external diameter 6–4 cm, depth 7 cm, internal diameter 5–1 cm, depth 4–5 cm; suspended by rim from thin fork near end of branch or in vine, near ground or up to 6 m above it. Clutch 2 eggs; incubation period 12–13 or 13–14 days; no information on nestling period.

Movements. No indication of any movements.

Status and Conservation. Not assessed. Probably not globally threatened. No estimates of abundance levels; generally considered fairly common to common.

Bibliography. Beehler (1978a), Beehler *et al.* (1986), Bell (1982a, 1982d, 1984b), Christidis & Schodde (1993), Coates (1990), Coates & Peckover (2001), Heron (1974), Le Souef (1900), Mayr & Rand (1937), Norman *et al.* (2007), Rand (1936a), Rand & Gilliard (1967), Watson *et al.* (1962).

20. Spot-breasted Honeyeater

Meliphaga mimikae

French: Méléphage de Mimika **German:** Mimikahonigfresser **Spanish:** Mielero del Mimika
Other common names: (Greater/Large) Spot-breasted/Mottle-breasted Meliphaga, Large Spot-breasted/Greater Spot-breasted/Mottle-breasted Honeyeater, Large Meliphaga

Taxonomy. *Ptilotis mimikae* Ogilvie-Grant, 1911, Mimika River, south New Guinea.

On basis of molecular evidence, genus consists of two clades; present species is part of group which contains also *M. orientalis*, *M. analoga*, *M. albonotata*, *M. vicina*, *M. gracilis*, *M. cinereifrons*, *M. montana*, *M. flavivirctus*, *M. albilineata*, *M. fordiana* and *M. reticulata*. Proposed race *rara*, described from single specimen among a collection of *M. analoga flavida* from lowlands of Idenburg R (upper Mamberamo Basin, in N New Guinea), considered of doubtful validity. Three subspecies recognized.

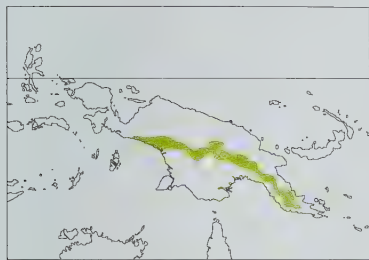
Subspecies and Distribution.

M. m. mimikae (Ogilvie-Grant, 1911) – S slopes of Central Range and lowlands of SW & SC New Guinea from at least Mimika R and Snow Mts E (including along rivers Kapare, Wataikwa, Iwaka, Setekwa, Utakwa and Noord) to upper Fly R.

M. m. bastille Diamond, 1967 – S slopes of Eastern Highlands.

M. m. granti Rand, 1936 – S slopes of mountains of SE New Guinea from upper Angabunga R E at least to Sogerih Plateau, and in Hydrographer Range on N watershed.

Descriptive notes. 16.5–17 cm; male 24–32.5 g, female 22–29 g (*bastille*). N nominate race has top and side of head and neck and upperparts dark greyish-olive to brownish-olive, with grey tinge on



or brownish-grey; bill blackish; legs grey. Differs from *M. orientalis* in larger size, more robust bill and finer rictal streak; from *M. montana* in yellow (not white) ear-patch and pale yellow (not white) rictal streak. Sexes alike in plumage, male on average larger than female. Juvenile undescribed. Race *granti* is larger than nominate, has greener upperparts, greyer forehead, more prominent mottling on underparts; *bastille* is similar in size to nominate but darker, and with more prominent mottling below. VOICE. Loud, short “tuck” or “chip” or “chup” note, similar to those of congeners; race *granti* (and possibly other races) utters repeated nasal piping, likened to call of Eurasian Bullfinch (*Pyrrhula pyrrhula*).

Habitat. Forest, mainly in foothills and lower montane slopes, c. 150 m to 1150 m, locally down to sea-level and as high as 1800 m. Nominate race recorded from sea-level to 900 m, mainly in hills; *bastille* at 400–1370 m; *granti* above 750 m, to 1800 m.

Food and Feeding. Diet includes fruit, arthropods (mainly insects) and almost certainly nectar. Forages mainly in shrubby understorey and lower middle storey, also among inflorescences of canopy epiphyte *Schefflera* (Araliaceae) and *Piper* (Piperaceae); sometimes on ground. Difficult to observe but not shy; typically very active. Singly or in twos (probably pairs); seen to forage in large flowering tree with other honeyeaters and sunbirds (Nectariniidae).

Breeding. Details from two nests in Crater Mt, in mid-Mar and late Apr. Nest a slightly oval open cup made of fine plant fibres, twigs and vines, thickly covered externally with live moss and fern, thickly lined with loose, shredded and fluffy plant down (partly covered eggs when adult off nest), external diameter 7.5–9 cm, depth 7.5 cm, internal diameter 4.5–5 cm, depth 4.5 cm, placed 1.7 m and 2 m above ground in horizontal fork of branch of understorey tree. Each nest contained 2 eggs. No other information.

Movements. Resident at Crater Mt; probably sedentary throughout range, with some local movements.

Status and Conservation. Not globally threatened. Generally fairly common to abundant, infrequently observed. One of the most abundant forest birds at Karimui, and the most common of the six closely similar species of this genus in the basin.

Bibliography. Beehler (1980a), Beehler *et al.* (1986), Brown & Hopkins (1996), Christidis & Schodde (1993), Coates (1990), Coates & Peckover (2001), Diamond (1967, 1972a, 1985), Finch (1983), Gregory (1995b), Mack (1994), Mack & Wright (1996), Mayr & Rand (1937), Norman *et al.* (2007), Ogilvie-Grant (1915), Rand (1936a, 1942a), Rand & Gilliard (1967), Salomonsen (1966a).

21. Forest Honeyeater

Meliphaga montana

French: Méléphage forestier **German:** Bergwaldhonigfresser **Spanish:** Mielero Montano
Other common names: (Forest) White-eared/(White-eared) Mountain/White-marked Scrub/Black-fronted Honeyeater, (Forest) White-eared/(White-eared) Mountain Meliphaga

Taxonomy. *Ptilotis montana* Salvadori, 1880, Arfak Mountains, New Guinea.

On basis of molecular evidence, genus consists of two clades; present species is part of group which contains also *M. orientalis*, *M. analoga*, *M. albonotata*, *M. vicina*, *M. gracilis*, *M. cinereifrons*, *M. mimikae*, *M. flavirictus*, *M. albilineata*, *M. fordiana* and *M. reticulata*. Previously considered conspecific with *M. albonotata*. Validity of some races, e.g. *margaretae*, possibly questionable. Birds of this species in Van Rees Mts and Foja Mts of uncertain racial identity, provisionally included in *sepik*. Seven subspecies tentatively recognized.

Subspecies and Distribution.

M. m. margaretae Greenway, 1966 – mountains of Batanta, in West Papuan Is.

M. m. montana (Salvadori, 1880) – mountains of Vogelkop, Onin Peninsula and Bomberai Peninsula, and Weyland Mts, in NW New Guinea.

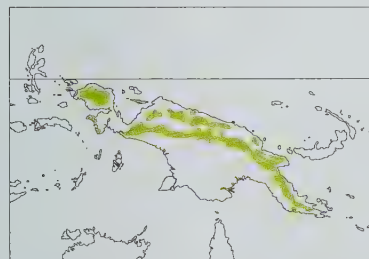
M. m. steini Stresemann & Paludan, 1932 – Yapen I, in Geelvink Bay.

M. m. sepik Rand, 1936 – Van Rees Mts, Foja Mts, North Coastal Range, and N slopes of Central Range from Idenburg R E to Schrader Mts.

M. m. germanorum E. J. O. Hartert, 1930 – Cyclops Mts, in N New Guinea.

M. m. huonensis Rand, 1936 – Adelbert Mts and Huon Peninsula, in NE New Guinea.

M. m. aicora Rand, 1936 – N slopes in SE New Guinea (E to Sibium Mts and Goodenough Bay), also in S at Cape Rodney.



outer edges and pale buff inner edges; tail feathers dark brown with dull olive-grey outer edges; greyish-olive or pale greyish below, darker grey on breast and with indistinct yellowish streaking or tinge on belly, sometimes apparently faint darker mottling on breast; underwing-coverts orange-buff; iris brown to greyish; bill blackish-brown to black; legs blue-grey. Differs from *M. albonotata* in darker olive-brown upperparts and crown, much less distinct and duller olive edges and fringes

forehead; blackish-olive lores, pale olive eyering, yellow lower ear-coverts (forming fairly large patch), and yellow to dull orange gape that meets fairly narrow and contrastingly paler yellow rictal streak (not extending to pale ear-patch); upperwing-coverts and alula dark brown with dark olive-green fringes, remiges dark brown with olive-green outer edges and olive-buff or pale buff inner edges; tail feathers dark brown with yellow-olive outer edges; olive-grey below, pale yellowish tinge or faint streaking on belly, and with darker brownish mottling on chin to upper belly; underwing-coverts olive-ochre to olive-yellow; iris brown

in wing, darker and greyer underparts (particularly breast); distinguished from all other New Guinean congeners by much paler, white, ear-spot. Sexes alike in plumage, male slightly larger than female. Juvenile is poorly known, like adult but has yellowish tinge in ear-patch. Races differ in tone and colour of plumage: *aicora* is distinctive, with darker, more olive, upperparts, richer yellowish tinge below, and slightly longer bill than nominate; *germanorum* has darker upperparts than nominate, less yellowish tinge on darker grey underparts, brownish wash on side of breast; *huonensis* has most pronounced mottling or streaking on breast, and slightly longer bill than nominate; *margaretae* is greener above than nominate, but with grey tinge on forehead, diffusely scaly or spotted appearance of crown, and has underparts and bill length similar to previous (or bill slightly longer); *steini* has darker head than nominate, also darker and more greenish-olive upperparts, and clearer grey underparts lacking yellowish wash; *sepik* is similar to last, but darker upperparts and yellowish wash on underparts. Voice. Main call a loud, slightly hoarse and upslurred “wheep”, similar to upslurred notes of congeners.

Habitat. Interior of undisturbed hill and lower montane primary forest; found also in tall secondary forest and occasionally in shrubby secondary growth (contrary to earlier claims that it occurs only in undisturbed forest). Mainly between c. 400 m and 1500 m: 560–930 m in Fakfak Mts; 400–750 m in Kumawa Mts; 800–1400 m on Yapen I; 600–1000 m (occasionally to 1200 m) in Foja Mts; at 360 m in Van Rees Mts; 600–1200 m (occasionally to 1400 m) in North Coastal Range. Single specimen from near sea-level at Cape Rodney, on S coast of SE New Guinea.

Food and Feeding. Diet includes fruit, seeds (possibly ingested with fruit) and arthropods (mainly insects); probably also nectar, but said rarely, if ever, to visit flowering trees. Forages mainly in middle storey, 3–12 m above ground, less often in understorey, by gleaning and hover-gleaning. Shy, difficult to observe. Usually singly, sometimes in twos (probably pairs); occasionally joins mixed flocks, but does not congregate in flowering trees.

Breeding. No information. Some published details referring to this species thought to relate to *M. albonotata*.

Movements. Nothing known; probably sedentary with some local movements.

Status and Conservation. Not globally threatened. No estimates of population, but considered common at various sites throughout range.

Bibliography. Beehler (1978a), Beehler *et al.* (1986), Christidis & Schodde (1993), Clapp (1987a), Coates (1990), Coates & Peckover (2001), Diamond (1972a, 1985), Finch (1980a), Gilliard & LeCroy (1961, 1967a, 1970), Greenway (1966), Hartert (1930), Lamothe (1979), Mack & Alonso (2000), Norman *et al.* (2007), Pratt (1982), Rand (1936a, 1942b), Rand & Gilliard (1967), Richards & Suryadi (2002), Rothschild *et al.* (1932b), Rowland (1995), Stein (1936).

22. Yellow-gaped Honeyeater

Meliphaga flavirictus

French: Méléphage souriant **German:** Gelbkinn-Honigfresser **Spanish:** Mielero Sonriente
Other common names: Yellow-gaped Meliphaga

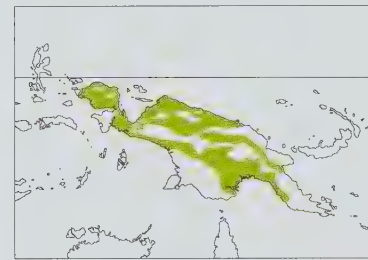
Taxonomy. *Ptilotis flavirictus* Salvadori, 1880, Fly River, south New Guinea.

On basis of molecular evidence, genus consists of two clades; present species is part of group which contains also *M. orientalis*, *M. analoga*, *M. albonotata*, *M. vicina*, *M. gracilis*, *M. cinereifrons*, *M. mimikae*, *M. montana*, *M. albilineata*, *M. fordiana* and *M. reticulata*. Races intergrade on S slopes of Snow Mts. Two subspecies recognized.

Subspecies and Distribution.

M. f. crockettorum Mayr & Meyer de Schauensee, 1939 – W & N New Guinea from Vogelkop E to Sepik R and Herzog Mts and, in S, to Utakwa R (Nassau Mts), Snow Mts and probably farther E towards Fly R.

M. f. flavirictus (Salvadori, 1880) – S watershed of Central Range from middle and lower Fly R E to S slopes of SE New Guinea.



Descriptive notes. 15 cm; one male 20 g, one unsexed 17 g (nominate), one male 22 g (*crockettorum*). Nominate race is rather pale greyish-olive above, side of head greyer, and with dark greyish lores, pale yellow or yellowish-white lower ear-coverts (forming small patch), and prominent bright yellow gape that merges with conspicuous yellowish-white to pale orange-yellow rictal streak, latter bordered below by narrow pale olive malar stripe and only narrowly separated from pale ear-patch; upperwing dark brown, coverts and alula with olive fringes, remiges with olive outer edges and yellowish-white inner edges; tail feathers dark brown with olive outer edges; greyish-white below, yellowish wash on chin and throat, underwing-coverts yellowish-white; iris light grey-brown or brownish; bill blackish to grey-brown; legs yellowish-olive. Differs from *M. albonotata* in smaller size, more slender bill, smaller ear-patch, greyer (less green) upperparts, more prominent rictal streak. Sexes alike in plumage, male slightly larger than female. Juvenile undescribed. Race *crockettorum* differs from nominate in richer olive-green upperparts, larger and more rounded yellow ear-patch, rictal streak brighter than ear-patch, darker lores, darker underparts, paler yellow underwing-coverts, blacker bill, greyish legs. Voice. Single-note nasal “kwek”; series of short, bubbling and descending “chip” or “chirp” notes (similar to those of *Lichenostomus obscurus*), which may be same as a series of short dry notes (said to be most distinctive call).

Habitat. Primary forest and edge, including foothill forest and monsoon rainforest; nominate race also in savanna. Sea-level to c. 1400 m.

Food and Feeding. Arthropods (mainly insects), and almost certainly fruit and nectar. Forages in canopy, often in flowering or fruiting trees (e.g. among inflorescences of *Eugenia*). Difficult to observe, but said to be more vocal than congeners. Usually singly or in small groups; sometimes with other honeyeaters, including *M. gracilis* and *M. analoga*.

Breeding. No information.

Movements. Resident at Crater Mt and probably throughout range; some local movements.

Status and Conservation. Not globally threatened. No estimates of total population but apparently generally rather rare, or at least easily overlooked. Considered possibly the rarest of the New Guinean members of genus.

Bibliography. Bailey (1992), Beehler (1978a), Beehler *et al.* (1986), Christidis & Schodde (1993), Coates (1990), Coates & Peckover (2001), Diamond (1972a), Eastwood (1996a), Finch (1983), Gilliard & LeCroy (1966), Mack & Wright (1996), Norman *et al.* (2007), Pälliser (1989), Rand (1936a, 1942a, 1942b), Rand & Gilliard (1967), Richards & Suryadi (2002), Rowland (1995).



Family MELIPHAGIDAE (HONEYEATERS) SPECIES ACCOUNTS

PLATE 40

23. White-lined Honeyeater

Meliphaga albilineata

French: Méléphage à boucle blanche **German:** Weißbart-Honigfresser **Spanish:** Mielero Listado
Other common names: White-striped Honeyeater

Taxonomy. *Ptilotis albilineata* H. L. White, 1917, King River, Northern Territory, Australia. On basis of molecular evidence, genus consists of two clades; present species is part of group which contains also *M. orientalis*, *M. analoga*, *M. albonotata*, *M. vicina*, *M. gracilis*, *M. cinereifrons*, *M. mimikae*, *M. montana*, *M. flaviviridis*, *M. fordiana* and *M. reticulata*. Previously considered conspecific with *M. fordiana*; recent molecular analyses indicate that both are closely aligned also to *M. reticulata* and that these are best treated as three separate species. Monotypic.

Distribution. N Northern Territory in W Arnhem Land (Wellington Range and Mt Borradaile S to E headwaters of Mary R and to Katherine Gorge, E to Mann R), in N Australia.



Descriptive notes. 17–20.5 cm; male 22.3–29.9 g, female 19–23.5 g. Medium-sized slim honeyeater with short, slender and slightly decurved bill. Has head, neck and upperparts mostly dark brownish-grey, merging to sooty grey on face, with small but prominent yellow gape, and thin white moustachial stripe extending from gape backwards below eye to meet narrow white ear-plume across rear ear-coverts (plume and stripe can appear separate, and plume sometimes indistinct); larger secondary upperwing-coverts mottled slightly darker, median coverts with narrow pale grey-brown fringes, greater coverts with narrow yellow fringes, and remiges edged pale yellow-green (forming diffuse panel on folded wing); rectrices also edged pale yellow-green; off-white chin and throat sometimes diffusely streaked brownish-grey; underbody off-white, grey-brown mottling across breast becoming solid wash at side of breast, diffuse brownish-grey streaks on lower breast, belly and flanks; undertail brownish-grey; underwing buff with broad brownish-grey trailing edge and tip; iris whitish-grey to pale blue-grey; bill black; legs grey to brown. Sexes alike in plumage, male larger than female. Juvenile is similar to adult but

with no moustachial stripe, larger and yellow-white ear-plume, upperwing-coverts tinged rufous, only faint mottling or streaking on lower throat and breast, pale buff-grey lower underbody without streaking. **Voice.** Various described as quiet or noisy. Song, given at most times of day and throughout year, of 2–3 extended loud, clear, melodious whistles, sometimes repeated, “too-ep”, “too-in”, or “tue-ee-ee”, “tu-i-in”, second and third syllables higher-pitched; first whistle with rising inflexion, second (sometimes omitted) undulates and usually falls, third (strongest) usually rises before falling away; described as ventriloquial. Calls include series of loud rapid chipping notes, given for 1 minute or longer at dusk by pair settling at roost; and chattering in agitation in presence of Southern Boobook (*Ninox boobook*).

Habitat. Vegetated gorges, gulleys, cliffs and plateaux of rugged sandstone escarpments and ranges, mostly in broadleaf scrub and thickets of *Xanthostemon*, *Terminalia* and *Gardenia*; sometimes in eucalypt woodland with thickets of acacias and figs (*Ficus*), gallery paperbark (*Melaleuca*) forest on valley floors, and patches of monsoon rainforest topographically protected from fire and with high availability of moisture all year (e.g. floors of valleys and gulleys in sandstone ranges). In study of monsoon rainforest patches, most abundant in sandstone spring and escarpment patches, with few in subcoastal patches, and none in coastal, lowland spring or rock outcrop patches; significantly more abundant in large (more than 2 ha) patches than in small ones. Also sometimes on floodplains near base of cliffs of escarpments.

Food and Feeding. Diet includes invertebrates, mainly insects, some spiders (Araneae), also nectar, fruit and some seeds. Forages in dense upper branches of vegetation (which often low); among foliage and at flowers and fruits of trees. Active, moving rapidly through foliage. Gleans items from foliage and large branches of trees and shrubs, probes in narrow crevices in rocks; also catches insects by sally-hovering and sally-striking. Often secretive and wary. Usually seen singly or in twos (probably pairs), occasionally in small parties (e.g. of five) at food sources; said also to associate with other species of honeyeater in flowering trees or other sources of food, and seen to behave aggressively towards smaller competitors.

Breeding. Few details. Eggs recorded in Sept, newly hatched nestlings early Oct, recently vacated nest mid-Jan, and two fledglings 23 Jan; from gonadal condition, season thought to be mainly Oct–Jan. Three nests described, each cup-shaped, made of fine branches and stems and interwoven strands of vine-like creeper, two were lined with fine long grasses, plant stems and fibre (one unlined), bound or reinforced at rim with cobweb, spider web or cotton-like vegetable material, external diameter 7.5–9.6 cm, depth 5.8–8.7 cm, internal diameter 5.5–7 cm, depth 5–6.3 cm; supported by branchlets or suspended by rim (or both) 1.2–5 m above ground in outer branches and twigs of small shrub or tree. Only one clutch found, of 2 eggs; male seen to feed fledglings, but not known if female also feeds. No other information.

Movements. Apparently sedentary, possibly with some local movements.
Status and Conservation. Not assessed. Probably not globally threatened. Restricted-range species: present in North-west Australia EBA. Not well known; perhaps locally common. Often secretive and easily overlooked; best detected by vocalizations.
Bibliography. Barrett *et al.* (2003), Blakers *et al.* (1984), Christidis & Schodde (1993), Colston (1974), Deignan (1964), Ford, J.R. (1978a), Freeman (1971), Higgins *et al.* (2001), Holmes & Noske (1990), Keast (1968a), Kikkawa *et al.* (1981), Lendon (1966), Longmore (1983, 1991a), Norman *et al.* (2007), Rix (1970), Schodde (1989), Schodde & Mason (1975, 1999), Schodde & Tidemann (1986), Stattersfield *et al.* (1998), Storr (1977), White (1917a, 1917b, 1917c), Woinarski (1993).

24. Kimberley Honeyeater

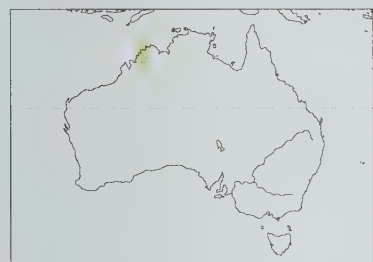
Meliphaga fordiana

French: Méléphage du Kimberley **German:** Kimberleyhonigfresser **Spanish:** Mielero de Kimberley
Other common names: White-striped Honeyeater

Taxonomy. *Meliphaga fordiana* Schodde, 1989, Mitchell River Falls, Mitchell Plateau, Kimberley Division, north-west Australia.

On basis of molecular evidence, genus consists of two clades; present species is part of group which contains also *M. orientalis*, *M. analoga*, *M. albonotata*, *M. vicina*, *M. gracilis*, *M. cinereifrons*, *M. mimikae*, *M. montana*, *M. flavivictus*, *M. albilineata* and *M. reticulata*. Until recently treated as conspecific with *M. albilineata*; molecular analyses indicate that both are closely aligned also to *M. reticulata* and that these are best treated as three separate species. Monotypic.

Distribution. N Western Australia: Kimberley Division from Admiralty Gulf and Drysdale R S to King Leopold Ranges, E to Drysdale River National Park, and including islands off NW coast (Boongaree, Bigge and Wollaston, in Bonaparte Archipelago).



Descriptive notes. c. 18.5 cm; male 27.2–30.5 g, female 19.5–26.5 g. Medium-sized slim honeyeater with short, slender and slightly decurved bill, differing only subtly from *M. albilineata*. Head, neck and upperparts are mostly dark brownish-grey, merging to sooty grey on face, with small but prominent pale yellow to whitish gape and thin white moustachial stripe extending backwards below eye to meet narrow white ear-plume across rear ear-coverts (plume and stripe can appear separate, plume sometimes indistinct); larger secondary upwringing-coverts mottled slightly darker, median coverts with narrow pale grey-brown

fringes, greater coverts with indistinct fine dull yellow fringes; remiges and rectrices concolorous with upperparts; off-white chin and throat sometimes diffusely streaked brownish-grey; underbody off-white, grading to paler white on belly, grey-brown mottling across breast becoming solid wash at side of breast, diffuse brownish-grey streaks on lower breast, belly and flanks; undertail brownish-grey; underwing pale creamy buff with broad brownish-grey trailing edge and tip; iris whitish-grey to pale blue-grey; bill black; legs grey to brown. Differs from very similar *M. albilineata* in lacking yellow edges on remiges and rectrices. Sexes alike in plumage, male larger than female. Juvenile is similar to adult, but with no moustachial stripe, larger and yellow-white ear-plume, upwringing-coverts tinged rufous, only faint mottling or streaking on lower throat and breast, and unstreaked pale buff-grey lower underbody. Voice. Poorly known. Song of powerful fluting notes, described as up to 12 upslurred and downslurred, chirruping whistles in rapid bursts. Chattering call in presence of Southern Boobook (*Ninox boobook*).

Habitat. Deep rugged sandstone gorges, gulleys, creek-lines and cliffs with sparse woodland of *Eucalyptus*, *Acacia* and figs (*Ficus*), with dense spinifex (*Triodia*) between sandstone slabs and boulders, and in patches of monsoon rainforest; apparently also broadleaf scrub and thickets. Possibly sometimes on floodplains near escarpments and gallery paperbark forests or woodlands, but confirmation required.

Food and Feeding. Very poorly known. Diet nectar (including of *Eucalyptus*, *Melaleuca*, *Xanthostemon*), also invertebrates, including ants (Formicidae); probably also fruit and seeds. Forages actively among foliage and at flowers and fruits. Gleans fruit and invertebrates from foliage and large branches of trees and shrubs, and probes in narrow crevices in rocks; catches insects also by sally-hovering and sally-striking. Usually singly or in twos (probably pairs); probably also forms small loose parties when foraging.

Breeding. No information.

Movements. No information; probably sedentary.

Status and Conservation. Not assessed. Probably not globally threatened. Restricted-range species: present in North-west Australia EBA. No estimates of abundance levels, but considered moderately common. Poorly known species, only recently described.

Bibliography. Barrett *et al.* (2003), Blakers *et al.* (1984), Brown *et al.* (1997), Christidis & Schodde (1993), Ford, J.R. (1978a, 1987c), Higgins *et al.* (2001), Johnstone & Burbridge (1991), Johnstone & Smith (1981), Johnstone & Storr (2004), Johnstone *et al.* (1977), Norman *et al.* (2007), Schodde (1989), Schodde & Mason (1975, 1999), Smith & Johnstone (1974), Smith *et al.* (1978), Stattersfield *et al.* (1998), Storr *et al.* (1975).

25. Streak-breasted Honeyeater

Meliphaga reticulata

French: Méléphage réticulé **German:** Temminckhonigfresser **Spanish:** Mielero Reticulado
Other common names: Streak-breasted/Timor Meliphaga, Reticulated/Temminck's/Timor Honeyeater

Taxonomy. *Meliphaga reticulata* Temminck, 1820, Timor.

On basis of molecular evidence, genus consists of two clades: present species is part of group which contains also *M. orientalis*, *M. analoga*, *M. albonotata*, *M. vicina*, *M. gracilis*, *M. cinereifrons*, *M. mimikae*, *M. montana*, *M. flavivictus*, *M. albilineata* and *M. fordiana*. Present species has in the past been placed in genus *Lichenostomus*, and formerly suggested as being close to *Xanthotis*. Molecular evidence and plumage similarities indicate that it is closely aligned with *M. albilineata* and *M. fordiana*. Monotypic.

Distribution. Timor and Semau, in E Lesser Sundas.



Descriptive notes. c. 15.5 cm. Distinctive medium-small honeyeater with rather short, stout and decurved bill. Male is greyish-olive above, with diffuse blackish loral stripe extending narrowly below and behind eye, prominent bright orange-yellow oval to crescent-shaped plume on rear ear-coverts, broad white submoustachial stripe extending from base of bill to level with rear of eye; anterior ear-coverts streaked grey and whitish, merging with dusky-olive malar stripe separating whitish submoustachial stripe from unmarked white to off-white chin and throat; upwringing and tail slightly browner than upperparts, yellowish-olive edges on remiges

and side of tail; underbody off-white to white, with bold but rather messy brownish-olive streaking from breast to undertail-coverts, weaker and more diffuse on lower underbody, yellow wash on belly; undertail dark olive-grey, underwing brownish-grey; iris blue-grey; bill black; legs dark grey. Sexes alike in plumage, male larger than female. Juvenile undescribed. Voice. Calls consist of a series of 9–10 plaintive and slightly upslurred “wheep” notes, beginning rapidly and then slowing, lasting for c. 5 seconds; monotonous, rapidly repeated and high-pitched series of 3–5 notes, “week week week...”, each note with rising inflection; and lower-pitched “work-work”.

Habitat. Primary and secondary forest, both deciduous and evergreen or semi-evergreen (including monsoon forest), degraded forest, scrub, semi-cultivated land, urban gardens; occasionally mangrove associations. Lowlands to 1300 m.

Food and Feeding. Diet includes insects and nectar, and possibly fruit. Occurs singly, in twos (probably pairs) and in small groups of 3–6 individuals. Noisy but often inconspicuous, foraging mostly at flowers of *Eucalyptus*.

Breeding. Estimated laying Mar–Apr and Sept, based on fledgling in late May, dependent juveniles mid-Nov, other juveniles late May and mid-Jun. No other information.

Movements. Presumably resident, possibly with some local movements.

Status and Conservation. Not globally threatened. Restricted-range species: present in Timor and Wetar EBA. Generally widespread and common on Timor. No estimates of abundance. Formerly considered Near-threatened.

Bibliography. Bruce (1987), Coates & Bishop (1997), Hellmayr (1914), Mayr (1944a), Norman *et al.* (2007), Noske (1995a, 2003), Noske & Saleh (1996, 1997), Stattersfield *et al.* (1998), White & Bruce (1986).

Genus *LICHENOSTOMUS* Cabanis, 1851

26. Black-throated Honeyeater

Lichenostomus subfrenatus

French: Méléphage à gorge noire **German:** Goldstreif-Honigfresser **Spanish:** Mielero Gorjinegro
Other common names: Black-fronted/Sub-bridled Honeyeater

Taxonomy. *Ptilotis subfrenata* Salvadori, 1876, Hatam, Arfak Mountains, Vogelkop, north-west New Guinea.

Genus often subsumed in *Meliphaga*. Present species sometimes placed in *Oreornis*. Forms a distinctive species group with *L. obscurus*, *L. frenatus*, *L. hindwoodi* and *L. chrysops*, and all sometimes combined in a separate genus, *Caligavis*. *Meliphaga albilineata* and *Meliphaga fordiana* once considered to be closely related to present species. Geographical variation partly clinal, plumage becoming darker from W to E. Four subspecies recognized.

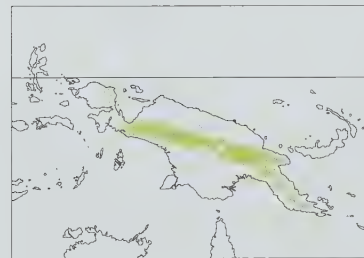
Subspecies and Distribution.

L. s. subfrenatus (Salvadori, 1876) – Arfak Mts, in NW New Guinea.

L. s. utakwensis (Ogilvie-Grant, 1915) – Weyland Mts and S slopes of Central Ranges (including Nassau Mts and Oranje Mts) E to Hindenburg Range, in WC New Guinea.

L. s. melanolaemus (Reichenow, 1915) – N slopes of Central Ranges (including Nassau and Oranje Ranges) E to Victor Emanuel and Schrader Ranges.

L. s. salvadorii (E. J. O. Hartert, 1896) – mountains of E New Guinea (E from Wharton, Bismarck, Kubor and Saruwaged Ranges).



Descriptive notes. 20.5–22 cm; male 29–36 g and female 25–29 g (*melanolaemus*), male 32–37 g and female 26–28 g (*salvadorii*). Nominative race has forehead grey, top of head and neck olive-tinged grey-brown, diffusely streaked or mottled darker; lores and rest of head and neck blackish-grey, with distinctive facial pattern of prominent swollen yellow gape narrowly joining (beneath eye) broad crescent-shaped patch of bare golden-yellow to dull yellow skin that curves up behind eye, this patch bordered below by black, white and golden-yellow streak arising beneath eye and curving up in short tuft behind ear-coverts to side of

neck; large irregular white to off-white patch on side of neck, and diffuse off-white to yellowish patch or fine streaking on side of lower throat; upperparts olive-brown, yellow-olive wash on outer webs of upwringing-coverts, dull yellow-olive outer edges of remiges (olive panel on folded wing), dull yellow-olive outer edges of rectrices; underbody paler and browner than upperparts, merging to paler olive-brown with off-white mottling in centre of belly, and with diffuse darker mottling throughout; undertail and underwing grey-brown, buff underwing-coverts and bases of remiges; iris grey to dark brown, black eyering; bill black; legs bright to dull yellow or olive-yellow. Sexes alike in plumage, male larger than female. Juvenile is not properly known, very like adult but slightly warmer brown (and less olive) above and below. Races vary mainly in tone of plumage, nominate palest: *melanolaemus* is somewhat darker than nominate, top of head and neck dark olive-brown, lores and

rest of head and neck (except for yellow parts) black; salvadorii is generally darker than previous, upperparts dark grey-olive, chin and throat blackish, underbody dark brownish-olive to greyish-olive (less brown-toned); utakwensis is similar to last but more olive-toned above and below, forehead and upperparts olive and underparts greenish-olive, with less blackish chin and throat. Voice. Song a pleasant, rich and loud, rapid bubbling series that rises and falls in pitch and gradually slows, and sometimes ends with few downslurred notes, song repeated 1–3 times; described also as series of short trills in changing key, or as cheerful series of “chip” notes that falls and then rises, falls and rises again, and descends to end with short flourish. Dual singing frequent when several birds in same tree, one sings identical song to another, starting several notes after the first bird starts; suggested that singing is competitive. At Dokfuma (Star Mts), most common call a complicated tuneful series of whistles, audible at some distance; when feeding young or disturbed by human observers, adults uttered harsh churring sound. Another call described as “whik whik...”, 6 notes per 10 seconds; loud, harsh “wit” calls by adults, when in vicinity of dependent young, may be same call.

Habitat. Primary montane forest (mainly middle to upper montane forest), including moss forest, forest edge, secondary growth and subalpine shrubland; at Dokfuma, in subalpine herb field with dense mat of ferns, small stands of tree-ferns and shrubs, and bordered by open Dacrycarpus woodland and some stands of mossy upper montane forest in sheltered areas. Occurs to tree-line; typically from 1350 m to 3700 m, more commonly above 2000 m, but as low as 1070 m in Huon Peninsula, and specimen collected at 1460 m in Victor Emanuel Mts; 1450 m in SE New Guinea.

Food and Feeding. Diet includes nectar, small arthropods (insects) and fruit. Forages mainly in canopy, but will descend to substage up to c. 3 m above ground and, rarely, to understorey; once seen on ground. Takes nectar from flowering trees (including Xanthomyrtus papuanis); insects mainly gleaned from outer foliage and twigs of canopy, also from branches and trunks of trees, and occasionally taken in air by sallying. One seen to hop clumsily up trunk of tree, probing bark and slipping occasionally, before flying to base of another tree and repeating ascent. Active, aggressive and conspicuous. Usually singly; sometimes associates in flowering trees with other species, including Melidectes rufocrissalis, with which it interacts aggressively, and Myzomela rosenbergii.

Breeding. Adults feeding fledglings in mid-Nov in Star Mts; adults carrying nesting material and females with enlarged gonads Apr, Jun–Sept and in early wet season, and single breeding birds Oct and Nov. No further information.

Movements. No information; probably sedentary. Status and Conservation. Not globally threatened. No estimates of global abundance; considered generally common above 2000 m.

Bibliography. Beehler (1978a, 1980b), Beehler et al. (1986), Coates (1990), Coates & Peckover (2001), Coles (1995), De Vis (1897), Diamond (1972a), Eastwood (1989b), Filewood (1969), Frith & Frith (1992), Gilliard & LeCroy (1961, 1968), Gregory (1995b), Gregory & Johnston (1993), Gyldestolpe (1955a), Heron (1977a), Iova (1993), Longmore & Boles (1983), Mayr & Gilliard (1954), Mayr & Rand (1937), Murray (1988b), Ogilvie-Grant (1915), Rand (1942b), Rand & Gilliard (1967), Ripley (1964), Sims (1956), Stein (1936).

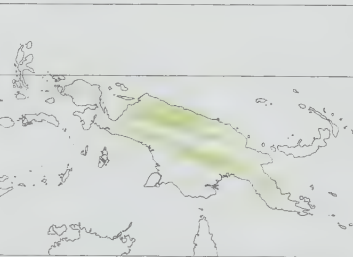
27. Obscure Honeyeater

Lichenostomus obscurus

French: Méléphage obscur German: Laubhönigfresser Spanish: Mielero Oscuro
Other common names: Lemon-checked Honeyeater

Taxonomy. Pitlotis obscura De Vis, 1897, Mount Scratchley, south-east New Guinea. Genus often subsumed in Meliphaga. Present species sometimes placed in Oreornis. Forms a distinctive species group with L. subfrenatus, L. frenatus, L. hindwoodi and L. chrysops, and all sometimes combined in a separate genus, Caligavis. Populations of Weyland Mts intermediate between nominate race and viridifrons. Two subspecies recognized.

Subspecies and Distribution. L. o. viridifrons (Salomonsen, 1966) – mountains of Vogelkop, in NW New Guinea. L. o. obscurus (De Vis, 1897) – patchily distributed on lower slopes of N, C & SE New Guinea E from Weyland Mts.



Descriptive notes. 18.5–19 cm; male 24–31 g, female 24–27 g, mean of 20 unsexed 26.5 g (nominate). Nominate race has forehead and forecrown dusky grey, merging to olive-grey on hindcrown to hindneck, and to blackish on upper lores, supercilium and upper side of neck behind eye; face distinctively marked with varying off-white to yellow gape and triangular patch on lores, which meets narrow yellowish partial orbital ring under eye, this broadening behind eye (forming small yellow patch at upper rear quadrant of eye, narrowly separated from orbital ring below eye by small patch of pale bare skin); pale yellow to yellow

patch or tuft on upper ear-coverts extending forwards to meet orbital ring beneath eye, and bordered behind by large white patch on side of neck; dark grey stripe across malar area and lower ear-coverts, narrowly and incompletely separated from dark grey side of lower throat by yellow line curving up towards ear-coverts from yellow chin and upper throat; upperparts olive-brown to brownish-olive, diffusely mottled darker brown on mantle, back and scapulars; yellow-green edges of rectrices and remiges (slightly contrasting panel on folded wing), sometimes an indistinct and broken buff bar across outer median secondary coverts, at least in fresh plumage; underbody paler than upperparts, greyish-olive, with olive-brown tinge across lower breast merging to off-white in centre of belly, and diffuse dark mottling throughout; undertail and underwing dark grey-brown, buff underwing-coverts; iris dark grey-brown to brown, black eyering; bill black; legs light blue-grey to grey, light brown rear of tarsus. Sexes alike in plumage, male larger than female. Juvenile is very like adult, but top of head olive-brown to brownish-olive, as upperparts, which also lack darker mottling, and rump and uppertail-coverts warmer brown, may also lack pale bar across upperwing-coverts. Race viridifrons differs from nominate in having olive-brown to brownish-olive forehead and crown, concolorous with upperparts. Voice. Often quiet. Song ebullient, of 2 notes (second lower than first) followed by 4 rapid and higher-pitched “cheep” notes on descending scale, which are repeated 2–3 times (somewhat like song of L. subfrenatus); other calls include bubbling series of “cheep” syllables, rising and falling in pitch, and a soft “ssit” repeated at intervals of 3–4 seconds during foraging. Call, or song, also described as loud, distinctive, descending set of “chip” notes in series of descending sets, each of lower pitch than preceding set.

Habitat. Primary forest (rainforest), mainly hill forest, less often in secondary growth and disturbed habitats such as gardens. At Lakekamu, recorded only in primary forest, and not in edge or non-forest habitat. Mainly in hills between 200 m and 1100 m, occasionally as high as 1400 m; locally in lowlands (to 100 m) bordering hills.

Food and Feeding. Diet includes nectar, small arthropods (insects) and fruit (including of Ficus). Forages mainly in lower and middle stages of forest, particularly understorey, but will search in crowns of large flowering trees; at Karimui and Soliabada (Eastern Highlands), noted foraging strictly in lower branches and middle storey. Seen to visit inflorescences of canopy epiphytes Schefflera and of Poikilospermum. Unobtrusive, rather sluggish and often quiet. Usually singly or in twos (probably pairs). Associates with other species in flowering or fruiting plants; in Eastern Highlands, recorded with up to eleven other meliphagid species, and at Karimui was one of a group of five honeyeaters that occurred together in most fruiting and flowering trees.

Breeding. Two active nests known, one in SW (Mimika R) at end Aug and the other in E (Crater Mt) in mid-Oct; seven specimens from Eastern Highlands had non-enlarged gonads in Jul–Aug. Nest cup-shaped, though one tilted and with rim built up on higher side and forming partial dome (covering almost one-quarter of cup), other made of moss and small dry twigs and lined with finer material, suspended by rim from horizontal fork only 15 cm above ground in small shrub. Two clutches each of 2 eggs. No other information.

Movements. Resident at Crater Mountain Wildlife Management Area; possibly vagrant near Brown R. Occurrence in lowlands adjacent to hills indicates some local movements.

Status and Conservation. Not globally threatened. Generally uncommon, but can be locally common or abundant (e.g. Crater Mt, Eloa Valley, and in SW of range). Best detected by vocalizations, but often quiet, e.g. no vocalizations heard from this species in long-term study in Eastern Highlands. Local sex ratios vary and unbalanced in Eastern Highlands.

Bibliography. Beehler, Pratt & Zimmerman (1986), Beehler, Sengo et al. (1995), Bell (1982a), Coates (1990), Coates & Peckover (2001), De Vis (1897), Diamond (1972a), Finch (1980b, 1983), Gregory (1995b), Longmore & Boles (1983), Mack (1994), Mack & Wright (1996), Ogilvie-Grant (1915), Rand (1942b), Rand & Gilliard (1967), Salomonsen (1966a), Schodde & Hitchcock (1968), Terborgh & Diamond (1970).

28. Bridled Honeyeater

Lichenostomus frenatus

French: Méléphage bridé German: Buntschnabel-Honigfresser Spanish: Mielero Embridado
Other common names: Broadbent’s/Mountain Honeyeater

Taxonomy. Pitlotis frenata E. P. Ramsay, 1874, Cardwell, north Queensland, Australia. Genus often subsumed in Meliphaga. Forms a distinctive species group with L. subfrenatus, L. obscurus, L. hindwoodi and L. chrysops, and all sometimes combined in a separate genus, Caligavis. Present species formerly included L. hindwoodi as an outlying population. Monotypic. Distribution. NE Queensland on E Great Divide from Mt Amos (S of Cooktown) S to S Paluma Range and Mt Elliot (SW of Townsville) including coastal islands, and extending inland to Windsor and Atherton Tablelands, in NE Australia.



Descriptive notes. 20–22 cm; male 34–43 g female 28–44 g, unsexed 28–44 g. Plumage is dark grey-brown above, merging to blackish-brown lores and blackish malar area and ear-coverts, and with prominent narrow, curving off-white moustachial stripe from gape joining short, narrow, bare orange patch beneath and behind eye, in turn meeting large white blotch above and behind eye; indistinct small yellow patch on upper rear corner of ear-coverts, large light grey patch on side of neck, and indistinct yellow throat-stripe; edges of rectrices and remiges dull yellow-green (dull wash on folded wing), can also have indistinct

off-white bar across outer median coverts in fresh plumage; underside paler grey-brown than upperparts, with slightly darker brown chin and off-white centre of belly, and diffusely mottled darker throughout; undertail and underwing dark grey-brown, buff underwing-coverts; iris and narrow orbital ring blue-grey (orbital ring merging to off-white where abutting white blotch behind eye); bill tip black, clearly demarcated from bright yellow basal half (which merges with whitish gape); legs dark grey or brownish-grey. Sexes alike in plumage, male larger than female. Juvenile is very like adult, but slightly warmer rufous-brown above (especially rump) and below, no pale wingbar. Voice. Rather quiet, though flocks in flowering trees can be noisy. Song described as rippling chirps run rapidly together and usually descending but sometimes rising and falling, “tchew-tchew-tchew...”. Calls include harsh scolding “chaaah” when feeding, and loud double or treble notes, e.g. “we-are” and “wachita-wachita”.

Habitat. Mainly higher-altitude tropical rainforests, including regrowth rainforest, but recorded also in tall open eucalypt forest adjacent to rainforest, in forest remnants in farmland, in gallery forest that extends into dry tropical woodlands, and occasionally in swamp-woodland; sometimes in towns, and in orchards or plantations near rainforest. At low altitudes, recorded in mangroves at mouth of creek. Mostly in uplands, from 600 m to 1500 m; occasionally near coast, e.g. at sea-level at Cape Tribulation.

Food and Feeding. Includes insects, nectar and fruit. In Paluma Range, diet changed from mainly nectarivorous in dry season (Aug–Nov) to mainly insectivorous during wet season (Dec–Mar). Forages mostly in canopy, less often at lower levels; of 127 observations of foraging in Paluma Range, 37% in lower canopy (10–17.5 m), 29.9% in upper canopy (17.5–25 m) and 14.2% in emergent trees (above 25 m), with only 17.3% in subcanopy (5–10 m), and 1.6% in understorey shrubs (1–3 m above ground). Forages in foliage, at flowers and, less so, on trunks of trees. Takes nectar and fruit from variety of rainforest trees, also at flowers of eucalypts, paperbarks (Melaleuca) and mistletoe (Loranthaceae); also from exotic trees and shrubs in towns. Sometimes feeds at sap-flows from incisions cut into red mahogany (Eucalyptus resinifera) trunks by yellow-bellied gliders (Petaurus australis). Mostly probes flowers for nectar; also gleans insects from foliage and branches of rainforest trees, sometimes while hanging in various positions. In Paluma, most insects gleaned (96% of 127 observations), remainder taken in sally (sally-striking at foliage, branches and trunks, or in air) and sally-hover. Visits picnic areas, investigates rubbish. Usually singly or in twos (probably pairs), sometimes in large numbers in flowering trees, e.g. on flower-spikes of umbrella tree (Schefflera actinophylla), when noisy and aggressive.

Breeding. Nest-building and unspecified breeding details reported Sept–Dec, dependent fledglings mid-Oct, and females with brood patches recorded Sept–Dec. Nest cup-shaped, made of long stems of a climbing plant and stems of fern, lined with vegetable fibre, external diameter 11.4 cm, depth 6.6 cm, internal diameter 6.4 cm, depth 4.1 cm; placed in tangle of creepers or vines or in mistletoe, said also to be placed in leafy twigs of tree or shrub, one c. 0.9 m above ground and reported as nesting up to 8 m above ground. Clutch usually 2 eggs; young fed for some time after fledging. No other details. In ringing studies, maximum longevity 7 years 7 months; estimated mean annual survival 64–73%.

Movements. Largely resident, with some local dispersion; part of population of uplands descends in winter to lower altitudes (e.g. Cape Tribulation, Tully Gorge) or to drier W areas (e.g. Mitchell R, Mt Garnet). At Paluma some shifts between rainforest and ecotone habitats dominated by flooded gum (*Eucalyptus grandis*), primarily to W during cooler months; nearby resident population sometimes augmented by influxes in Apr–Jun (though possibly only recently established as resident in Paluma). Also enters towns in winter (e.g. Atherton).

Status and Conservation. Not globally threatened. Restricted-range species: present in Queensland Wet Tropics EBA. No estimates of abundance levels. Seems to be fairly common.

Bibliography. Barrett *et al.* (2003), Blakers *et al.* (1984), Bourke & Austin (1947), Bravery (1970), Broadbent (1910), Campbell (1900), Campbell & Barnard (1917), Christidis & Schodde (1993), Colston (1974), Cooney *et al.* (2006), Dettmann (1995), Frith, C.B. & Frith (2005), Frith, D.W. (1984), Gannon (1962), Gill, H.B. (1970), Griffin (1974, 1995), Griffioen & Clarke (2002), Higgins *et al.* (2001), Keast (1968a), Kikkawa (1982), Laurance *et al.* (1996), Longmore & Boles (1983), Nielsen (1996), North (1907), Pizzey (1980), Schodde & Mason (1999), Schodde & Tidemann (1986), Storr (1953, 1984), Wheeler (1967b), Wieneke (1992).

29. Eungella Honeyeater

Lichenostomus hindwoodi

French: Méliphage de Hindwood **German:** Eungellahonigfresser **Spanish:** Mielero de Hindwood
Other common names: Mountain Honeyeater

Taxonomy. *Meliphaga hindwoodi* Longmore and Boles, 1983, Massey Creek, Clarke Range, east Queensland, Australia.

Genus often subsumed in *Meliphaga*. Forms a distinctive species group with *L. subfrenatus*, *L. obscurus*, *L. frenatus* and *L. chrysops*, and all sometimes combined in a separate genus, *Caligavis*. Present species formerly considered to be an outlying population of *L. frenatus*. Monotypic.

Distribution. SE Clarke (Eungella) Range, near Mackay (E Queensland), in NE Australia.



Descriptive notes. 17.2–19.7 cm; male 20–27.2 g, female 19.7–24 g. Plumage is dark grey-brown above, with fine pale grey scalloping on forehead and crown, fine pale grey streaking on mantle, back and scapulars; blackish face with narrow off-white gape and moustachial stripe extending below and behind eye and almost meeting small off-white patch at upper rear edge of eye; narrow upswept off-white plume on rear ear-coverts, finely bordered in front by yellow (difficult to see in field); tail feathers have dull yellow-olive edges; fine pale streaking on secondary upperwing-coverts and fine white tips on outer few median coverts, weak yellow-olive

wash on secondaries, fine off-white edges on primaries; underbody slightly paler grey-brown than upperparts, finely streaked off-white throughout; undertail brownish-grey, underwing largely brownish-grey with buff lining; iris blue-grey to greenish-blue; bill black; legs bluish-grey. Sexes alike in plumage, male larger than female. Juvenile is like adult, but with rufous-brown wash on top of head, and browner lower rump and uppertail-coverts. **Voice.** Typically quiet, but can be noisy at flowering trees. Vocalizations loud, strong and varied. Song a varying but short series of metallic notes, beginning with rather harsh rattle. Soft “chip” contact call; also a short sharp “chip”, “tick” or “churr”.

Habitat. Mainly higher-altitude rainforest; sometimes at edge; visits lowland eucalypt and casuarina forests and woodlands, and gardens. Usually above 900 m, but recorded as low as 150 m.

Food and Feeding. Diet mainly nectar and fruit, also some insects and parts of flowers. Forages mainly in canopy, among foliage of trees and in climbing plants, less often in understorey trees and shrubs. Nectar taken by probing flowers, including *Amyema* mistletoes and climbing pandanus (*Freyinetia excelsa*); insects and lerp gleaned from bark or beneath loose bark and in other crevices, and branches of trees and shrubs; captures insects also by sally-striking, often then bringing item back to perch to be eaten. Also takes fruits (e.g. of mistletoe) and eats flowers, e.g. tearing long, soft fleshy segments from centre of pandanus flowers and swallowing them whole. Usually singly or in twos (probably pairs); sometimes in small groups in flowering trees.

Breeding. Few details of season, but appears to be centred on spring, with building noted late Aug and mid-Oct, eggs Oct and nestlings Oct–Nov. Nest built by both sexes, a deep cup of fine plant fibre, covered with moss on outside, one with external diameter 7.6–8.9 cm, depth 6.4 cm, suspended 4.2–20 m (average 12.8 m) above ground, at least sometimes from horizontal twigs at end of tree branch, where well hidden in foliage, reported also in mistletoe, and sometimes on steep slope. One nest held 2 eggs (not known if clutch complete); incubation probably by only one of the pair, period probably 13–14 days; chicks fed by both parents, nestling period probably 14–15 days at one nest, more than 9 days at another; fledglings fed by both parents.

Movements. Resident; some local movements, including descent to lower altitudes in winter by some individuals.

Status and Conservation. Not globally threatened. Restricted-range species: present in Clarke Range Secondary Area. No estimates of abundance levels; once, c. 100 individuals recorded in one day. Global range tiny, and numbers presumably small. Found mainly in rainforest; dependent on protection within Eungella National Park.

Bibliography. Barrett *et al.* (2003), Blakers *et al.* (1984), Chisholm (1966), Cooney *et al.* (2006), Garnett (1993), Higgins *et al.* (2001), Longmore (1991a), Longmore & Boles (1983), Robertson (1962), Shields (1984), Stattersfield *et al.* (1998), Storr (1984).

30. Yellow-faced Honeyeater

Lichenostomus chrysops

French: Méliphage à joues d’or **German:** Dreistreifen-Honigfresser **Spanish:** Mielero Carigualdo
Other common names: Yellow-gaped Honeyeater

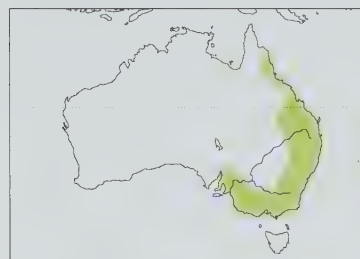
Taxonomy. *Sylvia chrysops* Latham, 1801, Nova Hollandia = region of Port Jackson, New South Wales, Australia. Genus often subsumed in *Meliphaga*. Forms a distinctive species group with *L. subfrenatus*, *L. obscurus*, *L. frenatus* and *L. hindwoodi*, and all sometimes combined in a separate genus, *Caligavis*. Poorly differentiated race *barroni* possibly not worthy of recognition; further studies pending. Three subspecies provisionally recognized.

Subspecies and Distribution.

L. c. barroni (Mathews, 1912) – montane NE Queensland from Shiptons Flat–Mt Amos–Mt Finnigan (near Cooktown) S, including Atherton and Windsor–Carbine Tablelands, to Clarke–Connors Ranges, in NE Australia.

L. c. chrysops (Latham, 1801) – NE Queensland (Dawson–Mackenzie Basin) S, inland to W slopes of Great Divide (scattered records W of this range), to Victoria and SE South Australia.

L. c. samueli (Mathews, 1912) – S Flinders Ranges, Mt Lofty Ranges and Fleurieu Peninsula, in SE South Australia.



Descriptive notes. 15–17.5 cm; male 12–20.5 g and female 15–20 g (nominate), two males 17–17.5 g and female 15–16 g (*samueli*), male 14–17.2 g and female 13.8–15.8 g (*barroni*). Nominat race is greyish-brown to olive-brown above, with diffuse darker mottling or streaking on top of head, hindneck, mantle, back and scapulars; broad curving yellow stripe from gape backwards below eye and across upper ear-coverts to meet small white patch on rear ear-coverts, and bordered above by black eyestripe (broken above rear edge of eye by small yellow to off-white patch) and below by black submoustachial stripe; uppertail brown; upperwing-coverts greyish-brown to olive-brown, broad off-white tips on outer median and secondary coverts and olive tips on primary coverts; remiges brown with fine olive outer edges (forming faint olive panel); chin, throat and underbody pale greyish-brown, slightly darker on breast, with slightly darker streaking on chin and throat and paler off-white streaking elsewhere; undertail greyish-brown, underwing pale rufous with darker, brown, trailing edge and tip; iris dusky blue, brown in some (possibly immatures); bill black; legs dark grey. Sexes alike in plumage, male slightly larger than female. Juvenile is very similar to adult, but paler and unstreaked above, rump and uppertail-coverts browner, underparts paler (breast unstreaked), bill black with orange-brown tip, gape may be slightly more yellow at least initially. Races vary little: *samueli* is significantly smaller than nominate, slightly paler and less mottled above, with more off-white bill; *barroni* is very similar to previous, but slightly paler above and below. **Voice.** Typical daytime song 1.8–2.6 seconds in duration, of 4–6 brief syllables, e.g. “chick-up”, at maximum of 15–17 per minute; infrequent throughout day, slightly more often in first hour of daylight and towards sunset. Dawn song a social chorus starting 35–20 minutes before sunrise and stopping 14–8 minutes before it, a major part of dawn chorus Aug–Jan; individual dawn song rendered as “chee-chitty di-chitty-tee-tee”, duration just over 1 second, at rate of 12–16 per minute. Countersinging, possibly between males, frequent. Calls include repeated, somewhat plaintive but harsh “chip” or “cheep”, uttered on autumn migration, in flight and while perched, migratory flocks producing distinctive chattering; harsh “kheer”. Snaps bill in aggression.

Habitat. Dry, open sclerophyll forests and woodlands dominated by *Eucalyptus*, including savanna and riverine woodlands, with understorey varying from dense to sparse shrubs, including heath, to sparse open grasses; less often in forests and woodlands dominated by *Angophora*, *Acacia*, *Banksia*, casuarina or cypress-pine (*Callitris*) and, in NE Queensland (race *barroni*), swamp-woodland dominated by *Lophostemon*. Sometimes in wet sclerophyll forests, more so when these heavily flowering. Tends to prefer mature forests and woodlands. Commonly also in coastal heathland or shrubland, particularly with flowering *Banksia*; and often in urban and suburban parks and gardens, and even found along streets. Also in remnant patches of forest or woodland in agricultural landscapes. Sometimes in mangrove associations, and in plantations of exotic pines (*Pinus*) and orchards. Occasionally in rainforests (but apparently not in NE Queensland). From coasts to high-altitude subalpine zone.

Food and Feeding. Wide range of items, including nectar (often of *Eucalyptus*, *Banksia*) and pollen, fruit and seeds, manna, and lerp and honeydew; also arthropods, mainly insects, also some spiders (Araneae) and millipedes (Diplopoda). Primarily arboreal, foraging at all levels, also aerially and, occasionally, on ground; proportion of time spent at different levels varies among studies, but often in subcanopy and canopy. Forages among foliage and at flowers of trees, shrubs and mistletoe (Loranthaceae); less often on bark of trees. Gleans from foliage and bark; probes various substrates, including flowers (for nectar) and bark (for invertebrates, such as insect and their products); sallies to capture prey in air or from foliage. Proportions of different methods vary, but gleanings usually constitutes a large proportion. Active, conspicuous. Tends to forage singly, in twos or in small loose groups of up to ten individuals; larger flocks during migration. Occasionally in mixed flocks dominated by insectivorous birds.

Breeding. Season broadly Jul–Mar, with clutches early Aug to late Feb and nestlings reported until early Mar. Nest built by female, often accompanied by male, a fine and fragile, neat woven cup, sometimes with swollen sides or narrower at rim (contents often visible through base or wall), often made of, or covered with, green materials, especially grass or moss, less often including bark or bark fibre, lichens, rootlets, plant stems, fibre or down, leaves, and wool, fur or hair, bound together and to nest plant with spider web, usually lined with very fine rootlets, grass or feathers or other soft plant material, external diameter 3.8–9.5 cm, depth 4.8–10.7 cm, internal diameter 4.3–7.3 cm, depth 3.5–9.5 cm; placed 0.15–25 m (mean 2.3 m) above ground, usually suspended from thin horizontal or vertical fork, or from foliage or shoots, usually among foliage and twigs of live understorey shrub, sometimes in tree or sapling or, less often, in mistletoe, ferns or mangrove, sometimes in dead vegetation, and often near or overhanging water; within a season, second and third nests tend to be higher than earlier ones. Clutch 2–3 eggs, rarely 1 (mean 2.35); incubation by female, period 13–15 days, though said to be as long as 17 days; chicks brooded probably by female alone, fed by both parents, nestling period 11–14 days, once 17 days; fledglings tended by both parents. Nests parasitized by Shining (*Chrysococcyx lucidus*) and Horsfield’s Bronze-cuckoos (*Chrysococcyx basalis*), and Fan-tailed (*Cacomantis flabelliformis*), Brush (*Cacomantis variolosus*) and Pallid Cuckoos (*Cuculus pallidus*). Success rate for 508 eggs in 235 nests was 0.35 fledged young per nest, and of 401 nests where outcome known 41.9% produced at least one fledged young; in one study, 89% of failures attributed to predation.

Movements. Nominat race partly migratory; isolated breeding populations of NE Queensland (*barroni*) and South Australia (*samueli*) appear sedentary. Part of nominate race migrates to and from SE Australia, N passage in autumn (Mar–May) and return in late winter–spring (S passage less conspicuous). Main stream follows Great Divide and E coast, on N passage tending NE during early autumn, then NW from about SE Queensland during late autumn–early winter; leaves Great Divide of N Victoria–S New South Wales and its tablelands in winter and moves to N New South Wales and inland, with decrease noted in coastal Victoria, and estimates of at least 20% of population moving, most between Mar and Jun. Migrates by day, in small to large flocks moving in one general direction (though can be seen to move in opposite direction to expected passage at some sites), usually at treetop level; migratory flocks usually of fewer than 100 individuals but can be larger, and several records of flocks of c. 1000. Large numbers observed on N passage, typically in successive flocks, e.g. at Wellington Point (SE Queensland) mean of 555 birds/hour (26–2355). Sometimes travels in mixed flocks, often with *Melithreptus lunatus*. Vagrant on islands of Bass Strait (mostly King I) and once on mainland Tasmania; vagrant at Iron Range, in far NE Queensland. Doubtful report of two individuals in New Zealand.

Status and Conservation. Not globally threatened. Common in most of range. No estimates of total population; recorded densities of 0.01–2.2 birds/ha and 0.25–1.52 pairs/ha. Formerly considered a pest in commercial fruit orchards.

Bibliography. Armstrong (1992b), Barrett *et al.* (2003), Bell (1980a), Bell & Ford (1987), Blakers *et al.* (1984), Boulton *et al.* (2003), Bounds (1996), Bourke & Austin (1947), Bravery (1970), Burbidge (1985), Campbell (1900), Chan (1995c), Clarke, R.H., Schipper *et al.* (2003), Cody (1991a), Cooney *et al.* (2006), Cooper (1975a), Davis & Recher (1993b), Egan (1997), Emison & Porter (1978), Emison *et al.* (1987), Ford, H.A. (1979, 1980, 1983), Ford, H.A. & Bell (1981), Ford, H.A. & Forde (1976), Ford, H.A. & Paton (1976a, 1976c, 1977), Ford, H.A., Bridges & Noske (1985), Ford, H.A., Noske & Bridges (1986), Friend (1982), Gosper, C.R. (1999), Gosper, D.G. (1992), Green & Catterall (1998), Griffioen & Clarke (2002), Hardy & Farrell (1990), Hermes (1981), Higgins (1999), Higgins *et al.* (2001), Hindwood (1930d, 1953, 1956b), Hudson *et al.* (1997), Keast (1968a, 1968c, 1985a, 1985b, 1993, 1994a, 1994b), Laurance *et al.* (1996), Law *et al.* (2000), Leach (1988, 1995), Liddy (1966), Lill & Fell (1990), Loyn (1980, 1985c, 1993), Mac Nally (1997), Marchant (1980, 1982, 1992), McAllan & Filewood (1994), McFarland (1986b, 1986c, 1996), McGill (1947), McLean *et al.* (2005), Mitchell *et al.* (1996), Munro & Munro (1998), Munro & Wilschko, R. (1993), Munro & Wilschko, W. (1992), Munro *et al.* (1993), North (1907), Officer (1971), Osborne & Green (1992), Paton (1980, 1988), Porter & Henderson (1983), Purchase (1985), Pyke & Recher (1988), Recher (1975), Recher & Holmes (1985), Recher *et al.* (1985), Roberts & Ingram (1976), Robertson & Woodall (1983), Schipper (1998), Schodde & Mason (1999), Schulz (1991), Shields & Recher (1984), Smith (1984, 1985a), Stanley & Lill (2002c), Storr (1984), Taylor (1992), Traill *et al.* (1996), Vaughton (1990), Wheeler (1967a, 1967b), White (1912), Wilson (1963), Woinarski, Cullen *et al.* (1989), Wolstenholme (1929), Wykes (1982, 1985).

31. Singing Honeyeater
Lichenostomus virescens

French: Méléphage chanteur **German:** Pfeifhönigfresser **Spanish:** Mielero Cantarín
Other common names: Black-faced/Large-striped/Forrest's Honeyeater

Taxonomy. *Melithreptus virescens* Vieillot, 1817, Nouvelle Hollande = Shark Bay, Western Australia. Forms a superspecies with *L. versicolor* and *L. fasciularis*; once considered conspecific with former. Races intergrade where they meet: *cooperi* intergrades with *forresti* in N Northern Territory; *forresti* intergrades with *sonorus* in narrow band from N Queensland (E drainage of Gulf of Carpentaria) S through C Cooper Creek Drainage to N Flinders Ranges and Gawler Ranges (South Australia), and with nominate from W Western Australia (between North West Cape and Shark Bay) E to W Eyre Peninsula (South Australia); in S South Australia, nominate, *forresti* and *sonorus* overlap in three-way melange SW of Gawler Ranges. Proposed race *insularis* (from Rottnest I, off Perth, in Western Australia) considered indistinguishable from nominate, and *westwoodia* (Westwood, in S Queensland) synonymized with *sonorus*. Four subspecies recognized.

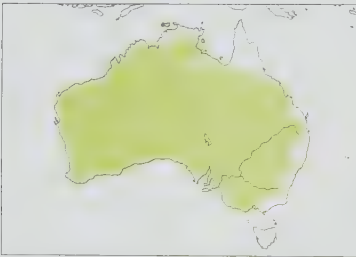
Subspecies and Distribution.

L. v. cooperi (Mathews, 1912) – Tiwi Is (Bathurst I, Melville I) and N Northern Territory (S to Victoria R and SW Gulf of Carpentaria, including Groote Eylandt and Sir Edward Pellew Is), in N Australia.

L. v. forresti (Ingram, 1906) – Western Australia from Kimberley Division S to Shark Bay and Wheatbelt, E to SE Gulf of Carpentaria and NC Queensland, South Australia (N Eyre Peninsula and N Flinders Ranges) and NW New South Wales.

L. v. sonorus (Gould, 1841) – CN Queensland (Burdekin–Flinders rivers to Dawson–Mackenzie Basin), S, W of Great Divide, to SE South Australia (E from Eyre Peninsula) and W Victoria (W of Westernport Bay).

L. v. virescens (Vieillot, 1817) – coastal and subcoastal SW & S Western Australia, from Carnarvon–Shark Bay S (including Rottnest I) to SW capes (absent from wetter far SW), inland to Wheatbelt, and E to SC South Australia (E to W Eyre Peninsula).



Descriptive notes. 16–24 cm; 29.3 g (nominate), male 20–28 g (*cooperi*), male 24.2–35 g and female 21–34 g (*sonorus*), male 21.8–29.7 g and female 19.1–26.5 g (*forresti*). Nominant race has greyish-brown head and neck, faintly streaked darker brown on top of head, black mask (extending across upper ear-coverts to shoulder) bordered below by yellow moustachial stripe that meets broad yellow stripe across lower ear-coverts, which in turn largely covers a white tuft that appears as white tip of posterior ear-coverts, and with diffuse greyish-white submoustachial stripe; upper-body deep greyish-brown with faint olive suffusion; uppertail and upperside greyish-brown to brown, yellow-olive outer edges of rectrices (forming narrow yellowish sides on folded tail), yellow-olive outer edges of secondaries and primaries (conspicuous panel on folded wing); off-white below, faint yellow wash on throat, fine pale brown streaks on chin and upper throat, streaks becoming heavy, dense and conspicuous on breast, flanks and upper belly; underwing creamy, orange-buff wash on coverts, brown trailing edge and tip; iris black-brown; bill black, gape colour varies from off-white to black (possibly breeding) to yellow (possibly non-breeding); legs dark grey. Sexes similar. Juvenile is similar to adult, but paler above (upperbody slightly darker than head), mask slightly narrower and duller, chin and upper throat tinged cream, underbody pale buffish-brown and mottled darker (not streaked), base of lower mandible dull pink, gape swollen and deep yellow, and iris dull dark brown. Races differ mainly in size (N populations tend to be smaller than S ones), darkness of plumage (correlated with average annual rainfall and humidity) and streaking on breast, also birds from offshore islands tend to be larger and darker than adjacent mainland ones: *sonorus* is smaller than nominate, with proportionately longer bill, slightly broader and longer mask, drab grey-brown upperparts lacking olive tinge, no yellow wash on throat, less densely streaked below; *forresti* is smaller than previous, with proportionately short bill, much paler above and below, dull creamy chin and throat lacking streaking, paler streaking on rest of underside; *cooperi* is similar to nominate, but with slightly less dense

and more diffuse streaking below. **VOICE.** One of first birds to call in morning, male singing from roost 30–20 minutes before dawn. Song at dawn, infrequently at other times, a fairly loud, rather high musical phrase of several notes or double notes; varies geographically; used in territorial defence, and during fights. In Western Australia, individuals sang only one song type, often shared by several others in neighbouring territories; individuals can modify songs to match those of neighbours. Most common call a repeated, fairly loud, drawn-out “preet”, “queek” or “sheek”; sharp, loud rippling or trilling “rer-er-er-er-er”, “te-e-e-e-e-e” or “chirr-r-r-r” whistle in alarm, also other alarm notes; territory defence accompanied by several calls, including intense chattering and continuous chirping. Range of other calls includes animated “terric, terric, terric...”, also drawn-out call (sound between a hiss and a snarl) when driving off independent young. Snaps bill in aggression.

Habitat. Open wooded habitats. Primarily open shrublands and low open woodlands, frequently dominated by *Acacia*, less often in patches of *Acacia*, or other species such as paperbarks (*Melaleuca*) or cypress-pines (*Callitris*), in grassland or savanna; often in low open chenopod shrublands or sparse lignum (*Muehlenbeckia*) shrubland, on plains, around swamps or other wetlands, in depressions, on claypans or flats, along bore drains or channels, and small creeks and other drainage lines; also in coastal shrubland, but not commonly in heathland. Less often in open woodlands or savanna dominated by *Eucalyptus*, *Banksia*, *Melaleuca*, casuarinas or cypress-pines, including open mallee woodland and low riparian paperbark woodlands. Often in parks and gardens in towns, suburbs and around homesteads; also in remnant woodland in partly cleared agricultural land. Sometimes in mangroves or in ecotone with coastal scrub. Very occasionally in open eucalypt forest, riverine *Eucalyptus* woodlands, e.g. those dominated by river red gum (*Eucalyptus camaldulensis*), and monsoon forest and vine thickets.

Food and Feeding. Diet includes nectar, invertebrates (mainly insects, also spiders and molluscs) and fruit; ratio of nectar to invertebrates estimated at 26:74 and 16:84 in two studies, but consumes much fruit at times. Reported also as taking eggs and nestlings of Zebra Finch (*Taeniopygia guttata*) and Double-barred Finch (*Taeniopygia bichenovii*). Forages at all levels, but usually in low shrubs and on ground, and generally at lower levels than those exploited by many other honeyeaters; proportions of foraging observations below 3 m in various studies 67–88%, with up to 22% on ground. Feeds at flowers (including of *Eucalyptus*, *Hakea*, *Grevillea*, *Calothamnus*, *Callistemon*), from foliage and bark of branches and trunks of trees and shrubs. Probes flowers for nectar and possibly invertebrates; invertebrates obtained mostly by gleaning and sallying, mostly sally-striking in air but also sally-pouncing and sally-striking at substrates; also gleans fruit and probes bark. Rubs bees (Apidae) against a hard surface before swallowing them. Active, conspicuous and gregarious. Usually singly, in twos (probably pairs) or in groups of 4–6 individuals (at least some of which are family parties), but tends to forage solitarily; occasionally in groups of up to twelve, or with other species, such as *Acanthagenys rufogularis* and *Lichenostomus leucotis*, in flowering plants; in NE Queensland seen in 58% of 127 mixed-species flocks.

Breeding. Breeds in all months; of 219 clutches, most (72.6%) mid-Aug to late Nov. Nest an open cup, typically substantial (at least in W of range), sometimes flimsy (at least in E), usually of woven grass or leaves, or both, matted and bound with spider web or wool (sometimes incorporates rootlets and twigs, occasionally spider egg sacs, flowers, bark, rarely string, paper or moss), lined with wool, hair or fur or rootlets, occasionally plant down or fine grass or vine tendrils, sometimes unlined, external diameter 6.4–10.8 cm, depth 3.2–7.6 cm, internal diameter 5.1–6 cm, depth 2.5–4.5 cm; placed 0.05–20 m (average 2 m) above ground and usually suspended from horizontal or vertical fork or from small twigs or foliage, usually in low shrub, often with thorns or prickles, or in dense foliage of mistletoes or vines, less often in low tree, sometimes supported (22% of 188 nests). Clutch 1–3 eggs, usually 2 (mean 2.2); incubation probably by female alone, period 12–14 days, once more than 14 days; chicks brooded probably by female, fed by both sexes, nestling period 11–16 days; fledglings fed by both parents. Nests parasitized by Pallid Cuckoo (*Cuculus pallidus*). From 249 eggs in 118 nests, 0.69 fledged young per nest; of 199 nests, 54.3% fledged at least one young.

Movements. Resident, usually with some local movements or fluctuation in numbers at specific locations. At some sites where apparently sedentary there is constant or large turnover of individuals. Vagrant at many sites at edge of or beyond normal range, e.g. in E New South Wales (mainly late Aug to early Oct), and on Kangaroo I, in South Australia (Sept and Jan–Feb).

Status and Conservation. Not globally threatened. Locally common; recorded densities of up to 4.33 birds/ha and 1.3 breeding pairs/ha. Declines reported in some areas but may have increased in others; may have benefited from clearance and fragmentation of vegetation in parts of SW Australia. In Wheatbelt of Western Australia readily flies over open agricultural land, so not highly susceptible to population fragmentation; in SW Australia, abundance similar in road verges and agroforestry sites but numbers much lower in wandoo (*Eucalyptus wandoo*) woodland and reforested sites.

Bibliography. Adriano (1995), Arnold (2003), Badman (1979), Baker (1993, 1994, 1996), Baker *et al.* (2001), Barrett *et al.* (2003), Baxter & Paton (1998), Blakers *et al.* (1984), Boehm (1957), Britton (1997), Brooker & Estbergs (1976), Brooker & de Rebeira (1996), Brooker *et al.* (1979), Burbidge & Fuller (2007), Campbell (1900), Carpenter & Matthew (1997), Christy (1995), Close & Jaensch (1984), Collins & Morellini (1979), Colston (1974), Cooney *et al.* (2006), Cooper (1975a), Cox & Pedler (1977), Crawford (1972), Davies (1982), Davies & Chapman (1975), Davies *et al.* (1988), Emison *et al.* (1987), Ford, H.A. (1979), Ford, H.A. & Paton (1976a), Ford, J.R. (1982), Griffioen & Clarke (2002), Haise *et al.* (1985), Hannah *et al.* (2007), Henle (1989), Higgins (1999), Higgins *et al.* (2001), Hobbs (1986), Hopper (1981), Immelmann (1960, 1961), Johnstone & Storr (2004), Johnstone, de Rebeira & Smith (1979), Johnstone, Smith & Fuller (1981), Jones (1986), Jurisevic & Sanderson (1994a), Keast (1968a), Ley *et al.* (1997), Longmore (1991a), Mann (1919), Matthew & Carpenter (1990), Mawson & Massam (1995), McKenzie (1996), Mees (1964c), Mitchell *et al.* (1996), Morris & Woolter (2001), Nichols & Nichols (1984), North (1907), Officer (1971), Pepper & Pepper (1973), Possingham & Possingham (1997), Recher & Davis (1998), Reilly (1991a), Saunders & Ingram (1995), Schodde (1976), Schodde & Mason (1999), Sedgwick (1949b, 1968, 1973a, 1984), Serventy & Whittell (1976), Smith & Johnstone (1985), Storr (1965, 1984), Storr *et al.* (1975), Taylor (1992), Tullis *et al.* (1982), Wheeler & Calver (1996), Winslet & Winslet (1987), Woinarski & Tidemann (1991), Woolter & Calver (1981a), Woolter *et al.* (1985), Yan (1993).



ssp. sonoroides

ssp. versicolor

PLATE 41

inches 3
cm 8

ssp. melvillensis

ssp. flavescens

ssp. penicillatus

ssp. carteri

32. Varied Honeyeater

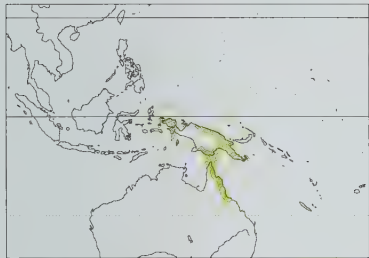
Lichenostomus versicolor

French: Méliphage versicolore **German:** Pirolhonigfresser **Spanish:** Mielerro Versicolor
Other common names: Yellow-streaked Honeyeater

Taxonomy. *Ptilotis versicolor* Gould, 1843, Cape York Peninsula, north-east Queensland, Australia. Forms a superspecies with *L. virescens* and *L. fasciolaris*. Previously considered conspecific with former; has sometimes been considered conspecific with latter, with which it apparently hybridizes to limited extent in S of range (near Townsville). In New Guinea, other proposed races are *intermedius* (originally described from Samarai I, off SE coast) and *vulgaris* (described from Finschhafen, in Huon Peninsula), both synonymized with *sonoroides* but perhaps worthy of recognition; further study required. Two subspecies currently recognized.

Subspecies and Distribution.

L. v. sonoroides (G.R. Gray, 1862) – West Papuan Is (Waigeo, Batanta, Salawati, Schildpad, Misool), and patchily coastal N New Guinea from Vogelkop E (including cities of Lae and Madang) to Milne Bay, and associated offshore islands of Yapen (in Geelvink Bay), Fergusson (in D’Entrecasteaux Is) and other islands off SE peninsula (including Killerton, Samarai and Doi). *L. v. versicolor* (Gould, 1843) – coastal S New Guinea from Merauke E (including some islands, e.g. Wallai I) at least to Port Moresby and probably farther (to Milne Bay); islands of Torres Strait (including Boigu, Saibai, Daru, Yam and Possession); and NE Australia S in coastal NE Queensland (including islands of Great Barrier Reef) to Townsville.



Descriptive notes. 19–24 cm; one male 35.5 g and two females 32.5 g and 33 g (nominate). Nominate race has top of head and neck olive, finely streaked darker, with dark grey forehead; dark mask (combination of black stripe across lores, over eye and extending well down side of neck, with grey upper ear-coverts), bordered below by conspicuous yellow stripe (combination of yellow gape, moustachial stripe and lower ear-coverts) that ends in small white tuft (white tips of rear lower ear-coverts), and with large dirty white patch on lower side of neck; upperbody olive with diffuse brown mottling, merging into brownish on rump and uppertail-coverts, latter mottled olive; tail brownish-olive with olive-green sides; upperwing brown, with olive margins of coverts (smaller coverts appearing mottled) and tertials, and yellow-olive outer edges of secondaries and primaries (forming pale panel); largely yellow below, with strong olive-green streaking, vent cream; undertail olive-grey, underwing creamy buff with olive-grey trailing edge and tip; iris dark red-brown or blackish-brown; bill black; legs blue-grey to dark grey. Sexes alike in plumage, male slightly larger than female. Juvenile is much paler and plainer than adult, top of head slightly paler and unstreaked, upperbody light brown and largely unstreaked, underbody paler with more diffuse streaking, bill grey-black with dull pink base of lower mandible, gape yellow to orange-yellow and swollen. Race *sonoroides* differs from nominate in much more greyish-brown upperparts, duller off-white to greyish-white underbody streaked greyish-brown, only faint yellow wash on breast. **Voice.** In Australia song loud, powerful, resonant and melodious whistles. In New Guinea loud, mellow and musical bubbling series, rising and falling in pitch, or cheerful, loud, varied, bubbling mellow syllables and disyllables, sometimes given only once but usually repeated rapidly several times (e.g. around Madang), phrases mostly of three syllables of low and high pitch, e.g. as repeated “tjo tja hü, tjo tja hü, tjo tja hü”. Often duets in New Guinea, singer responds to another’s song with same song, often starting before first bird finishes; possibly duets in Australia. Other calls reported in Australia include loud distress or alarm cries, excited chattering and loud calls when mobbing owl (Strigiformes), and hissing and chirping in response to dead goshawk (*Accipiter*); in New Guinea, repeated harsh note when scolding.

Habitat. In Australia, mainly in mangroves fringing coasts, estuaries and islands; also in coastal shrubland or scrub adjacent to mangroves or on coral cays, including vegetation dominated by paperbarks (*Melaleuca*), *Banksia*, *Acacia* or casuarinas, or associations including *Terminalia*, *Mimusops*, *Planchonia* with thickets of khoa (*Cordia subcordata*) and scattered shrubs; commonly in parks, gardens and seafront vegetation of coastal towns and villages; rarely in rainforest or eucalypt forests and woodlands. In New Guinea, coconut plantations and groves, mangroves, coastal vegetation, and gardens around houses, and in villages and towns; often on offshore islands. Coastal lowlands; exceptionally, recorded at 700 m at Wanuma (Adelbert Range), in N New Guinea.

Food and Feeding. Nectar and insects; said to take some crustaceans from mud at low tide. Forages by gleanings and probing in outer foliage of mangroves and other trees, and among lower aerial roots and trunks of mangroves. Often probes flowers, including flowering mangroves (e.g. *Sonneratia alba*), *Sesuvium portulacastrum*, umbrella tree (*Schefflera actinophylla*), *Melaleuca*, *Leptospermum*, coconut palms (*Cocos nucifera*), and exotic garden plants such as oleander (*Thevetia*), probably mainly for nectar. Gleans insects; seen also to search for prey on spider webs inside buildings. Noisy; often tame, but can be wary. Forages singly, in twos (probably pairs), and in small, noisy parties of up to ten or occasionally 15 individuals in flowering trees.

Breeding. Poorly known in New Guinea, with unspecified nesting in Jun, laying in Jan, nestlings Mar and Jul, and juvenile mid-Feb; apparently dry season in Australia, where reported Mar–Apr, Jun–Jul and Sept–Oct. Nest a deep but scanty open cup (Australia) or a shallow loose bowl or flat cup (New Guinea) made of rootlets and sometimes grass, bound with plant down and spider web, sparsely lined with fine rootlets, plant fibre and silky plant down, sometimes spider egg sacs attached to outside, one nest with external diameter 9.5 cm, depth 5.7 cm, internal diameter 7.6 cm, depth 3.8 cm, suspended near end of thin horizontal or drooping branch, one secured by one side of rim only, at 0.6–3.6 m (mean 2.5 m) above ground in mangrove, often close to sea or above tidal waters, but reported also in mistletoe (Loranthaceae). Clutch 2 eggs; no information on incubation and nestling periods; both sexes feed nestlings and fledglings.

Movements. Resident.

Status and Conservation. Not globally threatened. Generally common to very common. Abundant in some coastal towns in N New Guinea (e.g. Madang); abundant also on islands in Torres Strait, although generally uncommon on Saibai. No estimates of numbers.

Bibliography. Bailey (1992), Barrett *et al.* (2003), Beehler *et al.* (1986), Bell (1970a), Berggy (1978), Blakers *et al.* (1984), Campbell (1900), Campbell & Barnard (1917), Carter *et al.* (1997), Christidis & Boles (1994), Clarke (2004), Coates (1990), Cooney *et al.* (2006), Draffan *et al.* (1983), Eastwood & Gregory (1995), Finch (1978, 1981c), Fletcher (2000b), Ford, J.R. (1978b, 1982, 1987b), Gannon (1962, 1966), Gregory-Smith & Gregory-Smith (1989), Gyldestolpe (1955b), Hicks (1990b), Higgins *et al.* (2001), Keast (1961, 1968a), Lavery *et al.* (1968), Longmore (1978, 1991a), MacGillivray (1910b), Mackay (1991), Mayr & Rand (1935, 1937), McCarthy (2006), McLean (1993, 1995, 1996, 1997), Melville (1979), Nielsen (1996), North (1905, 1907), Ogilvie-Grant (1915), Rand (1942a, 1942b), Rand & Gilliard (1967), Ripley (1964), Schodde & Mason (1999), Stein (1936), Storr (1984), Thomson (1935), Tubb (1945), Wheeler (1967b), Wieneke (1992).

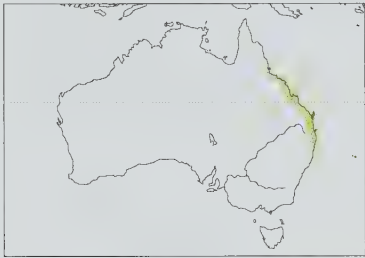
33. Mangrove Honeyeater

Lichenostomus fasciolaris

French: Méliphage des mangroves **German:** Mangrovehonigfresser **Spanish:** Mielerro de Manglar
Other common names: Fasciated/Island/Scaly-throated Honeyeater

Taxonomy. *Ptilotis fasciolaris* Gould, 1854, Moreton Bay, Queensland, Australia. Forms a superspecies with *L. virescens* and *L. versicolor*. Formerly considered conspecific with latter, with which it apparently hybridizes to limited extent at N end of range (near Townsville). Monotypic.

Distribution. Coastal E Australia from NE Queensland (Ross R, near Townsville) S, including islands from Whitsunday Group S to Moreton Bay, to NE New South Wales (Tweed R–Tweed Heads, and disjunctly farther S near Broken Head, Clarence R and mouth of Macleay R, and once at Wauchope, on Hastings R).



Descriptive notes. c. 19.5 cm; male 23.9–33.1 g, female 22–30 g. Plumage is olive-brown above, grading to greyish-brown on rump and uppertail-coverts, with fine dark streaking on top of head and hindneck, diffuse brown mottling on anterior upperbody, and olive mottling on uppertail-coverts; broad black mask extending well down side of neck (and including upper ear-coverts, which can appear paler than rest of mask), bordered below by yellow stripe (combination of pale yellow to off-white gape, narrow yellow moustachial stripe, and yellow lower ear-coverts) that ends in small white tuft (white rear lower ear-coverts), and

meets large greyish-white patch on lower side of neck; tail and upperwing olive-brown, dull olive-green outer edges on rectrices and remiges (forming greenish sides of tail, greenish panel on folded wing); chin and throat finely barred dark grey-brown and dull yellow; upper breast dark greyish, forming breastband, rest of underbody off-white with heavy greyish-brown streaks (sparsely on belly), undertail grey-brown, underwing cream to buff-pink with grey-brown trailing edge and tip; iris blue-grey; bill black; legs dark grey or bluish-grey. Sexes alike in plumage, male slightly larger than female. Juvenile is very similar to adult but plainer and duller, with no streaking or mottling on top of head and anterior upperbody, slightly browner rump and uppertail-coverts, pale yellow chin and throat slightly mottled (not barred) brown, paler breastband, weaker streaking below. **Voice.** Song loud, melodious and ringing, but varying, e.g. “whit-u-we-u”. Also scolding chatter.

Habitat. Mainly mangrove forests and woodlands fringing coasts, bays, estuaries and islands; less often in coastal shrubland, woodland or scrub (e.g. of *Eucalyptus*, *Banksia*, *Melaleuca* or combinations of these) near mangroves; regular visitor to parks and gardens in some towns near mangroves.

Food and Feeding. Nectar and invertebrates, possibly fruit. Invertebrates include insects, marine snails (Gastropoda) and crabs (Decapoda). Forages mainly in mangroves (e.g. *Aegiceras*, *Rhizophora*), among outer foliage, at flowers and, at low tide, over lower trunks, roots and pneumatophores; visits flowering trees and shrubs (e.g. *Banksia*, *Castanospermum*, *Erythrina*) in adjacent habitats. Gleans invertebrates, and once seen while trying to extract a leaf-curling spider from its leaf. Active, noisy and pugnacious. Usually singly or in small loose groups.

Breeding. Aug–Dec (peak Sept) and in N of range also Apr–May. Nest cup-shaped, of dried grasses and seagrass or plant fibre bound with spider web and matted egg sacs, lined with fine rootlets or fine grass, hair and plant down, for two nests external diameter 8.9–9.5 cm, depth 5.7–7.6 cm, internal diameter 6.4–7.6 cm, depth 3.8–5.1 cm, usually suspended by rim, occasionally supported, 0.5–2.7 m above ground (one was 1.2 m above ground and 0.75 m above high-water mark), almost always in small, dense mangrove but once in *Acacia* shrub, and reported in mistletoe (Loranthaceae). Clutch 2 eggs (single-egg clutches perhaps incomplete); no data on incubation and nestling periods; both adults feed nestlings and fledglings. Nests parasitized by Pallid (*Cuculus pallidus*) and Fan-tailed Cuckoos (*Cacomantis flabelliformis*), and perhaps Horsfield’s Bronze-cuckoo (*Chrysococcyx basalis*).

Movements. Resident; some local movements to exploit flowering vegetation. In Moreton Bay, in SE Queensland, numbers increase May–Jun and decline Jul–Dec, possibly result of local seasonal movements. Vagrant on One Tree I, in Capricorn Group (S Great Barrier Reef).

Status and Conservation. Not globally threatened. Restricted-range species: present in East Australian Mangroves Secondary Area. Fairly common locally; rare in S of range. No estimates of abundance levels. Possibly adversely affected by coastal development in some areas. Range thought to have expanded S over last 50 years, with first records at Yamba (where now resident) in 1947, and some records farther S (e.g. near mouth of Macleay R in 1958, and slightly farther S in 1961).

Bibliography. Barrett *et al.* (2003), Bielewicz & Bielewicz (1996), Blakers *et al.* (1984), Campbell (1900), Cayley (1958), Colston (1974), Cooney *et al.* (2006), Dawson *et al.* (1991), Ford, J.R. (1978b, 1987b), Gannon (1962, 1966), Gosper (1986), Griffioen & Clarke (2002), Higgins (1999), Higgins *et al.* (2001), Hindwood (1956a, 1959), Keast (1968a), Lavery *et al.* (1968), Longmore (1978, 1991a), McCarthy (2006), Morris *et al.* (1981), Officer (1971), Robertson & Woodall (1982, 1983), Schodde & Mason (1999), Storr (1984).

34. White-gaped Honeyeater

Lichenostomus unicolor

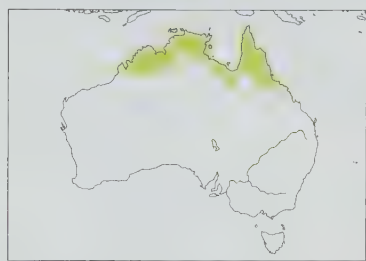
French: Méliphage unicolore **German:** Wulsthonigfresser **Spanish:** Mielerro Unicolor
Other common names: White gaped/Erect-tailed/River/Uniform-coloured Honeyeater

On following pages: 35. Yellow Honeyeater (*Lichenostomus flavus*); 36. White-eared Honeyeater (*Lichenostomus leucotis*); 37. Yellow-throated Honeyeater (*Lichenostomus flavicollis*); 38. Yellow-tufted Honeyeater (*Lichenostomus melanops*); 39. Purple-gaped Honeyeater (*Lichenostomus cratitius*); 40. Grey-headed Honeyeater (*Lichenostomus keartlandi*); 41. Yellow-plumed Honeyeater (*Lichenostomus ornatus*); 42. Grey-fronted Honeyeater (*Lichenostomus plumulus*); 43. Fuscous Honeyeater (*Lichenostomus fuscus*); 44. Yellow-tinted Honeyeater (*Lichenostomus flavescens*); 45. White-plumed Honeyeater (*Lichenostomus penicillatus*); 46. White-fronted Honeyeater (*Purnella albifrons*).

Taxonomy. *Ptilotis unicolor* Gould, 1843, Port Essington, Northern Territory, Australia.

Thought to form a species group with *L. flavus*. Monotypic.

Distribution. N Australia from Melville I and N Western Australia (Kimberley Division and off-shore islands) E throughout Top End of Northern Territory (S to upper Victoria R in SW and to Barkly Tableland in SE), and on Groote Eylandt, to N Queensland (S to near Proserpine; occasional records farther S, e.g. Mackay, and on Atherton Tableland).



Descriptive notes. Male 19–22 cm, 27.8–40.4 g; female 17–20 cm, 25–33 g. Plumage is plain dark olive-brown to greyish-olive above, and slightly paler and greyer below, slightly paler on vent and with faint pale yellow tinge on centre of belly; diffuse dusky lores, white to cream gape bulging upwards in semi-circular patch; tail feathers and secondaries have faint greenish wash on outer edges, primaries have fine off-white outer edges; undertail olive-grey, underwing greyish-white and merging into dusky on trailing edge and tip; iris brown or grey-brown, sometimes olive-grey or blue-grey; bill black; legs dark grey to black, soles paler. Sexes alike

in plumage, male slightly larger than female. Juvenile is very similar to adult and some probably inseparable in field, but initially distinguished by combination of softer plumage of upperbody, faint brown tinge on hindneck, upper mantle and rump, slightly stronger yellow wash on centre of belly, and (at least sometimes) brighter yellow gape. **VOICE.** Song loud and ringing or fluting, three similar phrases separated by interval of c. 0.5 seconds, e.g. “whit-o-wee” or “whit whit, awhit-whit, awhit-whit”; usually as duet whenever pair-members meet and to advertise territory, male initiating duet and female joining in after a pause (second and third phrases completely synchronized); can start song before alighting from flight, and male may respond instantly with loud song to unusual sounds, to entry of rival into territory, or to approach of potential predator. Apparent contact call, given frequently, “chiew” or “chop”, uttered at intervals of many seconds to minutes, also as nearly monosyllabic clicking “tyiet”; other calls include short, harsh repeated “chirrup” or “chirp” or rapid “chp-chp-chp-chp-chp-chp”, seldom heard and thought to be a contact call, also a soft warble by brooding bird on approach of mate, also loud chattering. Snaps bill during agonistic interactions.

Habitat. Mainly riparian forests and woodlands, frequently riverine or swamp associations dominated by paperbarks, e.g. weeping paperbark (*Melaleuca leucadendra*), or, less often, *Lophostemon*, or mixed assemblages of *Melaleuca*, *Lophostemon*, *Eucalyptus*, casuarina or *Erythrina*, and usually with dense thickets of screw-palms (*Pandanus*) and *Acacia* in understorey, or in mixed stands of *Eucalyptus* and *Pandanus*. Commonly also in monsoon rainforests. Ranges into open eucalypt woodland or savanna adjoining riverine forest, usually with grassy understorey and scattered shrubs or shrubby understorey; and occurs in ecotone between monsoon forest and open forest of acacias and eucalypts. Sometimes in mangroves, in *Acacia* forest or scrub, in spinifex (*Triodia*) grassland with scattered shrubs on sandstone plateaux, and in wet mosaic grassland and sedgeland. Also in gardens and parks in towns and around human habitation.

Food and Feeding. Diet includes nectar, fruit, seeds and invertebrates (mainly insects, also spiders). Usually forages in dense vegetation, from canopy to near ground; mostly on bark of trunks and branches of trees, shrubs and palms, or among green or dead foliage, but also on fruit and at flowers of trees and shrubs, and in air. Selects flowers that provide best source of nectar, which obtained by probing. Arthropods mainly gleaned from foliage (including palm fronds) and bark; captures aerial insects by sallying, less often performs sally-hovering to take prey from foliage, or flutter-chasing. Inspects spider webs; searches around buildings and even enters them. Seen to eat arils attaching seeds to seedpods of black wattle (*Acacia auriculiformis*). Usually singly, in twos (probably pairs) or threes, or in small groups of up to 6–8 individuals; sometimes feeds with other honeyeaters, or with other bird species.

Breeding. Probably throughout year, and recorded in all months except Jun near Darwin (Northern Territory); clutches Jul–Mar. Nest built by female, accompanied by male, a deep cup, usually made of bark or grass, bound with spider web or spider egg sacs, sometimes includes rootlets, grass, hair, plant fibres, twigs or casuarina needles, unlined or sparingly lined with fine grass and with plant down, nest said by some authors to be covered with shining layer of saliva (which helps to bind materials and make nest solid), external diameter 8–12.1 cm, depth 7–8.9 cm, internal diameter 5.4–8 cm, depth 3.8–6.4 cm; usually suspended from twig fork in topmost branches of live leafy tree or shrub, including mangrove and in mistletoe (*Loranthaceae*), occasionally near centre of tree, usually near water; six nests were 1.5–3.3 m (mean 2.18 m) above ground, but others reported as low as 1.2 m and as high as 12 m. Clutch usually 2 eggs; incubation by female, from second egg, period 15–16 days; chicks brooded by female, or allegedly by both parents, fed by both parents (possibly by female only for first 2 days), nestling period at one nest 13–14 days; both adults feed fledglings.

Movements. Resident. No evidence of nomadism, but possibly moves locally to exploit flowering; at Victoria River Downs, local range contracts during dry season. Occasional visitor or vagrant to sites at edge of range; unconfirmed early report from NE New South Wales.

Status and Conservation. Not globally threatened. No estimates of total population; recorded densities of up to 2 birds/ha. Formerly considered common at Mt Isa, in NW Queensland, but now recorded only N of there; formerly considered common or recorded at Ayer and Mission Beach, but no recent records. In study of effects of long-term exclusion of fire in Northern Territory forests, this species was found to be significantly more abundant in unburnt quadrats.

Bibliography. Aumann (1991), Barrett *et al.* (2003), Blakers *et al.* (1984), Boeckel (1979a, 1979b, 1980a), Braithwaite *et al.* (1984), Bravery (1970), Brooker *et al.* (1990), Campbell (1900), Collins (1995), Colston (1974), Cooney *et al.* (2006), Deignan (1964), Ford (1986), Franklin (1997), Franklin & Noske (1998, 1999, 2000a), Frith & Davies (1961), Frith & Hitchcock (1974), Gannon (1962), Griffiths & Clarke (2002), Higgins *et al.* (2001), Immelmann (1961), Johnstone (1983), Johnstone & Burbridge (1991), Johnstone & Storr (2004), Johnstone *et al.* (1977), Keast (1968a, 1985a, 1985b), Lavery *et al.* (1968), McKean (1985), Nielsen (1996), North (1907), Noske (1990), Noske & Franklin (1999), Robinson (1961), Schodde (1976), Schodde & Mason (1999), Slater (1959), Storr (1977, 1984), Verbeek *et al.* (1993), Woinarski & Fisher (1995b), Woinarski, Press & Russell-Smith (1989), Woinarski, Risler & Kean (2004), Woinarski, Tidemann & Kerin (1988).

35. Yellow Honeyeater

Lichenostomus flavus

French: Méléphage jaune **German:** Zitronenhonigfresser **Spanish:** Mielero Amarillo
Other common names: Broadbent's Honeyeater

Taxonomy. *Ptilotis flava* Gould, 1843, Port Essington, N coast of Australia = Cape York, north-east Queensland, Australia.

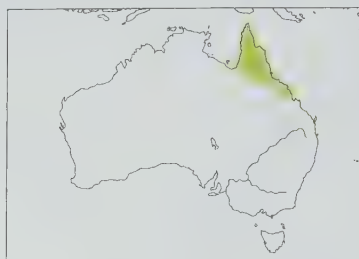
Thought to form a species group with *L. unicolor*. Geographical variation possibly clinal (e.g. wing length appears to decrease clinally from S to N, but much individual variation), and differences

between races slight; races appear to be separated by high ridges of Burdekin–Lynd Divide but may come into contact along narrow lowland corridor E of Great Divide, and apparently intergrade where they abut; more material from S of range required. Two subspecies provisionally recognized.

Subspecies and Distribution.

L. f. flavus (Gould, 1843) – Cape York Peninsula and coastal and subcoastal far NE Queensland S to about Burketown (SE Gulf of Carpentaria) in W and to Burdekin–Lynd Divide in E.

L. f. addendus (Mathews, 1912) – coastal and subcoastal CE Queensland, from high country of Burdekin–Lynd Divide S to Broad Sound.



Descriptive notes. c. 18 cm; male 19–30.8 g, female 16–25.4 g. Nominata race mainly olive-yellow above and on side of head, lemon-yellow below; diffuse lemon-yellow patch behind eye (sometimes extending narrowly over eye) and lemon-yellow moustachial stripe, isolating dusky olive-yellow eyestripe, and with narrow olive-yellow submoustachial stripe and lemon-yellow chin and throat; remiges and rectrices have broad lemon-yellow outer edges (folded wing and side of tail brighter yellow than upperparts); undertail dull olive-yellow; underwing yellow with brownish-grey trailing edge and tip; iris olive-grey to dark brown; bill black,

gape black or yellow (possibly varying seasonally); legs brownish-grey at front, brownish-orange at rear. Sexes alike in plumage, male larger. Juvenile is similar to adult but duller, with less obvious facial pattern, plumage also appears softer, and gape also puffy and yellow (at least at first). Race *addendus* tends to be slightly duller olive above than nominate, and has faint greyish-olive wash on breast and flanks, faint and diffuse darker streaking on flanks. **VOICE.** Vocal, especially at roosts or when mobbing; calls in flight. Four vocalizations distinguished in one study. Song a loud, melodious whistle, heard throughout day; also in duets, male and female alternating with different segments of song. Also gives short trill that ends in sharp whistle; noisy metallic “tut-tut-tut”; and soft mellow chattering notes. Other calls (either different descriptions of above-mentioned or possibly separate vocalizations) include piercing “whee-whee”, bold loud clear whistling note, merry “whee-a, whee-a”, and loud single high-pitched whistle; also short squeaky chirrup; and peevish, scratchy “jab!” in alarm.

Habitat. Open riparian forests and woodlands, particularly around swamps and other wetlands, typically dominated by *Eucalyptus* and frequently with understorey of paperbarks (*Melaleuca*) and bottlebrushes (*Callistemon*); also riparian forests and woodlands dominated by paperbarks and *Lophostemon*, often with dense understorey of palms. Sometimes in ecotone between forest or woodland and rainforest, or at edges of rainforest patches (but not within extensive rainforest), and in mangroves. Often in agricultural land, including sugar-cane crops, and in parks and gardens in towns and cities. Mainly coastal lowlands, extending into ranges and tablelands, occasionally as high as c. 1100 m.

Food and Feeding. Diet includes nectar, fruit and small arthropods (mainly insects, some spiders). Forages mainly in trees and shrubs, among foliage, trunks and branches, at flowers, including mistletoe (*Loranthaceae*) flowers, and fruit, sometimes in air or on ground. Nectar obtained directly by probing; insects gleaned from foliage and twigs, seized in aerial sally, or caught in sally-hover in front of spider webs. Acrobatic, often hangs upside-down to reach food. At a sugar mill, seen to feed on sugar accumulated along rafters, conveyor belts and beneath storage bins, and to drink molasses from drains. Usually singly, in pairs or in small groups of 3–4 individuals; will congregate at sources of abundant food (e.g. flowering eucalypts, paperbarks or mistletoes), where can associate with other species; once seen in loose mixed-species meliphagid flock with over 75 individuals of ten species.

Breeding. Recorded in all months, clutches Aug–May and nestlings Sept–May; one pair known to have raised three broods in one year. Occasionally co-operative breeder, with helper at nest. Nest probably built only by female (offspring from previous season once seen to assist), a shallow, often lightly constructed cup of bark with some grass, less often fibrous roots or palm fibres, sometimes bound together (and to nest plant) with spider web and arthropod egg sacs, usually lined with fine grass or bark, sometimes unlined, external diameter 7.5–8.9 cm, depth 5.1–7 cm, internal diameter 5.5–7 cm, depth 3.2–5.1 cm; usually suspended from fork or thin twigs 0.7–7.8 m (mean 4.1 m) above ground, occasionally higher (to 9 m), in leafy shrub or tree, but sometimes supported, reported also in mistletoe, one attached at three points with spider web. Clutch usually 2 eggs, mean 1.92 (clutch of 4 incubated, and almost certainly laid, by two birds); incubation by female, period c. 16 days; roles of sexes in brooding not known, probably by female only, chicks fed by both parents, sometimes by helpers when present, nestling period 12–14 days; both parents feed fledglings. Nests parasitized by Brush (*Cacomantis variolosus*) and Pallid Cuckoos (*Cuculus pallidus*). From 39 eggs in 20 nests, 0.75 fledged young per nest; of 29 nests, 48.3% successfully fledged at least one young.

Movements. Resident throughout range; in study of colour-ringed population at Townsville, found to be sedentary and territorial throughout year. Claims of nomadism at some sites appear to refer to local movements to exploit flowering.

Status and Conservation. Not globally threatened. Fairly common. No estimates of total population; recorded density of 0.02 birds/ha along Lockhart R.

Bibliography. Barrett *et al.* (2003), Beruldsen (1979), Blakers *et al.* (1984), Bravery (1970), Campbell (1900), Colston (1974), Cooney *et al.* (2006), Ford (1986, 1988), Ford *et al.* (1980), Forshaw & Muller (1978), Gannon (1962), Garnett & Bredl (1985), Garnett & Cox (1983), Griffiths & Clarke (2002), Higgins (1999), Higgins *et al.* (2001), Keast (1968a, 1985a), Lavery *et al.* (1968), Marshall (1934a), McLean (1995), Nielsen (1996), North (1907), Pizzey (1980), Sage (1994), Schodde & Mason (1999), Storr (1953, 1984), Thomson (1935), Wheeler (1967b), White (1922).

36. White-eared Honeyeater

Lichenostomus leucotis

French: Méléphage leucotique **German:** Schwarzkehl-Honigfresser **Spanish:** Mielero Orejiblanco
Other common names: Australian White-eared Honeyeater; New Norcia Honeyeater (*novaenoriae*)

Taxonomy. *Turdus leucotis* Latham, 1801, Nova Hollandia = region of Port Jackson, New South Wales, Australia.

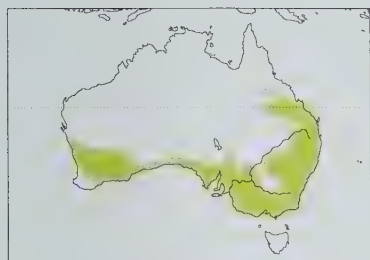
Forms a superspecies with *L. flavicollis*. Nominata race and *novaenoriae* intergrade along inner slopes of Great Divide from SE Queensland S to SE South Australia. Three subspecies recognized.

Subspecies and Distribution.

L. l. novaenoriae (Milligan, 1904) – S Western Australia (S from Kalbarri area) E to W edge of Nullarbor Plain, and across coastal and subcoastal mallee to SE South Australia (S from S Flinders Ranges), and from E Queensland (S from Burra Range, E of Hughenden) S through E Murray–Darling Basin and W watershed of Great Divide to SW & SE New South Wales and adjacent Victoria.

L. l. leucotis (Latham, 1801) – SE Queensland (about Bunya Mts) S, on and E of Great Divide, to Victoria and SE South Australia.

L. l. thomasi (Mathews, 1912) – Kangaroo I, in SE South Australia.



Descriptive notes. 16.5–21.5 cm; male 18–35 g and female 18–30 g (nominate), male 15–28 g and female 15–21 g (*novaeboracae*). Nominate race is bright olive-green above and paler yellow-olive below, with grey top of head and hindneck finely streaked black (except on forehead), and black side of head and neck to chin, throat and upper breast enclosing conspicuous large white ear-patch (can be tinged yellow at rear); sometimes chin to upper breast slightly duller and paler than face, and breast can be finely flecked with grey; remiges have olive-yellow edges (broad panel on closed wing, contrasting little with rest of wing and

upperbody), and uppertail has diffuse yellow-olive sides; underbody mottled with dark grey (except on centre of belly); underwing yellowish, mottled with grey on median and greater coverts, and with grey-olive trailing edge and tip; iris red-brown; bill black, gape black to grey-black; legs grey-black. Sexes alike in plumage, male larger than female. Juvenile is much duller and browner than adult, cap and hindneck dark olive and diffusely streaked brown, face and bib dark brown to brownish-grey, rear ear-patch strongly tinged yellow, upperparts olive-brown with greyer olive uppertail-coverts, underbody duller olive-yellow and mottled darker, bill duller, sometimes dull yellowish or pinkish base of lower mandible, gape pink or dirty yellow and initially swollen, iris dark brown to olive-brown. Races vary little, mainly in size and in tone of plumage: *novaeboracae* is slightly smaller than nominate, upperparts slightly duller olive, underparts slightly duller and paler yellowish-olive, off-white fringes at tail tips narrower; *thomasi* is very similar to previous, differing in duller and greyer-toned underbody with smaller unmarked yellowish patch in centre of belly, also male slightly larger. **VOICE.** Generally noisy (seasonal switch in main calls used). Eight main calls: most frequent “Chew call” and “Two-note call”; “Clock call”, “One-note call” and “Scolding” used often; “Rapid Clock”, “Trill” and “Chip” infrequent. Chew call of “chew” or “choor” repeated 1–8 times (two and three repeats most common), used in variety of circumstances, including while foraging and when perched, and Two-note call of double-note syllables repeated 1–8 times (two and three repeats most common), “tch-tchew, tch-tchew, tch-tchew” used in same circumstances as previous (significant temporal differences in use of these two calls; decline in use of chew and increase in use of two-note correspond with start of breeding, and peak use of two-note in late winter and early spring corresponds with peak of breeding.) One-note call of single-note syllables repeated 1–8 times, with no apparent seasonal trends in use. Clock call of single syllables repeated rapidly, sounding like “clock-clock-clock-clock-clock...”, during foraging and when perched, often when partner nearby; peak use when switching from chew to two-note calls, which also precedes start of breeding. Rapid-clock similar to preceding call (possibly better considered a variant of it), but syllables repeated more rapidly; given infrequently over year. Quiet trill occasionally during interactions at territorial boundaries, aerial chases, during interactions between partners, and occasionally when interacting with young. Chip call a single-note vocalization, similar to scolding, given during foraging, more often when other birds nearby. Scolding a brief, broad-band call, typically in long bouts, often when foraging or when alarmed, including among other vocalizations. Other calls include very loud single or double “tchoo” (probably same as first two of above-described eight main calls); occasional “little bubble of song” and a chortle; liquid “quilt” during foraging; and frog-like call (which seems inappropriate for any known calls of this species).

Habitat. Dry woodlands and open forests dominated by eucalypts, usually where trees have decorticated bark on trunks and branches, and with dense well-developed shrub understorey (including heath), and widespread in mallee woodlands, shrublands or mallee heath; less often in dry eucalypt forests and woodlands with grassy understorey (probably not when breeding, for which requires shrub layer). Recorded also in dense regrowth within eucalypt forest and woodlands. In study in Victoria, presence significantly associated with trees having large amounts of decorticated bark, high density of scent bark (*Eucalyptus aromaphloia*) stems, and low level of eucalypt dieback. In E Australia, also commonly in damp and wet sclerophyll forests dominated by eucalypts such as mountain ash (*Eucalyptus regnans*). Also coastal heathlands and tree heaths, especially where adjoining forests or woodlands; *Banksia* or *Angophora* woodlands or shrublands with heath understorey; and semi-arid *Acacia* shrublands or woodlands of lancewood (*Acacia shirleyi*) and brigalow (*Acacia harpophylla*). Occasionally in paperbark (*Melaleuca*) and tea-tree (*Leptospermum*) shrublands and thickets, or forests of cypress-pine (*Callitris*); very occasionally foraging in mangroves. Rarely in agricultural areas, but enters orchards and vineyards and rural gardens. Very rarely in exotic plantations of pines (*Pinus*), usually with understorey of native vegetation. Coasts and lowlands to high altitudes, including to tree-line in Southern Highlands (New South Wales).

Food and Feeding. Mainly invertebrates (insects, also spiders), as well as nectar, lerp, manna and honeydew, and some fruit; estimated ratio of insect-feeding to nectar-feeding in two studies 89:11 and 72:27:5. At some sites, feeds mostly on honeydew of psyllids and eriococcids (Coccoidea) and manna, rarely on nectar. Forages at all heights, from ground to canopy, but often in subcanopy of trees and in shrub layer; only occasionally aerially or on ground or on fallen timber, but appears to forage more on ground in semi-arid regions. Forages mostly on bark, less often foliage, fruits and buds, eucalypt seed capsules, or flowers. Mainly in *Eucalyptus*, exploiting non-eucalypts often only when in flower. Probes beneath, or gleams from, loose, peeling or hanging bark, and probes crevices in rough-barked species such as bloodwoods (*Corymbia*); gleams from foliage; takes nectar from flowers by probing; occasionally takes fruit, including in orchards and vineyards, or takes insects by sallying (sally-strikes in air for flying insects, sally-strikes on twigs and foliage) or pouncing. Feeds at wounds in trunks and branches, including on exudate from *Acacia*. In S South Australia (including Kangaroo I), most food taken from bark was honeydew of coccids. Normally in twos (usually pairs), less often singly (partner often not far away), occasionally in small family parties. In much of range, pair maintains large permanent all-purpose territory, but sometimes gathers at sources of abundant food; occasionally joins mixed-species flocks. Can be aggressive towards other species.

Breeding. Recorded in all months, mainly late winter to mid-summer and with resurgence in activity in autumn, most clutches Aug–Dec, and in S Tablelands and Highlands season varies with altitude; re-lays within season, whether earlier attempt successful or failed. Female collects material, accompanied by male, nest a deep and thick-walled open cup, typically neat and firmly woven (some coarsely made), of grass or bark or both, less often plant stems and twigs, leaves, plant down, fine rootlets and moss, bound with spider web and egg sacs and cocoons of spiders or insects, usually deeply lined with mammalian fur or hair (well known for habit of collecting hair or fur from live mammals, including from people), less often with plant down or fibres, bark, feathers, fine grass and artificial fibres; external diameter 8.9–10.2 cm, depth 4–8.9 cm, internal diameter 5–6 cm, depth 3.8–4.5 cm; usually suspended, sometimes supported, often in small vertical fork or upright branches in live shrub or low tree, occasionally grass tussock (usually sheltered by overhanging vegetation), fallen branches, epicormic growth from trunk of burnt tree, once between dead mallee stem and peeling bark, typically bound to twigs and branches by grass stems and leaves; nearly always close to ground, in one study at 0.2–9 m (mean 1 m), and recorded as low as c. 15 cm above ground in grass

tussock. Clutch usually 2 eggs, occasionally 3 and infrequently 1 (one nest contained four young), mean 2.09; incubation of eggs and brooding of young by female only, nestlings fed by both parents; combined incubation and nestling periods at one nest 28–32 days; fledglings fed by both parents. Nests parasitized by Fan-tailed (*Cacomantis flabelliformis*) and Pallid Cuckoos (*Cuculus pallidus*) and Horsfield’s (*Chrysococcyx basalis*) and Shining Bronze-cuckoos (*Chrysococcyx lucidus*). From 52 eggs in 26 nests, 0.31 fledged young per nest; of 40 nests, 45% fledged at least one young.

Movements. Resident; some local movements. Partial altitudinal migration in highlands of SE Australia: recorded at all altitudes below tree-line throughout year, but numbers at different altitudes change seasonally, with descent from high country in winter and subsequent increase in abundance at lower altitudes (including coastal SE Australia), and return in later winter–spring; e.g. in Australian Capital Territory, above 1300 m less common in mid-winter but populations re-established by Oct, at 1100–1300 m common at all times, below 1100 m marked increase from late Mar through winter and starts to return to higher altitudes about Aug. Extent of other observed movements not known, e.g. irregular or vagrant in some regions, and occasional influxes or congregations in response to flowering of *Eucalyptus*.

Status and Conservation. Not globally threatened. Fairly common but somewhat patchily distributed, e.g. nominate race largely absent from coastal areas of SE Queensland (S of Rockhampton) and NE New South Wales (S to Central Coast). No estimates of global population, but recorded densities of up to 1.8 birds/ha and mean densities of up to 1.3 birds/ha. Appears to have declined in Wheatbelt of SW Australia as a result of extensive land clearance; may have declined in E Victoria (E Gippsland). Thought not to fly readily over large open spaces. Has been claimed that loss of native mammals after European settlement created shortage of nesting material, explaining this species’ penchant for taking hair from humans.

Bibliography. Barrett *et al.* (2003), Baxter (1989), Bedggood (1980), Bell (1980b), Blakers *et al.* (1984), Campbell (1900), Chaffin (1933), Chisholm (1968), Colston (1974), Cooper, R.M. (1986), Cooper, R.P. (1975a), Disney & Stokes (1976), Driscoll (1977), Emison & Porter (1978), Emison *et al.* (1987), Er (1997), Er *et al.* (1998), Ford, H.A. & Bell (1981), Ford, H.A. & Paton (1976a), Ford, H.A. (1985), Ford, H.W. (1908), Ford, J.R. (1971, 1987b), Ford, J.R. & Stone (1957), Ford, J.R. *et al.* (1980), Friend (1982), Gall & Longmore (1978), Gannon (1962), Gell (1977), Griffioen & Clarke (2002), Halse *et al.* (1985), Hermes (1981), Higgins (1992, 1999), Higgins *et al.* (2001), Hindwood (1930a, 1944, 1967), Holmes & Recher (1986a), Johnstone & Storr (2004), Keast (1968a), Keast & Condon (1968), Leach (1988), Leishman (1994), Lenz (1981), Loyn (1980, 1985a, 1985b, 1993, 1998), Luck *et al.* (1999), Mac Nally (1997), Mason (1985), McKeown (1936), McLean *et al.* (2005), Milligan (1904), Morris & Wooller (2001), Morris *et al.* (1981), North (1907), Paton, D.C. (1980), Paton, J.B. (1975), Pearce (1966a, 1996b), Possingham & Possingham (1997), Pyke (1985), Pyke & Recher (1988), Pyke *et al.* (1989), Recher & Abbott (1970b), Recher & Davis (1998), Recher & Holmes (1985), Recher *et al.* (1985), Saunders & Ingram (1995), Schmidt (1978), Schodde & Mason (1999), Sedgwick (1949a, 1949b), Serventy & Whittell (1976), Smith (1984), Stone (1917), Storr (1984), Taylor (1992), Traill (1985), Turner (1992), Woinarski (1989b), Woinarski, Cullen *et al.* (1989), Wolstenholme (1929), Wykes (1982).

37. Yellow-throated Honeyeater

Lichenostomus flavicollis

French: Méliophage à gorge jaune **German:** Gelbkohl-Honigfresser **Spanish:** Mielero Cuelligualdo

Taxonomy. *Melithreptus flavicollis* Vieillot, 1817, Nouvelle Hollande = King Island, Bass Strait, southern Australia.

Forms a superspecies with *L. leucotis*. Monotypic.

Distribution. Tasmania and islands in Bass Strait (King I and Furneaux Group).



Descriptive notes. Male 20–23 cm, 18–40 g; female 18–20 cm, 22–33.5 g. Plumage is bright olive-green above, with dark silvery grey head and neck, and bright yellow chin and throat; grey-black forehead, lores, malar area and ear-coverts continuous with diffuse narrow blackish band across bottom of throat-patch, and merging into fine blackish streaking on top of head and neck; diffuse silvery patch behind and below eye, small pale yellow patch on rear ear-coverts; edges of remiges and rectrices slightly brighter yellow-olive than upperparts; breast dark grey, grading to paler grey belly, vent and flanks with olive wash, and diffusely mottled

darker throughout; undertail-coverts dark grey-brown, mottled with yellow, undertail dull greyish-olive; underwing buff-yellow, merging to dark grey on trailing edge and tips and with yellow leading edge of coverts; iris reddish-brown, sometimes dark orange to pale brown; bill black, gape black to dirty pink or dirty yellow; legs grey-black, soles paler. Sexes alike in plumage, male larger than female. Juvenile is slightly duller than adult, with brown wash on top of head, hindneck and mantle, grey of neck merging into olive of upperparts (not sharply demarcated), paler and greyer malar area and anterior ear-coverts, paler and less uniform throat, pink-buff or yellow gape, and duller red-brown to straw-yellow iris. **VOICE.** Loud and powerful. Eight main vocalizations, with “Trill” and “Tonk song” heard throughout year, most often in non-breeding season, and “Breeding song” in breeding season; all three used in territorial advertisement or mate attraction. Breeding song varies geographically. Most common vocalization is tonk song, a loud, resonant “tonk, tonk, tonk” or whistled “tchook, tchook, tchook...” or “chock-chock-chock...”, at Mt Nelson, mean of 4 notes per song. Breeding song a loud “de-witt” or whirling “churuk-churuk...”, usually repeated 3–4 times in a bout, sometimes only once or in bouts of up to six; at Mt Nelson, mean of 7 notes/song. Male gives tonk and breeding songs more often and more loudly than female. Trill a warbling trill or rattling repetition of same note, or low running notes; at Mt Nelson, mean 15 notes/song. “Churr” (or aggressive call) a harsh “kra-kra-kra”, often in flight and by both sexes, associated with agonistic interactions or territorial behaviour. “Challenge call” harsh and high-pitched, of rapidly repeated notes, during fights with conspecifics. Harsh high-pitched “Squeal” by male during distraction display. “Cheep” by intruding female when chased from territory. Harsh “Food call” of rapidly repeated notes, by female when approaching with food, by both sexes when feeding fledglings. Other vocalizations include soft version of breeding song, usually alternating with cheep, by female when attempting to collect hair for nesting; and purring call from incubating female. Snaps bill during agonistic interactions.

Habitat. Dry and wet sclerophyll forests dominated by eucalypts, including dry eucalypt forests with understorey of sclerophyllous shrubs or grassy ground layer, and damp to wet sclerophyll forest with understorey of either sclerophyllous shrubs or cool-temperate rainforest elements. Less often in open eucalypt woodland or subalpine eucalypt forest, usually with diverse (often heath) shrub layer; cool-temperate rainforest; coastal and riparian heathlands or closed wet shrublands dominated by *Eucalyptus*, *Banksia*, *Hakea*, *Leptospermum*, *Acacia*, casuarina and grass-trees (*Xanthorrhoea*) and other heath species. Commonly in urban areas and towns, in parks, gardens and reserves. Rarely, in buttongrass (*Gymnoschoenus sphaerocephalus*) sedgeland or heath-sedgeland with scattered eucalypts; alpine *Poa*

grassland and lower-altitude hermland; and low coastal scrub. Sometimes in orchards, and in cleared or partly cleared land, including agricultural land. Sea-level to c. 1550 m, mostly below 1000 m.

Food and Feeding. Arthropods (insects, some spiders), also nectar and fruit, possibly seeds. Forages at all levels, from canopy to, rarely, ground; mainly in large trees, as well as in saplings, shrubs and among litter or herbs on ground; once among reeds. Searches twigs, branches and foliage, mainly in canopy and on trunks of large trees. Main methods are gleaning from surfaces of bark and foliage, or from ground, and probing beneath loose bark of branches and trunks; often sallies for flying insects, sometimes pulls at bark. Only occasionally forages at flowers, taking insects and occasionally probing for nectar. When foraging on bark, prefers large trees with greater surface area. Agile; often hangs upside-down. Usually singly or in twos (probably mostly pairs) throughout year, occasionally in family groups; may congregate in small groups at abundant sources of food. Aggressively defends resources against conspecifics and other species, especially other honeyeaters; in non-breeding season, flocks of smaller *Melithreptus* can overrun territories of present species.

Breeding. Season late winter to mid-summer, mainly Sept–Nov, clutches recorded Aug–Dec. Female collects material and builds nest, usually a small open cup, sometimes deeper and more substantial, of grass and strips of bark. Sometimes bound with spider web, thickly lined with fur or, less often, wool, hair, fine grasses or bark, plant down or string (often alights on live mammals, including human heads, to pull out hair or fur for nesting material), other materials used for external structure include thin twigs, wool, feathers, lichen, spider egg sacs and string, external diameter 7.6–14 cm, depth 6.5–11.4 cm, internal diameter c. 5–7.6 cm, depth c. 4–6.4 cm; typically supported, occasionally suspended, usually low down, 0.15–7.6 m (mean 1.1 m) above ground, close to centre of dense shrub, grass tussock, rushes or, often, epicomorphic growth from stump or burnt eucalypt, occasionally in tree or fern or in fallen branches or litter. Clutch usually 2–3 eggs, but up to 5 recorded (mean 2.4); incubation by female only, claimed that male once fed mate at nest, incubation period 15–17 days; chicks fed by female, nestling period 16 days; fledglings tended at first by female alone, solely by male if female renests, fed for at least 3 weeks and possibly until end of season; fledglings roost close together. Nests parasitized by Pallid (*Cuculus pallidus*) and Fan-tailed Cuckoos (*Cacomantis flabelliformis*).

Movements. Resident, with at least some local movements. Males largely sedentary in permanent territories, but apparent dispersion of at least some females and young at end of breeding season; such movements and dispersion probably basis for claims of nomadism. Unconfirmed report from mainland Australia, on Wilsons Promontory (S Victoria).

Status and Conservation. Not globally threatened. Restricted-range species: present in Tasmania EBA. Fairly common and widespread. No estimates of total population; recorded densities of 0.96–1.19 birds/ha, and mean densities of 0.12–1.97 birds/ha. Formerly considered a pest in orchards growing smaller fruits, such as cherries and currants.

Bibliography. Barrett *et al.* (2003), Blakers *et al.* (1984), Bruce (1984, 1988a, 1988b, 1988c), Campbell (1900), Dove (1917), Fielding (1977), Green (1989, 1995), Green & McGarvie (1971), Green & Mollison (1961), Griffiths & Clarke (2002), Henderson & Green (1982), Higgins (1999), Higgins *et al.* (2001), Hingston (1994), Keast (1968a, 1968b), North (1907), Pattemore (1980), Ratkowski (1979, 1985, 1993a), Ratkowski & Ratkowski (1977, 1978, 1980), Recher *et al.* (1971), Ridpath & Moreau (1966), Rose (1980), Schodde & Mason (1999), Sharland (1925), Slater (1994), Taylor *et al.* (1997), Thomas (1980), Wilson (1981).

38. Yellow-tufted Honeyeater
Lichenostomus melanops

French: Méléphage cornu **German:** Gelbstirn-Honigfresser **Spanish:** Mielero Orejigualdo
Other common names: Black-faced/Gippsland Yellow-buffed/Golden-tufted/Spectacled/Subcrested/Yellow-throated Honeyeater; Helmeted Honeyeater (*cassidix*)

Taxonomy. *Turdus melanops* Latham, 1801. Nova Hollandia = region of Port Jackson, New South Wales, Australia.

Closest to *L. cratitius* and *L. keartlandi*. Race *cassidix* formerly considered a separate species by some authors. Birds in E Victoria and SE New South Wales intermediate between latter and nominate, and sometimes treated as intergrades; analysis of microsatellite-DNA variation within species, however, supports their recognition as race *gippslandicus* (and provides no evidence for recent introgression between *cassidix* and *gippslandicus* or *cassidix* and *meltoni*). Four subspecies recognized.

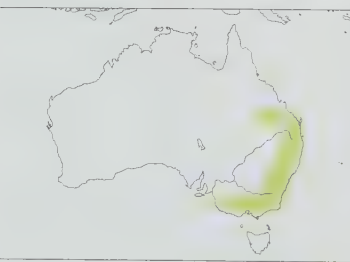
Subspecies and Distribution.

L. m. meltoni (Mathews, 1912) – W watershed of Great Divide, narrowly extending to E watershed of SE Queensland, S to NE & CN Victoria, thence W to border region near South Australia, with outlying populations at high altitude in Snowy R watershed and Mt Kosciuszko region (SE New South Wales).

L. m. melanops (Latham, 1801) – New South Wales E of Great Divide.

L. m. gippslandicus (Wakefield, 1958) – E Victoria (W Gippsland) E to extreme SE New South Wales (Narooma and Eden).

L. m. cassidix (Gould, 1867) – Yellingbo area, in W Gippsland (CS Victoria).



(forming strong panel on folded wing); uppertail olive, yellow-olive sides and broad white tip on outer feathers (lost with wear); underparts olive-grey, washed yellow, diffusely streaked yellow across breast; underwing buffish-yellow with olive-grey trailing edge and tip; undertail olive-grey with yellow-olive sides and white tip; iris rufous-brown to rich red-brown; bill and gape black (in non-breeding periods some develop traces of yellow on gape and faint grey or yellowish base of lower mandible); legs grey. Sexes alike in plumage, male slightly larger than female. Juvenile is duller and paler than adult, with brownish-black mask, paler yellow ear-tuft and malar area, brownish downy feathers on back and rump, black-brown to black bill with yellow or orange base of lower mandible, yellow and swollen gape, and dark brown iris. Races differ in size and plumage: *meltoni* is like nominate, differing only in smaller size, slightly less dark hindneck to back, and slightly narrower pale tip on outer rectrices; *cassidix* is highly distinctive, both sexes significantly larger than others (estimated 7–17% larger than previous race in linear dimensions and 40–43% heavier), forehead feathers elongated and forming richer yellowish crest, otherwise differs from nominate and previous in much broader and (on some)

longer black mask, longer ear-tuft, yellow-olive nape and hindneck (grading into or sharply demarcated from black-brown mantle), much darker upperside, black wash on throat in some birds, richer yellow belly and streaking on breast, and (in fresh plumage) broader white tips of outer rectrices; *gippslandicus* is intermediate between nominate and last in plumage, closer to last in size. **Voice.** Complex and varied, and some listed calls possibly variant descriptions of others. Some calls harsh and scratchy, others clear and almost whistling. Contact call “tsup”, “shup”, “jik”, “chow” or “scow”, sometimes used also in alarm. Other alarm calls include single or repeated “see”, varying in pitch and intensity, may be given by several birds in response to bird of prey; sometimes also as contact during strong winds (when single-note contact would not be heard); variant, described as sharp “peep”, as alert call (e.g. by male to female on nest). Various soft notes in social contexts, and often during corroborees (see page 534); and very soft conversational warble, “jor, jor, jor, jor, jor, jiree, jiree, jiree, jiree” or as “twee, twee, twee, twee, coffee-coffee-coffee-coffee”, repeated 2–3 times, typically between pair-members at nest, when human observer near young and (a louder version) during corroborees; soft indistinct “weet-weet-weet...”, usually of 4–5 notes, appears to be a territorial call. Other calls include repeated “char, char, char...”, often for long periods or interspersed with “see” calls, possibly same as harsh “churl, churl, churl...”; scolding note by adults attacking own young or when potential threat nearby; harsh scolding “chuzz-uzz” or “chuzz-uzz-uzz-uzz” when alarmed; incessant loud chattering during mutual chasing; low melodious trilling in flight; and harsh low continuous “tooyey-t-tooyey-t-tooyey-t...” trill during corroborees. Snaps bill in aggression.

Habitat. Dry open sclerophyll forests and woodlands, typically dominated by eucalypts and with well-developed, often dense, understorey; frequently in riparian associations, along watercourses or in or bordering swampland, or vegetation near water. Nominative race, *meltoni* and *gippslandicus* mainly in mixed eucalypt associations, especially box–ironbark forests or woodlands, e.g. of mugga (*Eucalyptus sideroxylon*) and grey box (*Eucalyptus microcarpa*), but in range of combinations of box, stringybark, gum and peppermint eucalypts and *Angophora*, and often confined to riparian associations; recorded also in mixed eucalypt–cypress-pine (*Eucalyptus–Callitris*) woodland, and sometimes woodlands dominated by cypress-pines or in mallee associations. Nominative race also inhabits communities dominated by *Banksia*, and heathland, very occasionally forages in coastal *Leptospermum* shrubland or among mangroves, and sometimes visit gardens. In some areas moves from open forest with dense understorey to wooded gulleys in autumn–winter, or shifts into different habitats (e.g. nominate race often uses heathland with flowering *Banksia* in autumn–winter). Endangered race *cassidix* largely confined to narrow remnant strips of tall riparian forest and woodland dominated by mountain swamp gum (*Eucalyptus camphora*) on flats along streams or surrounding swampland, with tall dense understorey of scented paperbark (*Melaleuca squarrosa*) and woolly tea-tree (*Leptospermum lanigerum*), or reeds or sedges; in winter, some movement to nearby terraces or slopes with more open forest dominated by swamp gum or mixed green scent-bark–messmate–narrow-leaved peppermint (*Eucalyptus fulgens–E. obliqua–E. radiata*), with diverse dense heath understorey; formerly also in tall open riparian manna gum forest on less swampy sections of creeks, and recently reintroduced into this habitat.

Food and Feeding. Primarily arthropods (mainly insects, some spiders, occasionally gastropod snails) and insect products, such as lerp and honeydew, as well as nectar and manna; occasionally fruit. Race *cassidix* commonly feeds on exudate flows from injuries on trunks of eucalypts. Forages mainly in canopy of tall trees (typically eucalypts), less often in subcanopy, in saplings and shrubs, occasionally on ground; *meltoni* fed mainly in trees (c. 77–92%), with rest in shrubs or on ground, but in other studies foraging done almost equally at all levels. Frequently forages among foliage, twigs, and on exfoliating or decorticating bark on small and large branches and trunks of trees, or feeds aerially; occasionally at flowers. In studies of race *cassidix* at Yellingbo, foraging comprised only 16% of general behaviour, and in one case foraged almost wholly in trees (c. 95–97% of observations of non-nectar-feeding), with remainder in shrubs; foraging height varied seasonally, much time spent in lower strata during Mar–May, and most in upper strata in Jun–Oct; this race specializes on foliage and bark of eucalypts, taking mainly arthropods and sugary exudates, and tends to feed on nectar and aerially more often in non-breeding season. All races obtain most food by gleaning from foliage and bark, by probing bark, and by sallying for insects (sally-striking both in air and on foliage) or sally-hovering to take manna from tree trunks; only occasionally probe flowers, both for nectar and to obtain insects, or glean from ground litter. Sometimes licks sap from wounds made by Leadbeater’s possums (*Gymnobelideus leadbeateri*) on branches or trunks of paperbarks and tea-trees. Active, conspicuous. Gregarious, usually in pairs or in small to large groups; in non-breeding season also in larger mobile flocks, exceptionally of up to 100 or more individuals at food. Aggressive towards most avian species, especially other honeyeaters.

Breeding. Breeding recorded in all months, though rarely May–Jun, most clutches in Sept–Nov; at Yellingbo (race *cassidix*), early nests finished late Jul and eggs early Aug to mid-Feb (most mid-Aug to Jan); multi-brooded, usually renesting rapidly after failure or success, mean of three nesting attempts per territory per season. Breeds in pairs, sometimes co-operatively and often colonially; breeding colonies, or “neighbourhoods”, composed of birds in several adjacent territories, at least some of which persist throughout year (some known to exist for at least several decades), but permanence varies, possibly with variation in food and weather. Nest often built by female alone, occasionally by both pair-members, a tightly woven cup of grass, pieces of bark, spider web and egg sacs and, less often, plant down, twigs, leaves, wool, fur or hair, feathers, lichen and moss, and roots or rootlets, usually lined with plant down or bark or, sometimes, feathers, fine grass, fur or wool, and leaves; race *cassidix* external diameter 7.8–11 cm, depth, 6.2–10.2 cm, internal diameter 5.7 cm, depth 6 cm, other races combined external diameter 6.4–10.2 cm, depth 5.7–10.2 cm, internal diameter 3.8–6.4 cm; depth 3.8–5.1 cm; usually suspended, sometimes supported (very occasionally on ground), in living or dead understorey shrub, less often in tree, sapling, epicomorphic growth or fallen branches, ferns, grass tussock, nest of *cassidix* generally in dense shrubby thicket and often over standing or running water (usually no more than 0.5 m deep); throughout range nest 0.05–1.6 m (mean 1.4 m) above ground, *cassidix* 0.5–7 m (mean 2.2 m). Clutch usually 2 eggs, occasionally 1 or 3, and once four young recorded in nest, mean 1.98 (*cassidix* mean 2.01); incubation mostly or solely by female, fed on nest by male, period 14–16 days; chicks brooded by female, fed by both sexes and by any helpers present, nestling period from 10 days (probably minimum period) to 16 days, probably usually 10–14 days; fledglings fed by breeding pair and any helpers, mostly independent after 6 weeks of age, but fed sporadically up to at least week 14. Nests parasitized by Fan-tailed (*Cacomantis flabelliformis*) and Pallid Cuckoos (*Cuculus pallidus*) and Shining Bronze-cuckoo (*Chrysococcyx lucidus*). From 128 eggs in 65 nests, 0.11 fledged young per nest, and of 89 nests 24.7% fledged at least one young; of 62 nesting attempts by race *cassidix*, 59.7% produced at least one fledged young, mean productivity of nests with eggs 0.53 young fledged and 0.48 young raised to independence.

Movements. Largely sedentary, with some local movements; altitudinal migration in S. Race *cassidix* sedentary, with some local movement, mainly in winter and mainly by immatures and non-territorial adults, but also involving a few breeding females (which may disperse up to several kilometres, but usually return to same mate and territory in following breeding season). Other races also sedentary, again with some local movements, e.g. in Sydney moves in autumn from forest breeding habitat to heathland; abundance fluctuates at some sites, and apparently some movements occur, seasonal in some areas and irregular in others (latter often described as nomadism), though extent of such movements not known and possibly local or post-breeding dispersal. Some movements (especially by

race *meltoni*) related to climate, particularly drought; *meltoni* occasional vagrant S of Great Divide, including at Yellingbo (range of *cassidix*), at least 50 km S of nearest known breeding site. Altitudinal migrant in Southern Highlands (New South Wales), moving to lower levels in May–Aug.

Status and Conservation. Not globally threatened. Race *cassidix*, sometimes treated as separate species, listed as “endangered” nationally and “critically endangered” in Victoria; CITES I. Locally common in most of range; no estimates of total population of species. Race *meltoni* recorded at densities of 12–5 birds/ha. Population of *cassidix* in 2000 contained 37 breeding pairs (and 36 fledglings produced); densities of up to 6 breeding birds/ha. This race now confined to small section of creek-line (of c. 5 km²) near Yellingbo, but formerly occurred throughout much of SW Gippsland along tributaries of middle Yarra R (area of 2000–3000 km²); three of the four remaining populations have almost certainly become extinct since 1983. This race has declined primarily as a result of habitat loss following clearing for agriculture, which produced a cascading series of impacts: clearance of natural habitat changed patterns of runoff, subjecting remnant trees to increased levels of stress and making them more susceptible to infestation by defoliating psyllids, which, in turn, encourages colonization by *Manorina melanophrys*; latter species causes *cassidix* to spend increased amounts of time in defending territories, possibly leading to reduced breeding success. At Yellingbo, *cassidix* visited nearby areas immediately after *Manorina melanophrys* had been culled, and established territories within 6 months. An artificial levee in Cockatoo Swamp, within Yellingbo, caused channelization and subsequent erosion and sedimentation of a section of Cockatoo Creek, leading to dieback of vegetation at a major colony in 1990s, resulting in twelve territories being abandoned, becoming non-breeding territories, or being incorporated into larger breeding territories of other birds; populations of *Cardinia* Creek and Cockatoo ultimately extirpated by bushfires in Feb 1983. Replanting of suitable vegetation at Yellingbo began in 1978, and the honeyeaters have foraged and bred in these revegetated areas. Population of *cassidix* lives within the Yellingbo Nature Conservation Reserve. A captive management programme was established in 1989; in 2000 there were 35 birds in captivity.

Bibliography. Anon. (2007r), Backhouse (1987), Barrett *et al.* (2003), Blackney & Menkhurst (1993), Blakers *et al.* (1984), Campbell (1900), Clarke (1995), Cooper (1967), Crome (1973), Davidson (1992), Emison *et al.* (1987), Emison & Porter (1978), Ford (1987b), Franklin (1995), Franklin, Smales, Miller & Menkhurst (1995), Franklin, Smales, Quin & Menkhurst (1999, 2000), Garnett & Crowley (2000), Griffioen & Clarke (2002), Higgins (1999), Higgins *et al.* (2001), Hindwood (1930b, 1932), Leishman (1994), Ley *et al.* (1997), Lill & Fell (1990), Loyn (1980), Mac Nally & Timewell (2005), Marchant (1992), McCarthy (1995), McCarthy *et al.* (1994), McMahon & Carr (1992), McMahon & Franklin (1993), Menkhurst & Middleton (1991), Menkhurst *et al.* (1999), Morris (1967, 1975b), Morris *et al.* (1981), Moysey (1997), North (1907), Pearce, Burgman & Franklin (1994), Pearce, Menkhurst & Burgman (1995), Quin & Reid (1996), Runciman (1996), Runciman *et al.* (1995), Schodde & Mason (1999), Smales (1988), Smales, Craig *et al.* (1990), Smales, Menkhurst & Horrocks (1995), Smales, Miller *et al.* (1992), Storr (1984), Taylor, I.M. (1986), Taylor, M. (1992), Timewell & Mac Nally (2004), Traill *et al.* (1996), Wakefield (1958), Wheeler (1966, 1967a, 1967c), Woinarski (1984b), Woinarski & Wykes (1983), Woinarski, Cullen *et al.* (1989), Wykes (1982, 1985).

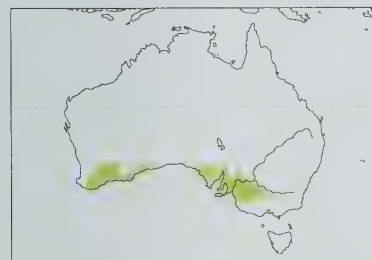
39. Purple-gaped Honeyeater

Lichenostomus cratitius

French: Méliphage grisé **German:** Purpurzügel-Honigfresser **Spanish:** Mielero de Boqueras
Other common names: Lilac-wattled/(Victorian) Wattle-cheeked/Mountain Purple-gaped Honeyeater

Taxonomy. *Ptilotis cratitius* Gould, 1841, interior of South Australia and Kangaroo I = Kangaroo I, South Australia.
Probably forms a superspecies with *L. keartlandi*. Type locality was formerly assumed to be mainland South Australia (either “interior of South Australia” or “Upper Torrens” R), but is, in fact, Kangaroo I; mainland populations thus belong in race *occidentalis*. Name *halmaturinus* (type from Kangaroo I) is therefore a synonym of nominate. Two subspecies recognized.

Subspecies and Distribution.
L. c. occidentalis Cabanis, 1851 – mallee from S Western Australia (area from Wheatbelt E to Kalgoorlie, S to Albany and Cape Arid) E, discontinuously, to S South Australia and the SW Murray–Mallee E to NW & NC Victoria.
L. c. cratitius (Gould, 1841) – Kangaroo I, off South Australia.



and throat; upperparts rather dark olive-grey, slightly browner on upperwing-coverts, which also faintly margined paler; broad yellow-olive outer edges of remiges (distinct panel on folded wing); uppertail brown with olive edges, and fine white tip when fresh; underbody largely olive-grey, diffusely streaked dull yellow-olive, with dull yellow centre of belly; undertail olive-grey, underwing off-white to pale grey with broad brownish-grey trailing edge and tip; iris dark brown; bill black, gape and gape-stripe purple (colour apparently less intense when not breeding); legs grey-black. Sexes similar in plumage, male slightly larger than female. Juvenile is very similar to adult, but facial pattern duller, with eyestripe brownish-black and submoustachial stripe paler yellow, upperparts tinged brownish, some upperwing-coverts with yellow-brown fringes (appearing more scaly), underparts paler yellowish, bill duller, with yellowish base, gape yellow (not purple). Race *occidentalis* is smaller than nominate, also slightly brighter and paler above and below, e.g. underbody greyish-olive to yellowish-olive, with yellow centre of belly, breast faintly streaked slightly darker, flanks and lower regions diffusely streaked pale yellow. Voice. Sometimes noisy; at Eyre Bird Observatory (Western Australia) most vocal Sept–Oct. Vocalizations include rapidly repeated loud chattering “chuc-chuc-chuc-chuc”, during distraction displays and possibly in advertising and defence of territory; scolding in response to potential threats (possibly same as chattering); single harsh “chirp”; loud whip-like whistle; soft warbling like that of a parrot (Psittacidae); sharp unmusical “twit-twit” in flight; and jerky rattling notes. Said also to have pleasing song and a call like one given by *Manorina melanocephala*, both of which may refer to one of preceding vocalizations.

Habitat. Mallee eucalypt associations, preferring mallee heathland, but also often in mallee woodland and shrubland, including remnants in agricultural land or beside roads, and usually with dense

Descriptive notes. 16–19 cm; male 19.5–24.7 g and female 15.5–22.5 g (*occidentalis*), four males 12.5–23.2 g and two females 17–19 g (nominate). Nominat race has distinctive head pattern of dark grey top of head and neck (faint blackish scaling on crown), black eyestripe extending from bill to well behind eye, merging with grey anterior ear-coverts, yellow tuft on rear ear-coverts (can be partly covered by dark anterior ear-coverts), purple gape-stripe (gape and fleshy continuation of gape) extending along bottom edge of eyestripe (often inconspicuous in field), bright yellow submoustachial stripe, and olive-yellow chin

shrubby understorey of heath plants, such as broombush (*Melaleuca uncinata*) or, sometimes, spinifex (*Triodia*); often in thickets of broombush associated with mallee. In some areas, found in non-mallee sandplain heaths and shrublands (e.g. Western Australia), in dry sclerophyll forest or woodland dominated by eucalypts and usually with heath understorey (e.g. Kangaroo I), and in riparian eucalypt or paperbark (*Melaleuca*) associations.

Food and Feeding. Invertebrates (mostly insects, including psyllids and coccids; some spiders) and nectar (frequently of *Eucalyptus*, *Banksia*, *Adenanthos* or other proteaceous or epacrid shrubs); also lerp and honeydew; also some fruit, e.g. of ruby saltbush (*Rhagodia*), and seeds. In one study, proportion of nectar to insects in diet 38:62. Forages fairly low in trees and shrubs, frequently among foliage or at flowers, including occasionally those of mistletoes (Loranthaceae), as well as beneath loose bark of outer branches of trees and in air; occasionally on ground. Feeds on nectar from non-eucalypt sources more on Kangaroo I than on mainland. Invertebrates gleaned from foliage, bark and ground, in aerial sallying, and taken by probing; nectar taken by directly probing flowers. In one study, sallied and gleaned in almost equal proportions. Can be acrobatic when foraging. Usually singly, in twos or in small groups of up to 10–12 individuals, sometimes in larger groups of up to 30 or more at abundant food, such as flowering mallee. Aggressive towards smaller and other medium-sized honeyeaters, e.g. *Acanthorhynchus*, and Silvereyes (*Zosterops lateralis*).

Breeding. Mainly spring and autumn, apparently also unseasonally after rain; clutches recorded Aug–Nov, Jan and Mar–Apr. Nest built probably by female alone (claims that both sexes contribute possibly due to observations of male accompanying female), a deep and compact cup, small for size of bird, usually of woven grass and fine shreds of bark, sometimes small sticks, bound with spider web and egg sacs, lined with wool, fur, fine grass, spider web, a few small feathers or, occasionally, plant down, external diameter 7–8.9 cm, depth 7.6–10.1 cm, internal diameter 5.1–6.4 cm, depth 5.1 cm; 0.5–3 m (mean 1.2 m) above ground in small shrub or, less often, small tree or mistletoe, usually suspended from foliage, fine twigs or fork of horizontal branch, sometimes partly suspended and partly supported, or in vertical fork. Clutch usually 2 eggs; incubation period c. 13–14 days; chicks fed by both sexes, no information on duration of nestling period.

Movements. Resident, with local movements in response to food availability, particularly flowering eucalypts. Sporadic outside usual range, sometimes in large numbers. Seasonal increase in reports near Eyre Bird Observatory, in Western Australia, in Sept–Oct possibly a result of increased conspicuosity, but influxes sometimes recorded there. Reports from Northern Territory and Queensland erroneous.

Status and Conservation. Not globally threatened. Uncommon. No estimates of total population; recorded densities of 0–0.2 to c. 5 birds/ha. Numbers have declined following clearing, degradation or fragmentation of habitat, especially loss of understorey; also overharvesting of broombush, and, at least in short term, fire. Range has contracted in Western Australia.

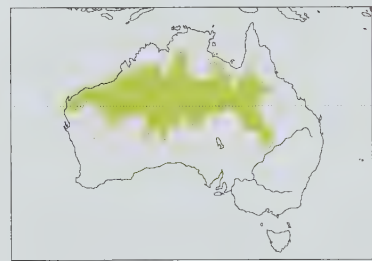
Bibliography. Ashton *et al.* (1996), Barrett *et al.* (2003), Blakers *et al.* (1984), Bonnin & Angove (1980), Campbell (1900), Carpenter & Matthew (1997), Colston (1974), Cooney *et al.* (2006), Davies (1982), Emison *et al.* (1987), Ford (1976, 1977, 1979, 1980, 1981a), Ford & Paton (1976a, 1982), Forde (1986), Gannon (1962), Garnett & Crowley (2000), Griffioen & Clarke (2002), Higgins *et al.* (2001), Hobbs (1961), Hopper & Burbidge (1982b), Hopper & Moran (1981), Johnstone & Storr (2004), Keast (1968a), Keast & Condon (1968), Longmore (1991a), Milligan (1904), Milne (1937), North (1907), Paton (1980, 1991), Paton & Ford (1977), Paton *et al.* (1994), Pizzey (1980), Possingham & Possingham (1997), de Rebeira & de Rebeira (1977), Saunders & Ingram (1995), Schodde & Mason (1999), Schodde & Tidemann (1986), Serventy & Whittell (1976), Storr (1947), Taylor, P.W. (1987), Whitley (1971), Whitlock (1911), Woinarski (1989b).

40. Grey-headed Honeyeater

Lichenostomus keartlandi

French: Méliphage à tête grise **German:** Grauscheitel-Honigfresser **Spanish:** Mielero Cabecigrís
Other common names: Keartland’s) Honeyeater

Taxonomy. *Ptilotis keartlandi* North, 1895, McMinns Range, central Australia.
Probably forms a superspecies with *L. cratitius*. Monotypic.
Distribution. NC Western Australia (S Kimberley Division and Pilbara) E to SW Northern Territory (E to NW Simpson Desert, and patchily in N around Victoria R and in subcoastal S Gulf of Carpentaria to Barkly Tableland), NW South Australia and W Queensland (S of Mt Isa, and in upper Cooper Creek Drainage Basin; apparently isolated population near Eulo).



Descriptive notes. 13–16.5 cm; male 13–17 g, female 12.5–18 g. Has pale grey top of head grading to light grey-brown on hindneck and upperbody, slightly browner on rump and uppertail-coverts; dark mask (formed by grey-black lores, eyering and feathers behind eye, and grey ear-coverts diffusely edged black at rear), which can appear almost wholly black or contrastingly black and grey (depending on light); pale yellow moustachial stripe that meets bright yellow neck-plume extending from below rear ear-coverts and up behind rear of mask; pale yellow chin and throat; upperwing olive-brown, diffusely mottled brown on coverts, fine

white tips on greater secondary coverts, dull yellow-olive outer edges of remiges (yellowish panel on folded wing); uppertail dark olive-brown with dull yellow-olive sides, fine white tip when fresh; breast, belly and anterior flanks yellow with light brown streaking, merging into pale buff-yellow on rest of underbody; underwing pale orange-buff with broad grey-brown trailing edge and tip, undertail grey-brown with off-white tip (in fresh plumage); iris dark brown, dark grey orbital ring; bill and gape black, yellow or buff base of lower mandible and yellow gape when not breeding; legs pinkish-brown. Sexes alike in plumage, male slightly larger than female. Juvenile paler than adult, with rather uniformly grey and less contrasting mask (only indistinct dark line at rear), much paler yellow neck-plume, grey or brown-black bill with orange-yellow to pink-brown base of lower mandible, yellow to orange gape, pinkish-brown orbital ring. Voice. Not well known. Calls frequently, particularly when foraging. Loud, penetrating and rather peevish “chip”; bubbling or lightly trilling song, which may be given in flight; loud deep “kwoyt-kwoyt-kwoyt”; “kew-kew-kew-kew” or “peep-peep-peep”; and “chee-toyt” or “chutoyt” call, thought to be uttered only when breeding. Snaps bill in agonistic interactions.

Habitat. Mainly low, open, arid and semi-arid woodlands, typically in sandstone ranges but also on tablelands and plains, and usually dominated by stunted or mallee eucalypts or with *Acacia*, such as mulga (*Acacia aneura*), or *Grevillea wickhamii*, co-dominant or in understorey; and riverine woodlands dominated by *Eucalyptus*, *Lophostemon* or *Erythrina*, often with dense shrub understorey. Less often in low open mulga woodland, occasionally in *Astrelba* grasslands.

Food and Feeding. Invertebrates (mostly insects, also spiders) and nectar, occasionally fruit. Proportions of observations comprising foraging for nectar 35% in one study, less than 5% in another.

Forages at flowers of wide variety of trees and shrubs (especially *Grevillea*, *Eucalyptus*, *Hakea*, *Lophostemon* and *Erythrina*), in foliage and on large branches of trees and shrubs; insects taken by gleaning from foliage, bark or in shrubs, and by sallying; nectar taken by probing flowers. Active, noisy, often approachable. Usually in twos (probably pairs) or in small groups of 5–6 individuals; occasionally in loose parties of up to 20 or more. Seen to forage with *L. virescens* and *Lichmera indistincta*; six individuals drank from pool with Painted Finches (*Emblema pictum*).

Breeding. Recorded in all months, probably mainly winter–spring, although suggested as breeding at any time after rain; clutches Jan–Feb, Apr–May, Jul and Oct–Feb, and nestlings Apr and Jul–Sept; probably single-brooded. Nest an open, compact cup of dried grass and plant stems and fine strips of bark, bound with spider web and cocoons, lined with plant down, fine rootlets, hair, feathers or spider egg sacs, one had external diameter 6.4 cm, depth 4.4 cm, internal diameter 5.1 cm, depth 3.2 cm; usually (not always) suspended by rim from horizontal fork or among twigs or drooping foliage low in live tree or shrub or mistletoe (Loranthaceae), twelve nests 0.6–3.5 m (mean 1.4 m) above ground. Clutch usually or always 2 eggs; no information on incubation and nestling periods; both parents tend fledglings. Nests parasitized by Pallid Cuckoo (*Cuculus pallidus*).

Movements. Poorly known. Apparently mainly resident, with at least local movements. Occasional influxes at some sites. Widespread scattered records beyond normal range, e.g. at Wyndham and Turkey Creek (in N Western Australia), in Simpson Desert, and in N Flinders Ranges (South Australia).

Status and Conservation. Not globally threatened. Relatively poorly known species, with little information on numerical status. Widespread in N Western Australia and W Queensland. No estimates of population.

Bibliography. Barrett *et al.* (2003), Blakers *et al.* (1984), Burbidge & Fuller (2007), Campbell (1900), Colston (1974), Cooney *et al.* (2006), Ford, H.A. & Paton (1976a), Ford, J.R. (1974, 1987a), Ford, J.R. & Parker (1974), Frith & Davies (1961), Gannon (1962), Griffiths & Clarke (2002), Higgins (1999), Higgins *et al.* (2001), Howard (1986), Immelmann (1961), Johnstone & Storr (2004), Johnstone, de Beira & Smith (1979), Johnstone, Smith & Fuller (1981), Keast (1968a), Le Souëf (1903), Liddy (1962), Longmore (1991a), North (1907), Noske (1978), Officer (1971), Parker (1970, 1977), Schodde (1976), Schodde & Mason (1999), Serventy & Whittell (1976), Shurcliff (1986), Start & Fuller (1983), Storr (1977, 1984), Whitlock (1909).

41. Yellow-plumed Honeyeater
Lichenostomus ornatus

French: Méléphage orné **German:** Gelbscheitel-Honigfresser **Spanish:** Mielero Adornado
Other common names: Graceful/Mallee Honeyeater

Taxonomy. *Ptilotis ornatus* Gould, 1838, Swan River, south-west Western Australia.
Forms a species group with *L. plumulus*, *L. fuscus*, *L. flavescens* and *L. penicillatus*. Monotypic.

Distribution. SW Australia (mostly S of 30° S but largely excluding far SW) E to Eyre Bird Observatory (scattered records N of this range), and from E Nullarbor Plain and S Great Victoria Desert E in South Australia (including Eyre Peninsula, Flinders Ranges) to The Coorong and Murray-Mallee and to NW & NC Victoria and C New South Wales.

Descriptive notes. 14–18.5 cm; male 16–22.1 g, female 12.2–21.1 g, unsexed 11–22 g. When breeding, top of head is yellow-olive, grading to olive-grey on hindneck and side of head, with dusky smudge in front of and around eye, narrow dull yellow moustachial stripe, and diffuse black band on rear ear-coverts bordering anterior edge of long bright yellow neck-plume that ends in pointed tuft; upper-body and upperwing dark brownish-grey, grading to grey-olive on rump and uppertail-coverts; yellow-olive edges of upperwing coverts, and bright olive-yellow edges on otherwise brown remiges (bright panel on folded wing, diffuse panel through middle of spread wing); uppertail olive-brown with yellow edges and fine white tip (rapidly lost with wear); off-white below, strongly streaked brown on chin, throat, breast, upper belly and flanks, merging to lighter streaking on lower underbody; undertail greyish-brown; underwing greyish orange-buff, with pale grey bases of all except outer remiges, greyish-brown trailing edge and tip; iris brown, orbital ring black; bill and gape black; legs greyish-brown. Non-breeding as breeding but orbital ring yellow to orange-yellow, and bill black with pale yellow to yellow-orange base and yellow to orange-yellow gape. Sexes alike in plumage, male larger than female. Juvenile is paler and browner than adult, with brownish-olive top of head, short diffuse yellowish supercilium, duller dusky smudge in front of and around eye, less heavily streaked below, black-brown bill with yellow to orange-yellow base (duller than non-breeding adult) and swollen pale yellow to yellow gape. **VOICE.** Can be very noisy; one of first species to vocalize in morning, and heard sporadically through day. Range of loud, clear or harsh and sharp vocalizations. Song brisk chirping “chickwiddee” or loud, ringing “chick-o-wee”; flight song repeated rapid trilled whistles. Contact call repeated “chip” notes. Several alarm calls, including e.g. flat trill and long shrill note, rapidly repeated chirps.

Habitat. Mallee eucalypt woodlands, usually with sparse understorey of *Leptospermum*, *Acacia* and *Eremophila* and ground cover dominated by chenopods. In Western Australia, common also in coastal eucalypt woodlands or forests dominated by tuart (*Eucalyptus gomphocephala*), wandoo (*Eucalyptus wandoo*) or, occasionally, salmon gum (*Eucalyptus salmonophloia*), though not commonly in non-mallee woodlands elsewhere in range. Sometimes in *Acacia* woodlands, e.g. those dominated by western myall (*Acacia papyrocarpa*), or mixed woodlands of cypress-pine-belah (*Callitris-Casuarina cristata*) or *Callitris-Eucalyptus*; rarely, in dense jarrah (*Eucalyptus marginata*) forests in Western Australia.

Food and Feeding. Arthropods (insects, also spiders and mites), nectar (e.g. of *Eucalyptus*, *Banksia*, some Epacridaceae) and lerp, manna and honeydew; occasionally flowers and fruit. Proportion of insect-foraging to nectar-feeding in one study 76:24. Forages mainly in trees (90% of observations in one study), especially eucalypts, and less often in understorey shrubs, only occasionally on ground; at Dryandra (Western Australia), mean foraging height 6.7 m, and 84% of observations in canopy and subcanopy. Forages at flowers, on bark, on twigs, in foliage (particularly outer foliage), in air, and occasionally among leaf litter and bark on ground. In Victoria, mean of 38% of observations of foraging were at flowers, 27% on branches, 9% on twigs, 1% on trunks, 15% in foliage, 10% in air; at Dryandra, 8% at flowers, 44% on bark of branches, 12% on bark of trunks, 20% in foliage, 15% in air. Nectar obtained by probing. Insects gleaned from foliage, bark, infrequently ground; also caught by sallying, mainly sally-striking for flying insects but also sally-striking and sally-hovering on foliage or bark; also by probing under bark, occasionally by pouncing. Appeared to crush ripe fruits of ruby saltbush (*Enchylaena tomentosa*) to extract juice. Usually

singly, in twos (probably pairs) or in small flocks, often of six or more individuals (up to 20) at flowering trees; in NW Victoria, 80% of records were of 1–2 birds. Often aggressive, squabbling, but will co-operate to exclude conspecifics and other species at feeding site. Hundreds may gather in areas with abundant food, or at water, e.g. 650 birds in one area. Where co-occurring with *L. plumulus* latter tends to be dominant, but present species tends to dominate when more numerous.

Breeding. Recorded in all months, apparently least often in mid-summer and late autumn; most clutches (69%) Oct to early Dec. Possible instances of opportunistic co-operative breeding, but circumstances not properly known. Nest a rather shallow open cup usually of woven grass and wool and bound with spider web, sometimes with other materials (e.g. spider egg sacs, flowers, fine fibre, bark strips, rootlets and tufts of wool), lined with wool, fine grasses, plant down and feathers, often unlined, external diameter 6.4–7.5 cm, depth 3.2–5 cm, internal diameter 4.4–5.5 cm, depth 3–3.5 cm; usually suspended by rim from thin horizontal fork or drooping foliage or leafy twigs, frequently in live mallee eucalypt (93% of records in one sample), occasionally supported (e.g. in upright shoots), occasionally in other site, e.g. suspended inside dead spout of live mallee, or in vertical fork against trunk or in mistletoe (Loranthaceae); 0.45–20 m (mean 3.1 m) above ground, 31 nests in Eyre Peninsula 0.76–4.6 m (mean 1.8 m). Clutch 1–3 eggs, usually 2 (mean 2.09); estimated incubation period 12–15 days and nestling period 12–14 days, but no accurate determinations; both adults feed nestlings and fledglings. Nests parasitized by Fan-tailed (*Cacomantis flabelliformis*) and Pallid Cuckoos (*Cuculus pallidus*) and by Horsfield’s (*Chrysococcyx basalis*) and Shining Bronze-cuckoos (*Chrysococcyx lucidus*). For 89 eggs in 44 nests where outcome known, 0.55 fledged young per nest; of 83 nests, 53% fledged at least one young.

Movements. Largely resident over much of range, but at least some local movements. In detailed study at Mt Mary Plains, in South Australia, numbers fluctuated (including lower numbers in spring–summer of some years); movements said to be related to food supply, and possibly involve mainly immature and unpaired birds. Movements elsewhere often said to be associated with flowering of food trees. Occurrence at some sites seemingly unpredictable, and thus described as partially nomadic in some regions. Some shifts seem to be influenced by climatic factors, e.g. in dry years in Victoria moves locally during autumn–winter, with records in S or E regions, and in Adelaide region of South Australia disperses to S in dry years. Large S movement of hundreds of individuals noted once (in May) in W New South Wales. Vagrants recorded beyond normal range, e.g. in South Australia scattered records W of main range and vagrant in investigator Is and on Kangaroo I.

Status and Conservation. Not globally threatened. Locally common. Recorded densities of up to 3.6 birds/ha. Population N of Dubbo, in New South Wales, possibly isolated. Declined in distribution and abundance throughout S of range, with local extirpations, as a result of widespread loss, fragmentation and degradation of habitat for agriculture; apparently unable to persist in highly fragmented landscapes. Requires most productive habitats within a region, but these have been preferentially cleared for agriculture, and small remnants of native vegetation unlikely to contain sufficient expanse of suitable habitat to sustain populations, e.g. was common in Wheatbelt of Western Australia in early 20th century, but now reduced to small populations confined to remnant woodlands. In contrast, range thought to have expanded into SW Western Australia, along Blackwood Valley, after extensive clearing of forests since 1930s.

Bibliography. Anon. (1926), Barrett *et al.* (2003), Blakers *et al.* (1984), Boehm (1957, 1978), Brooker & Brooker (2004), Brooker *et al.* (1979), Campbell (1900), Carpenter & Mathew (1997), Colston (1974), Cooney *et al.* (2006), Deli (1978), Elliott (1916), Emison *et al.* (1987), Ford, H.A. (1980), Ford, H.A. & Paton (1976a), Ford, J.R. (1971), Gannon (1962), Griffiths & Clarke (2002), Higgins (1999), Higgins *et al.* (2001), Hobbs (1961), Jenkins & Miller (1976), Johnstone & Storr (2004), Jurisevic & Sanderson (1994a), Keast (1968a), Mac Nally & Timewell (2005), Masters & Milhinch (1974), Mathew & Carpenter (1993), McEvey & Middleton (1968), Menkhurst & Davies (1983), Morris & Wooller (2001), Morris *et al.* (1981), North (1907), Paton & Ford (1977), Paton *et al.* (1994), Pizzey (1980), Ragless (1985), de Beira & de Beira (1977), Recher & Davis (1998), Saunders & Ingram (1995), Schmidt (1978), Schodde & Mason (1999), Schodde & Tidemann (1986), Serventy (1948, 1977), Serventy & Whittell (1976), Sutton (1924), Timewell & Mac Nally (2004), Wilson & Recher (2001), Woinarski (1984b), Woinarski, Cullen *et al.* (1989), Wykes (1982).

42. Grey-fronted Honeyeater
Lichenostomus plumulus

French: Méléphage à plumet noir **German:** Grünscheitel-Honigfresser **Spanish:** Mielero de Plumón
Other common names: Plumed/Yellow-fronted Honeyeater

Taxonomy. *Ptilotis plumulus* Gould, 1841, York district, Western Australia.
Forms a species group with *L. ornatus*, *L. fuscus*, *L. flavescens* and *L. penicillatus*. Race *grangeri* intergrades with nominate in narrow zone in CE South Australia (W slopes of Flinders Ranges and Willouran Range), and appears to intergrade with *planasi* in CE Queensland (but few data); uncertain whether *planasi* and nominate intergrade where they meet (in C Northern Territory). Birds from Port Augusta, in South Australia, described as race *ethelae*, which name is sometimes applied to E Australian form; type locality, however, lies within zone of intergradation between nominate race in W and populations in E, and name *grangeri* (type from Mt Grainger, in South Australia) is therefore used for latter form. Three subspecies recognized.

Subspecies and Distribution.
L. p. planasi (A. J. Campbell, 1910) – N Western Australia (S & E Kimberley Division) E across S Top End to N Queensland (S Gulf of Carpentaria–Selwyn Range and, in NE, W of Great Divide).
L. p. plumulus (Gould, 1841) – SW & C Australia from near W coast (between Pilbara region and Geraldton) E to C ranges of S Northern Territory and to EC South Australia (S to E Nullarbor Plain, E to Gawler Ranges and W edge of L Eyre Basin).
L. p. grangeri (Mathews, 1912) – inland E Australia sparsely from CE Queensland (c. 20–21° S) S, E to W fringes of Great Divide, to SW New South Wales and NW Victoria, and through Murray–Darling Basin W to Flinders Ranges of South Australia.

Descriptive notes. 14–16.5 cm; male 13.5–18.5 g and female 15–16.5 g (nominate), male 15–22.5 g and female 16–27.5 g (*grangeri*), male 12–21.5 g and female 11–16.7 g (*planasi*). Nominative race has olive-yellow top and side of head, with inconspicuously grey lower forehead, distinct stripe formed by black-brown lores and eyering, and fine black gape-line meeting black tips of rear ear-coverts, and a short, broad yellow neck-plume that fans out on side of neck; upperparts light grey-brown, tinged yellow; upperwing brown, dull yellow-olive outer edges of secondaries and primaries (large panel on folded wing), fine white tips of remiges and terminal outer edges of primaries; tail grey-olive with yellow-olive sides; off-white

SPECIES ACCOUNTS

PLATE 41

below, yellow wash on chin, throat, breast and undertail-coverts, and diffuse brownish streaking throughout, faintest on breast; underwing cream with brownish-grey trailing edge and tip; iris dark brown; bill and gape black; legs dark blue-grey to dark grey. Sexes alike in plumage, male slightly larger than female. Juvenile is slightly duller and paler than adult, with browner upperbody, paler and less distinct neck-plume, light grey-brown upperwing-coverts with light brown fringes, greyish-brown bill with yellowish to cream base of lower mandible, and swollen yellow to orange gape. Races differ in size and plumage: *grangeri* is significantly larger than nominate, with darker upperparts and (some individuals) darker grey-brown streaking on breast and richer yellow centre of breast, adults from E limit of range tending darker above and with bolder breast streaking (extending to upper belly and over flanks) than those from W; *planasi* is similar to nominate but with longer bill and shorter tarsus, upperbody generally paler, streaking below finer and better defined, grey band on lower forehead much narrower, top of head duller yellow-olive, merging to grey-brown on nape and hindneck, and black line across rear ear-coverts broader. VOICE. Vocalizations described as sharp, shrill, loud, and repeated often, but can be silent for long periods during day. Male song described as canary-like; and flight song a loud, sharp, almost guttural "it-wirt", "wirt, wirt, wirt" or "it-wit it it", given in and after display-flights. Calls include repeated "clit", as contact; harsh squeaking note in alarm or when congregating; twittering calls; harsh screeching; and a "sw-e-e-t".

Habitat. In S mainly mallee eucalypt woodlands or shrublands or associated habitats, and commonly in low, densely coppiced mallee regenerating after fire or harvesting, though infrequently in taller mallee woodlands; and also semi-arid heathland or mulga woodland interspersed with patches of mallee eucalypts. Rarely far from mallee, but recorded in low non-mallee eucalypt woodlands, particularly those close to mallee, and will exploit flowering vegetation near or in ecotone with mallee vegetation. In inland and N Australia mainly in low riparian vegetation, including understorey of taller riverine associations, and savanna eucalypt woodlands or forests, usually with grassy ground layer. Throughout range, recorded also in low woodlands or shrublands dominated by *Acacia* or paperbark (*Melaleuca*). **Food and Feeding.** Nectar, particularly of *Eucalyptus*, *Eremophila* and mistletoes (Loranthaceae), and arthropods (mostly insects, some spiders); also fruit and seeds (latter probably from fruits). Usually forages in crowns of trees (especially mallee eucalypts) or in shrubs, sometimes in air, occasionally on ground. Obtains insects by gleaning from foliage, twigs and bark of larger branches of trees and shrubs, also by sallying above canopy; very occasionally gleans from ground; nectar taken by probing flowers. Usually forages singly, in twos (probably pairs) or in groups of up to c. 15 individuals, occasionally in larger loose flocks of up to 80 birds in areas of flowering trees. Often displaces other meliphagids; variously dominant over or submissive to *L. ornatus*, apparently related to numerical dominance of each species in an area; seen to forage with *L. fuscus* and *L. penicillatus* without aggression.

Breeding. Recorded in all months, but centred on winter-spring; clutches Jun–Mar. At one nest, only one member of pair appeared to build (occasionally accompanied by mate); nest a deep cup, often slightly smaller at rim, usually of fine grass, spider web, plant down or fibre or fine strips of bark, lined with plant down, feathers or hair or fur (other materials used include spider egg sacs, cocoons, and rootlets), external diameter 7–7.6 cm (6.4 cm at rim), depth 5.7–6.4 cm, internal diameter 4.4–5.1 cm, depth 2.5–4 cm; usually suspended (occasionally supported) 0.6–6.6 m (mean 2.3 m) above ground, often in terminal foliage but also from twigs, drooping branch or fork, in live small tree (especially mallee eucalypt) or shrub, occasionally mistletoe. Clutch usually 2 eggs, occasionally 1 or 3; incubation period once 15 days, said also to be 14 days; chicks fed by both sexes, nestling period once 12 days, once 15 days, given also as 14 days; at one nest, incubation of eggs and brooding of young by only one member of pair, probably female; fledglings fed by both adults. Nests parasitized by Pallid Cuckoo (*Cuculus pallidus*) and, possibly, Horsfield's Bronze-cuckoo (*Chrysococcyx basalis*). Of seven nests, six fledged at least one young.

Movements. Resident in many places. Numbers can fluctuate, e.g. around Mt Isa, in NW Queensland, numbers highest May–Dec; described as partially nomadic in New South Wales and possibly in Northern Territory, and said not to stay for long at any site in South Australia. No information on causes of fluctuations or extent of any movements. Vagrants of race *planasi* recorded N of normal range in Top End; vagrant *grangeri* recorded E of range.

Status and Conservation. Not globally threatened. Formerly listed as "endangered" in Victoria. Uncommon and rather sparsely distributed; no estimates of population. Adversely affected by clearance of mallee vegetation for agriculture, particularly wheat-cropping, in S of range, but may have benefited from harvesting of mallee for *Eucalyptus*-oil production, which creates areas of coppiced or regenerating mallee.

Bibliography. Aumann (1991), Badman (1981), Barrett *et al.* (2003), Black & Badman (1986), Blakers *et al.* (1984), Boehm (1945, 1957), Campbell (1900), Colston (1974), Cooney *et al.* (2006), Crawford (1972), Emison *et al.* (1987), Ford, H.A. & Paton (1976a), Ford, J.R. (1971), Ford, J.R. & Sedgwick (1967), Gannon (1962), Griffioen & Clarke (2002), Hannah *et al.* (2007), Higgins (1999), Higgins *et al.* (2001), Jenkins & Miller (1976), Johnstone & Storr (2004), Johnstone, Dell *et al.* (1977), Johnstone, de Rebeira & Smith (1979), Keast (1968a), Lavery *et al.* (1968), Liddy (1962), Longmore (1991a), Matthew & Carpenter (1990), McGilp (1945), Menkhurst & Davies (1983), Morris *et al.* (1981), North (1907), Saunders & Ingram (1995), Schmidt (1978), Schodde (1956), Schodde & Mason (1999), Schodde & Tidemann (1986), Sedgwick (1986), Serventy & Whittell (1976), Storr (1967, 1977, 1984), Turner (1992).

43. Fuscous Honeyeater

Lichenostomus fuscus

French: Méléphage grisâtre **German:** Olivkehl-Honigfresser **Spanish:** Mielerio Fusco

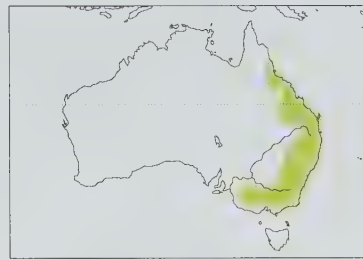
Taxonomy. *Meliphaga fusca* Gould, 1837, New South Wales = region of Sydney, east Australia. Forms a superspecies with *L. flavescens*, with which formerly often considered conspecific; both are part of a species group that includes also *L. ornatus*, *L. plumulus* and *L. penicillatus*. Races intergrade in fairly narrow region of Dawson–MacKenzie rivers, in CE Queensland; birds from Dawson R described as race *dawsoni*, but represent part of this intergrading population. Two subspecies recognized.

Subspecies and Distribution.

L. f. subgermanus (Mathews, 1912) – E Queensland on and E of Great Divide (from Big–Windor Tablelands SE of Cooktown, S to Dawson–Mackenzie Basin), in NE Australia.

L. f. fuscus (Gould, 1837) – E & SE Australia from Dawson–Mackenzie Basin S to Victoria (W to South Australia border region).

Descriptive notes. 13.5–17 cm; male 12–24 g and female 13.7–19 g (nominate), male 14–20 g and one female 14 g (*subgermanus*). Nominata race breeding is greyish olive-brown above, with smudged blackish-brown ring around eye sometimes extending to lores, small pale yellow neck-plume narrowly bordered black on upper rear edge; olive scaling on upperwing-coverts, dark brown patch at bend of wing; remiges dark brown with yellow-olive outer edges (broad olive panel on folded wing), neat, fine white tips on outer primaries (in fresh plumage); yellow-olive sides of upperpart; chin, throat and breast slightly paler than upperparts, brown-grey, faintly streaked cream to buff, rest of underbody off-white, faintly streaked grey-brown; underwing light grey-brown, darker brownish-grey trailing edge and tip; undertail dull brown with yellow-olive sides; iris dark brown, orbital ring black; bill and gape black; legs grey. Non-breeding plumage as breeding, but base of bill yellow, and cere, gape and orbital ring yellow. Sexes alike in plumage, male slightly larger than female. Juvenile is very similar to



"twit't't't" or "arig arig a", often ending in harsh "taw-taw-taw..."; flight song a deep metallic "tew-tew-tew". Alarm calls include rapidly repeated high-pitched fluting in response to aerial predator; high-pitched twittering, possibly same as call described as short high-pitched "twee-twee-twee", during corroborees (see page 534); a call between last-mentioned and the one for aerial predator, given during chases, when captured or when potential avian predator close to nest; and harsh note or scolding when very agitated or alarmed.

Habitat. Dry, open sclerophyll forests and woodlands dominated by range of eucalypts and with dense or sparse understorey of shrubs or open grassy ground cover, especially box–ironbark, box or bloodwood (*Corymbia*) associations, or spotted gum forests and woodlands, and sometimes in eucalypt associations mixed with cypress-pine (*Callitris*); very occasionally in mallee woodlands. Sometimes also in remnant patches, including linear remnants, such as stock routes and roadside vegetation, in agricultural land or remnant trees in pastoral land; also gardens. On New England Tableland (NE New South Wales), occupied extensive eucalypt woodland away from streambed and dominated by Blakely's red gum (*Eucalyptus blakelyi*), and with increasing abundance of yellow box (*Eucalyptus melliodora*) with distance from stream, in preference to riverine woodland dominated by river sheoak (*Casuarina cunninghamiana*) or ecotone between eucalypt and riverine woodland mainly of Blakely's red gum and rough-barked apple (*Angophora floribunda*). During autumn and winter often in heathland or coastal woodland with heath understorey, particularly heathland dominated by *Banksia*. Rarely recorded in low closed forest or dry monsoon forest.

Food and Feeding. Mainly arthropods (insects, some spiders), honeydew (including of Eriococcidae) and lerp (of Psyllidae); also nectar, mainly from eucalypts but also other species, including mistletoes (Loranthaceae); occasionally fruit. At one site in Victoria, insects and their products (lerp, honeydew) and nectar comprised roughly equal proportions of diet, but birds fed predominantly on nectar in summer, and more on honeydew and lerp during autumn–winter; on New England Tableland, mainly insects and less often nectar. Forages at all heights, mainly in crowns of trees, less often in understorey; mainly among foliage and at flowers of trees or shrubs (overwhelmingly eucalypts, some in mistletoes or other trees or shrubs, such as *Acacia*), also on bark of twigs and large and small branches, on trunks of trees, in air, and occasionally on ground among grass and litter. Nectar obtained by directly probing flowers; insects caught mainly by gleaning, but also by probing under bark or, less often, by sallying, including sally-strikes on foliage and in air, sally-hovering and sally-pouncing. On New England Tableland, mean proportion of daytime spent in foraging 60% over whole year, but greater during autumn–winter (60–80%) than in spring–summer (45–50%). In C Victoria, diurnal foraging characterized by early-morning phase with high levels of nectar-feeding and low levels of insect-eating, and rest of day with increased levels of insect consumption. Gregarious, often in small active flocks to 20 or more individuals, and considered semi-colonial; can occur in larger flocks, of up to 150, on passage. Often associates with other bird species; also in mixed flocks in non-breeding season. On New England Tableland, foraged at similar heights and mainly among foliage whether *L. penicillatus* present or not, but more on trunks of trees and less at flowers in areas where *L. penicillatus* absent; choice of foraging trees and foraging methods not affected by presence or absence of latter species.

Breeding. May–Mar, mainly late winter to late summer, with clutches recorded Jul–Feb; at Armidale (NE New South Wales) season starts later and ends earlier, late Aug to early Feb (most activity Oct–Nov), with up to five breeding attempts, typically 3–4, of which two may be successful. Nest built usually by female alone, occasionally assisted by male, a well-built cup (though some purse-like or rounded) of fine grass, spider web, bark and wool or hair (which can be taken from live animals), bound with spider web or wool, lined with grass, wool or fur and plant down, sometimes unlined or sparsely lined (other materials include spider egg sacs, plant down or fibre, cotton, twigs, rootlets and moss and lichen), external diameter 4.8–7 cm, depth 5.1–7.6 cm, internal diameter 3.9–4.3 cm, depth 2.9–4.4 cm; suspended in outer foliage or between twigs among dense foliage at end of branch, mainly in crown of eucalypt or tall acacia, occasionally in mistletoe, 0.15–2.5 m (mean 4.9 m) above ground, at Armidale usually suspended from leafy horizontal or vertical twigs 0.8–3.0 m (mean 1.4 m) up. Clutch 1–3 eggs, once 4, mean throughout range 2.4 eggs; incubation, brooding and nest maintenance by female only, most brooding during first 5–6 days; chicks fed by both parents, mostly by female in first two-thirds of nestling period, and then more equally by sexes; at Armidale, incubation period 11–18 days (average 14.9 days), nestling period 12–19 days (average 15.7 days); fledglings fed by both parents, probably independent 4–6 weeks after leaving nest, although later broods may remain with parents for up to 2 months. Nests parasitized by Horsfield's Bronze-cuckoo (*Chrysococcyx basalis*) and Pallid Cuckoo (*Cuculus pallidus*). For 55 eggs in 27 nests throughout range, 0.33 fledged young per nest; of 64 nests where outcome known, 34.4% fledged at least one young; at Armidale, overall success of 127 nests 28.2%, but as low as 7.5% in very dry season and as high as 40.9% in very good season, and success significantly higher at sites with high density of present species (where group defence more likely to occur) than at sites with low density.

Movements. Variable. Resident or partly so over much of range, with some local movements. Altitudinal migrant in S Highlands, making post-breeding descent during autumn–winter (e.g. migration to lower altitudes of Australian Capital Territory in Apr) and returning to higher levels late winter (e.g. mid-Aug); few remain in lowlands during summer. Changes in seasonal occurrence or abundance, or movements, observed in some other areas, but extent of movements not known and perhaps largely local; apparent departure or arrival noted in some places, e.g. near Mudgee (C New South Wales) present throughout year but abundance highest Dec–Jun, few present after Jul, before increase again in Dec. Occasionally recorded in unusual numbers or beyond normal range, with some occurrences consistent with timing of more regular movements. Local abundance often associated with availability of food or seasonal conditions. Migratory populations often in small flocks, often with *L. chrysops* and *Melithreptus lunatus*. Nominata race vagrant in SE South Australia.

Status and Conservation. Not globally threatened. Reasonably common or locally common. No estimates of total population; recorded densities of 0.1–5.4 birds/ha. Thought to have declined in coastal SE New South Wales, and no longer occurs SW Sydney.

Bibliography. Barrett *et al.* (2003), Blakers *et al.* (1984), Campbell (1900), Chan (1990, 1995c), Clark *et al.* (1976), Colston (1974), Cooney *et al.* (2006), Davis & Recher (1993b), Dunkerley (1989), Emison & Porter (1978), Emison *et al.* (1987), Er (1997), Er & Tidemann (1996), Ford, H.A. (1985b), Ford, H.A. & Bell (1981), Ford, H.A., Bridges &

Noske (1985), Ford, H.A., Huddy & Bell (1990), Ford, H.A., Noske & Bridges (1986), Ford, J.R. (1986), Ford, J.R. *et al.* (1980), Gannon (1962), Gosper (1992), Griffiths & Clarke (2002), Higgins (1999), Higgins *et al.* (2001), Keast (1968a), Lamm *et al.* (1963), Lane (1983), Leach & Hines (1987), Leishman (1994), Ley *et al.* (1997), Lord (1956), Loyn (1985a), Mac Nally & Timewell (2005), Marchant (1992), Marshall (1932a), McCarthy (2006), McFarland & Ford (1991), McLean *et al.* (2005), Morris (1974), Morris *et al.* (1981), North (1907), Parker (1971b), Paton (1980, 1985b), Paton *et al.* (1994), Pizzey (1980), Pyke & Recher (1988), Pyke *et al.* (1989), Robertson & Woodall (1983), Schodde & Mason (1999), Smith (1984), Storr (1984), Taylor (1992), Timewell & Mac Nally (2004), Traill *et al.* (1996), Turner (1992), Wakefield (1958), Wheeler (1967a, 1967b), Woinarski, Cullen *et al.* (1989), Wykes (1982, 1985).

44. Yellow-tinted Honeyeater

Lichenostomus flavescens

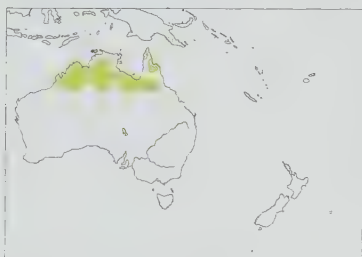
French: Méliophage flavescens **German:** Sichelohr-Honigfresser **Spanish:** Mielero Amarillento
Other common names: Pale-yellow/Yellowish Honeyeater

Taxonomy. *Ptilotis flavescens* Gould, 1840, Derby, King Sound, Western Australia.

Forms a superspecies with *L. fuscus*, with which formerly often considered conspecific; both are part of a species group that includes also *L. ornatus*, *L. plumulus* and *L. penicillatus*. New Guinea birds very similar in appearance to Australian ones, but treated by some authors as a separate race, *germanus* (described from Laloki R. in Port Moresby District); further study required. Proposed races *deserticola* (from Margaret R. in Kimberley District of Western Australia) and *zanda* (from Normanton, Gulf of Carpentaria, in Queensland) are synonyms of nominate. Two subspecies recognized.

Subspecies and Distribution.

L. f. melvillensis (Mathews, 1912) – Tiwi Is (Bathurst I, Melville I), off N Northern Territory, in N Australia. *L. f. flavescens* (Gould, 1840) – SE New Guinea (from Aroa R E to near Port Moresby, inland to Sogeri Plateau); and from N Western Australia (Kimberley Division and associated offshore islands) E through S Port End (largely absent Arufura coast and most of Arnhem Land) to N & NW Queensland.



Descriptive notes. 13–15.5 cm; male 11–16 g and female 9.5–15.5 g (nominate), male 16.5–17 g and female 13–15.5 g (*melvillensis*). Nominant race is mostly light grey-brown above, with yellow-olive forehead and lores merging into olive-grey crown and nape, yellow tinge on uppertail-coverts, strong yellow-olive panel on folded wing (formed by outer edges of remiges); tail with yellow-olive sides and (in fresh plumage) white tip; side of head and most of underbody yellow, bold black crescent across lower and rear ear-coverts (narrow below front of eye and broadening to rear), bordered below and behind by a diffuse bright yellow

plume; diffuse and often faint grey-brown streaking on breast, side of belly and flanks; undertail-coverts off-white, undertail brownish-grey; underwing off-white with brownish-grey trailing edge and tip; iris dark brown to grey-brown; bill and gape black; legs pinkish-brown or pinkish-grey. Sexes alike in plumage, male slightly larger than female. Juvenile is duller and paler than adult, with paler yellow sides of head and upper neck, dark crescent duller and less conspicuous, narrow olive tip of tail and, most obviously, brown bill with black tip and yellow-orange cutting edges, and swollen yellow gape. Race *melvillensis* is similar to nominate, but with significantly longer bill, slightly darker, more olive-brown, upperbody, stronger olive tone on forehead, lores and crown, and more strongly yellow and more heavily streaked breast, belly and flanks. **Voice.** In Australia, song “porra-cheu, porra-cheu, porra-cheu-cheu”, described as short series of calls; in New Guinea, brief bubbling series of short notes. Song given in flight, in synchronized duets between pair-members, and in agonistic interactions. Contact call a harsh descending “tew” or “taw”; in Australia alarm a rather weak trilled “weeweeeweeewee”, in New Guinea repeated high “wi wi wi...” of 12 or more notes. Other calls reported in New Guinea include hard but rich, rapid, churring and slightly descending “trrrrrrr”, 0.7–1.3 seconds, by two or more birds, probably in threat, and sometimes repeated; short sharp “chip” or “chop”, fairly high-pitched; low-pitched, harsh scolding notes, often between members of group when harassing other species; thin contact note, “tsip”; short downslurred trill of c. 4 notes, repeated over and over and answered by others nearby, given only at dawn, dusk or when sky darkens. Other calls reported in Australia include snake-like hiss, as threat; “eh” note while flying around crocodile; and call sounding like twanging of a short string.

Habitat. Tropical open sclerophyll forests and woodlands, usually near rivers or other wetlands, typically riparian associations dominated by eucalypts, e.g. river red gum (*Eucalyptus camaldulensis*), Darwin woollybutt (*Eucalyptus miniata*), Darwin stringybark (*Eucalyptus tetrodonta*) and bloodwoods (*Corymbia*), paperbarks (particularly *Melaleuca leucadendra*) and *Pandanus*; also in other open or savanna eucalypt forests and woodlands, and open acacia woodlands. Sometimes in grassland with scattered trees, in vine scrubs and thickets, in mangroves (mostly on landward side), and in gardens and parks in towns or around homesteads. In New Guinea, in eucalypt savanna, isolated eucalypts in agricultural land, and in town gardens with eucalypts; in lowlands and foothills, to 450 m.

Food and feeding. Nectar and invertebrates (mostly insects, some spiders), also some seeds (possibly from fruit) and honeydew. Forages at all heights. Insects gleaned from foliage, branches and trunks, occasionally on ground, and caught in aerial sally; nectar taken directly from flowers. In New Guinea, seen to probe fallen flowers on ground. Active and acrobatic; in New Guinea, often hangs upside-down when feeding from flowers. Usually singly, in twos (probably pairs) or in small parties, and said to forage in small flocks of up to 6–8 individuals; small flocks seen to sally for flying termites (Isoptera) above termite mounds. Often indulges in mutual chasing, sometimes ending in fights; aggressive also towards other species. Once seen in mixed-species flock of 40–50 honeyeaters, of six genera, in Australia. Flocks of 20–40 birds seen to drink from pools or water troughs.

Breeding. In Australia recorded in all months, mainly in dry season, but around Innisfail (NE Queensland) said to breed Sept–Oct and Jan, and on Fitzroy R (Western Australia) only in dry season; in New Guinea Mar–May and late Jul to Dec, mostly Sept–Nov. Nest built by female, accompanied by male, a small neat cup typically of fine grass, spider web, plant down, strips of bark and bark fibre, less often moss, rootlets, caterpillar silk and spider egg sacs, firmly woven together, bound with spider web, lined with feathers, fine grass, rootlets or bark fibre, sometimes unlined, external diameter 5.7–6.4 cm, depth 3.3–7.6 cm, internal diameter 4.1–5 cm, depth 3.3–3.6 cm (external length × width for four nests 4.3–6.1 × 3.6–5.3 cm); suspended in cluster of foliage, between branches or in horizontal fork in outer crown of tree (often *Eucalyptus* or *Acacia*), less often closer to trunk, occasionally in mistletoe (Loranthaceae), 13 nests 0.9–1.2 m (mean 6.2 m) above ground. Clutch 1–2 eggs (mean 1.59); incubation period said to be c. 10–12 days; both parents feed chicks, nestling period reported as c. 14 days. Nests parasitized by Brush (*Cacomantis variolosus*) and Fan-tailed Cuckoos (*Cacomantis flabelliformis*), possibly also by Common Koel (*Eudynamis scolopacea*). Of five nests, four fledged at least one young.

Movements. Resident, recorded throughout year at many sites; some local movements in response to availability of food. Apparently regular summer visitor to Mt Isa (formerly resident), in NW Queensland, from farther N; also vagrant or irregular at sites on periphery of core range. Scattered records farther S in Western Australia, S & N of main range in Northern Territory, and farther N & E in Queensland. Rare records in N Northern Territory (Melville Bay, Gove Peninsula and Darwin) probably involve race *melvillensis*. Once seen as component of a mobile mixed flock of hundreds or thousands of birds.

Status and Conservation. Not globally threatened. Fairly common. No estimates of total population; in Australia, recorded mean density of 0.55 birds/ha NW of Katherine, in Northern Territory. Described as patchily common in New Guinea.

Bibliography. Aumann (1991), Barrett *et al.* (2003), Beshler *et al.* (1986), Beruldsen (1979), Blakers *et al.* (1984), Boekel (1976, 1979b, 1980b), Coates (1990), Close & Teese (1978), Collins (1995), Colston (1974), Cooney *et al.* (2006), Deignan (1964), Elgood (1979), Finch (1980b, 1983), Ford, J.R. (1978a, 1986, 1987b), Ford, J.R. *et al.* (1980), Franklin & Noske (2000a), Griffin (1972), Higgins (1999), Higgins *et al.* (2001), Immelman (1961), Johnstone (1983), Johnstone & Storr (2004), Johnstone *et al.* (1977), Keast (1968a), Lavery (1986), Liddy (1962), Longmore (1991a), Mayr & Rand (1937), McCarthy (2006), McKean (1985), North (1907), Parker (1971b), Pizzey (1980), Rand & Gilliard (1967), Sage (1994), Schodde (1976), Schodde & Mason (1999), Schodde & Tidemann (1986), Sedgwick (1988b), Slater (1959), Smith *et al.* (1978), Storr (1977, 1984), Storr *et al.* (1975), Thair (1976), Tubb (1945), Watson *et al.* (1962), Wheeler (1967b), Whitlock (1925), Woinarski & Tidemann (1991).

45. White-plumed Honeyeater

Lichenostomus penicillatus

French: Méliophage serti **German:** Weißbüzel-Honigfresser **Spanish:** Mielero Empenachado
Other common names: Carter’s/Cloncurry/Pallid Honeyeater

Taxonomy. *Meliphaga penicillata* Gould, 1837, interior of New South Wales = Wagga Wagga area, Australia.

Forms a species group with *L. ornatus*, *L. plumulus*, *L. fuscus* and *L. flavescens*. Races intergrade where they meet. Described races *centralis* (from C Australia) and *interioris* (Ward R, S of Charleville, in SW Queensland) represent intergrading populations; other proposed races are *geraldtonensis* (from Geraldton, in Western Australia) and *ladasi* (East Murchison, in Western Australia), both merged with *carteri*, and *mellori* (Templestowe, in Victoria), synonymized with nominate. Four subspecies recognized.

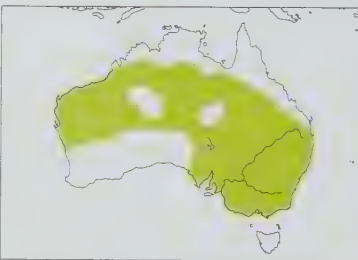
Subspecies and Distribution.

L. p. calconii (Mathews, 1912) – extreme SW & S Kimberley (S Fitzroy River Drainage Basin) and adjacent Great Sandy Desert, in N Western Australia.

L. p. carteri (A. J. Campbell, 1899) – Pilbara and Gascoyne regions of Western Australia (from upper De Grey–Fortescue rivers S to Geraldton and N Wheatbelt) E to E Gibson Desert and in Great Victoria Desert to NW South Australia.

L. p. leilavalensis (North, 1899) – NC Northern Territory (from c. 18° S) and NC Queensland S to South Australia (S to Gawler Ranges and N Flinders Ranges) and NW New South Wales (Barrier Range), but largely absent from Simpson Desert.

L. p. penicillatus (Gould, 1837) – Greater Murray–Darling Basin, from CE Queensland (W of Great Divide) S to gulfs of South Australia, extending E to Great Divide and locally to coastal and subcoastal S & SE Australia.



Descriptive notes. 13.5–18 cm; male 17–25 g and female 14–20 g (nominate), male 14.3–20.5 g and female 12–20 g (*leilavalensis*), male 17–19.5 g and female 14.5–17 g (*carteri*), male 16.5–18 g and female 15–18.5 g (*calconii*). Nominant race breeding has largely yellow-olive head, tinged dull olive on top and on chin and throat, with slightly brighter yellow eyering, and conspicuous white neck-plume from side of throat to near nape and edged at front with short black stripe across tips of rear ear-coverts; upperparts mostly greyish-olive, yellow tinge on uppertail-coverts; upperwing mostly brown, with olive to yellow-olive tips

or edges on wing-coverts and yellowish outer edges on secondaries and primaries (form distinct broad panel); uppertail olive-brown with broad yellow-olive sides and, in fresh plumage, white tip; underbody pale brownish-grey, streaked pale yellow in centre of breast and suffused with pale yellow elsewhere, except for cream central lower belly; underwing off-white with broad brownish-grey trailing edge and tip, undertail brownish-grey; iris black-brown to olive-brown; bill and gape black; legs pinkish-grey to purple-grey. Non-breeding plumage as breeding, but has orange-yellow, orange-brown or pink-brown base of bill or base of lower mandible only, and yellow gape. Sexes alike in plumage, male slightly larger than female. Juvenile is like adult, but top of head and neck duller and greyer, underbody slightly browner, lores, eyering and ear-coverts brighter yellow, white plume smaller and less distinct, little or no black on rear ear-coverts, bill pink or yellowish with brown tip, becoming black with yellow-orange or pinkish base, and gape swollen and yellow. Races differ mainly in size and in intensity of yellow in plumage, nominate race largest: *leilavalensis* is similar in size to nominate (but with shorter wing and tail), also paler and yellower above and on chin and throat, breast paler and less grey, underwing-coverts tinged yellow; *carteri* is smaller than nominate, similar to previous but with shorter tarsus, yellower above and below, brighter yellow on face and underwing-coverts; *calconii* is similar in size to *leilavalensis* but with plumage yellower, and is paler yellow than preceding race. **Voice.** Three main songs and a range of calls. Main song “chick-o-wee” or “chick-oo-wee” or “chick-ick-o-wee” or “cheep a cheep” and many variants, duration 0.4–2 seconds; appears to vary geographically, and local populations have more than one song type, e.g. at Clayton (Victoria) three types with variants, and near Adelaide (South Australia) two songs, both of which also varied. Flight song a liquid, rolling warble, consisting of regular series of 3-note phrases. Early-morning song geographically variable; at one site typically a short note (c. 0.1 second) followed by two 4-note phrases (each c. 0.4 seconds), interval between single note and first phrase c. 0.5 seconds and between first and second phrases c. 0.2 seconds, uttered at intervals of 5–10 seconds for up to 18 minutes. Main call a sharp, descending “chip”, often repeated monotonously at intervals of c. 0.5 seconds for up to one minute. Three types of alarm call (intermediate variants common): Type A rapidly repeated sharp, shrill, penetrating “pee-pee-pee...” lasting up to 10 seconds, in response to flying predator; Type B longer notes than previous, slightly harsh, typically in sequence that develops into Type A calls, given when mobbing (or alternating with Type A when mobbing); Type C alarm quite harsh and generally quieter than other two types, usually single or sometimes paired notes (and sometimes in sequence that develops into Type B calls and then into Type A calls), given when disturbed, excited, in aggression or when threatened or alarmed, including as response to predator. Other calls include twittering during corroborees

(see page 534); high-pitched clear tones and ascending whistles during foraging and from high perches; soft “chick, chick” when coming to feed nestlings. Said to mimic Pacific Baza (*Aviceda subcristata*) and Golden Whistler (*Pachycephala pectoralis*). Snaps bill in aggressive interactions. **Habitat.** Dry, open sclerophyll forests and woodlands, typically riparian associations dominated by eucalypts and bordering wetlands such as watercourses, swamps, waterholes, bores and springs; strongly associated with riparian river red gum (*Eucalyptus camaldulensis*) forests and woodlands along watercourses, but occupies wide range of other riparian eucalypt associations, e.g. those dominated by coolibah (*Eucalyptus coolabah*), snappy gum (*Eucalyptus brevifolia*) or bloodwoods (*Corymbia*) or, less often, woodlands and forests dominated by paperbarks (*Melaleuca*) or casuarinas, sometimes co-dominant with eucalypts. Sometimes in other open forests and woodlands dominated by eucalypts, *Acacia*, cypress-pines (*Callitris*) or casuarina, or occasionally combinations of these, though rarely in mallee eucalypt associations. Often in remnants or isolated trees in cleared lands or built-up areas, or in shelter-belts or plantations of eucalypts; commonly in parks and gardens in cities and towns and around homesteads.

Food and Feeding. Mainly nectar, arthropods, and manna; also pollen and fruit and, very occasionally, seeds (most probably ingested with fruit); seen to take a small skink (Scincidae). Arthropods mainly insects, but also spiders (Araneae), pseudoscorpions (Pseudoscorpiones) and, rarely, snails (Gastropoda); insect products including honeydew (of Ericococcidae, Pseudococcidae and Psyllidae) and lerp (produced by psyllids). In one study, ratio of nectar to insects in diet 31:69; at another site, fed mainly on manna from foliage of manna gum (*Eucalyptus viminalis*) throughout year, also on nectar, mostly in spring. Forages at all levels, from canopy to ground, mainly in tree crowns and less often in saplings or shrubs, only occasionally in air or on ground; on New England Tableland (NE New South Wales), mainly 5–13 m above ground but used wide range of heights. Nectar usually taken by directly probing flowers, especially of eucalypts, but often mistletoes (of genera *Amyema*, *Lysiana*); sometimes steals nectar from tubular flowers (e.g. *Tecoma*, *Correa*, *Lachenalia*) by piercing base of flower or slitting flower from tip to base. Insects, insect products and manna mainly gleaned from foliage, bark and, sometimes, ground; also probes beneath loose bark, and captures insects by sallying. Vocal, bold and very active. Singly, in twos (probably pairs) and in small flocks of 5–7 individuals (or up to 20 when drinking); gregarious and possibly colonial or semi-colonial, with much social interaction within groups; at one site, appeared to occur in groups of c. 12 in non-breeding season but in smaller groups, perhaps solitary pairs, in breeding season. On New England Tableland, foraging behaviour influenced by presence of *L. fuscus*: where co-occurred with latter, present species usually foraged at lower levels, and less often in foliage and more on trunks of trees and in air, than it did in areas without *L. fuscus*; no difference in foraging method or tree species used, whether congener present or not, but tended to select different tree species regardless.

Breeding. Recorded in all months, most clutches (72%) in late Aug to Nov; usually two and sometimes three clutches in a year. Nest probably built by female only, a small, neat, fragile and slightly swollen cup, usually of woven grass, bound with spider web or wool, sometimes with hair, plant or synthetic fibres, plant down, feathers, bark strips or fibres, fine twigs, egg sacs, rootlets, leaves, flowers, moss, lichen or plastic, lined with wool, hair, feathers, fine grasses or, less often, plant down, fur or rootlets (parts of nest plant can be incorporated), external diameter 5.1–8.9 cm, depth 5.1–6.4 cm, internal diameter 5.7 cm, depth 3.8–4.4 cm; typically suspended 0.4–3.3 m (mean 3.7 m) above ground in crown of tree, especially eucalypt, less often in shrub, vines or very occasionally mistletoes or artificial site, in foliage, less often in twigs or fork, and occasionally in dead foliage of fallen limb or tree. Clutch 2–3 eggs, occasionally 1 and rarely 4, mean 2.31; incubation probably by female only, period 13–15 days; chicks fed by both parents, nestling period 11–15 days; juveniles fed for at least 2 weeks after fledging, by both parents, occasionally assisted by auxiliaries. Nests parasitized by Pallid (*Cuculus pallidus*) and Fan-tailed Cuckoos (*Cacomantis flabelliformis*) and Horsfield’s (*Chrysococcyx basalidis*) and Shining Bronze-cuckoos (*Chrysococcyx lucidus*). From 177 eggs in 82 complete clutches, 0.6 fledged young per nest; of 240 nests where outcome known, 64.6% fledged at least one young.

Movements. Breeding adults resident, but some local movements, e.g. at Mt Isa (NW Queensland), small proportion of population makes short movements during wet season, and in SE leaves suburban gardens of Canberra in spring, probably moving to nearby reserves to breed. Subadults may disperse widely from natal area. Some movements evidently associated with availability of water, e.g. short-distance shifts away from permanent water during wet season, and to more suitable habitat during severe droughts; can appear at water sources remote from permanent wetlands. Vagrant or sporadic at sites at periphery of range, e.g. occasional records (probably of race *leilavalensis*) N of 18° S in Northern Territory, and in Western Australia *carteri* vagrant near Perth and Kellerberrin.

Status and Conservation. Not globally threatened. Widespread and locally common; sparsely distributed in some areas, e.g. NW part of South Australia, and largely absent from Simpson Desert, in C Australia. Recorded densities of up to 14.3 birds/ha. Range has changed in several regions: increases in range and abundance in e.g. Sydney and Newcastle (New South Wales), and range contractions in e.g. Illawarra region (New South Wales) and Wilsons Promontory (Victoria). Readily adapts to urban habitats, and one of the commonest honeyeaters of urban Australia. At least formerly, occasionally responsible for damage to soft fruits in orchards.

Bibliography. Anon. (1914), Ashton (1985, 1996), Barrett *et al.* (2003), Bell (1980a), Blakers *et al.* (1984), Brooker & Estergs (1976), Campbell (1900), Carruthers (1972), Chan (1990, 1995c), Clark *et al.* (1976), Close & Jaensch (1984), Colston (1974), Cooney *et al.* (2006), Cooper (1970, 1975a), Cox & Pedler (1977), Degabriele *et al.* (1979), Dow (1980b), Emison *et al.* (1987), Er (1997), Er & Tidemann (1996), Fisher *et al.* (1972), Ford, H.A. (1979, 1980), Ford, H.A. & Forde (1976), Ford, H.A. & Paton (1976a, 1976c, 1977), Ford, J.R. (1987b, 1988), Franklin & Robinson (1989), Gannon (1962, 1966), Gee *et al.* (1996), Griffiths & Clarke (2002), Hannah *et al.* (2007), Higgins (1999), Higgins *et al.* (2001), Hindwood (1950), Hobbs (1961), Hornsby (1997), Johnstone & Storr (2004), Johnstone, de Rebeira & Smith (1979), Johnstone, Smith & Fuller (1981), Jones, D.N. (1981, 1986), Jurisevic & Sanderson (1994a, 1994b), Keast (1968a, 1968b), Ley *et al.* (1997), Liddy (1962), Lill & Fell (1990), Longmore (1991a), Loyn (1985a), McCarthy (2006), McCulloch (1977), McFarland (1983c, 1984a, 1995), Morris *et al.* (1981), Newbey & Newbey (1989), North (1907), Paton (1980, 1985b), Paton & Paton (1980), Rix (1976), Rooke (1972), Saunders & Ingram (1995), Schodde & Mason (1999), Schrader (1981), Serventy & Whittell (1976), Sharp & Sewell (1995), Start & Fuller (1983), Storr (1977, 1984), Talmage (1993), Taylor, M. (1992), Taylor, P.W. (1987), Templeton (1992), Traill *et al.* (1996), Turner (1992), Winslet & Winslet (1987), Woinarski, Cullen *et al.* (1989), Woodall (1995), Wykes (1982).

Genus *PURNELLA* Mathews, 1914

46. White-fronted Honeyeater

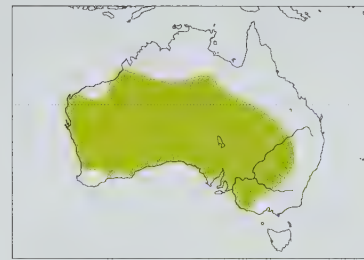
Purnella albifrons

French: Méléphage à front blanc **German:** Weißstirn-Honigfresser **Spanish:** Mielero Frentiblanco

Taxonomy. *Glyciphila albifrons* Gould, 1841, York District, south Western Australia.

Genus sometimes merged with *Phylidonyris*. Species has in the past been placed with *Phylidonyris novaehollandiae* and *Phylidonyris niger* in a separate genus, *Meliornis*; has also been thought to be close to *Glyciphila melanops*. Monotypic.

Distribution. Widespread through arid and semi-arid Western Australia E to S Northern Territory (mostly S of 23° S), SW Queensland (S from about Mt Isa), South Australia (mostly N of 33° S), W New South Wales and W Victoria (in Mallee and Wimmera regions, mainly N of 37° S).



Descriptive notes. 13–18.5 cm; male 15–22 g, female 12–19 g. Plumage is mostly black-brown above, with fine white scaling on crown and nape merging into heavy white streaking on hindneck and most of upperbody, and with pale rufous streaking on dark brown rump; side of long sloping forehead, lores, eyering and submoustachial stripe white, dissected by thin black-brown moustachial stripe; ear-coverts silvery grey, merging into uneven white stripe extending broadly down side of neck; upperwing dark brown, white to yellow-olive margins on wing-coverts and tertials, yellow-olive edges on rest of remiges (broad panel on folded wing); uppertail dark brown with fine yellow-olive edges and white tip; bold black-brown bib from chin to upper breast (in fresh plumage chin and throat sparsely and finely speckled white), this merging to white with diffuse black streaking on flanks, and white on rest of underbody; undertail brownish-grey, underwing pale orange-buff with brownish-grey trailing edge and tip; iris reddish-brown, small area of bare pink-red skin behind eye; bill and gape black; legs grey-black. Sexes alike in plumage, male larger than female. Juvenile is paler than adult and without bold facial markings, has forehead, lores and submoustachial stripe greyish-brown and contrasting little with dark brown of rest of head and neck, but with white stripe on side of neck (as adult), paler and browner upperside, brown upper breast, gape cream or yellow and swollen, iris brown, bare patch behind eye smaller and less intensely coloured. Voice. Can be noisy when nesting. Main call a distinctive, ringing, metallic “tink-tink”, “chink-chink”, “cheep-cheep” or “chip-chip”. Song described as “pert-peatoo-weet” or “peter-peat-peat”, first note rather harsh, rest more musical. Alarm is a scolding “tuck, tuck” with a click. Other calls include a peevish, grating “tweet”, a gravelly or metallic “kweet” or “kwaak”, and a mournful and long-drawn “cre-e-e-k”; also utters “chu-chu-chu”, occasional trill, mellow “tok-tok” (may be same as “tink-tink”), and flat, short, nasal “wha-wha”. Reported to mimic Australian ringnecks (*Barnardius*) and Crested Bellbird (*Oreocitta gutturalis*).

Habitat. Occupies fairly dense mallee eucalypt shrubland, woodland or heathland, with shrub layer often dominated by *Acacia*, *Eremophila* or broombush (*Melaleuca uncinata*), and ground cover of bluebush (*Maireana*) or spinifex (*Triodia*); these include dense regenerating patches of burnt or harvested mallee eucalypts or broombush. Also, often found in *Acacia* shrublands, usually with ground cover of chenopods or grasses. Sometimes in non-mallee eucalypt woodlands, including riparian woodlands dominated by river red gum (*Eucalyptus camaldulensis*), and sometimes mixed with other species such as cypress-pine (*Callitris*) and *Banksia*; also occurs in non-eucalypt associations, including casuarina shrublands and woodlands, cypress-pine woodlands, *Banksia* woodlands, and riparian paperbark (*Melaleuca*) associations. Inhabits arid and semi-arid zones, sometimes coastally.

Food and Feeding. Diet consists mainly of nectar, e.g. of *Eucalyptus*, *Erythrina*, *Lophostemon*, *Eremophila*; also arthropods (mostly insects, some spiders), occasionally honeydew. Forages in trees (particularly *Eucalyptus*), shrubs (including *Banksia*, *Epaeris*, occasionally broombush) and mistletoes (e.g. of genera *Amyema*, *Lysiana*), mainly at flowers but also in foliage, on branches; occasionally on ground or aerially. Probes flowers for nectar; takes insects by gleaning and sallying. When taking nectar from the mistletoe *Amyema linophyllum*, moves rapidly from one inflorescence to another. Wary and gregarious; often in twos (probably pairs) or small loose parties, and in large numbers in areas with abundant flowering plants; sometimes singly. Often forages with other meliphagids.

Breeding. Season Aug–Nov, but occasional records for all other months (mostly Feb–Jul); probably double-brooded. Possibly semi-colonial breeder, often many nests in small area. Nest built by female, cup-shaped, usually of woven grass, bark, twigs, plant stems and spider web, lined with plant down, wool or fur and, less often, fine grass, woolly seeds and other soft material, sometimes unlined, external diameter 6.2–8 cm, depth 5.7–6.4 cm, internal diameter 3.8–5.1 cm, depth 3.8–5.5 cm; usually supported, sometimes suspended by rim, 0.2–4.55 m (mean 0.94 m) above ground in small shrub, less often in tree (often *Eucalyptus*), occasionally in top of clump of spinifex, atop stump or broken trunk, or in mistletoe. Clutch 1–3 eggs, usually 2 (mean 2.09); incubation begins when clutch complete, probably by female alone, period usually 13 days, once 12 days; chicks fed by both sexes, nestling period 10–12 days; both sexes feed fledglings. Nests parasitized by Pallid Cuckoo (*Cuculus pallidus*) and Horsfield’s Bronze-cuckoo (*Chrysococcyx basalidis*). From 128 eggs in 65 nests, 0.86 young fledged per nest.

Movements. Complex, not fully understood; described as resident at a few sites. Generally highly mobile, but extent and patterns of movements not known. Irregular visitor in many areas; occasional influxes or irruptions, especially at edges of range. At many sites occurrence seasonal and species thus sometimes considered migratory; movements in some areas may exhibit regular seasonality if flowering regime constant. Often travels in parties, occasionally in hundreds or thousands, and recorded rates of up to 50–60 birds per minute on passage. Vagrant Kangaroo I (South Australia), and E & S of normal range in E Australia, especially during extreme conditions (e.g. prolonged droughts).

Status and Conservation. Not globally threatened. Locally common. No estimates of total population; recorded densities of up to 0.73 birds/ha. Widespread, but largely absent from SW and far N of Western Australia, and scattered in Western Australian deserts and Simpson Desert; in South Australia, absent from much of NE, and from S Eyre and Yorke and Fleurieu Peninsulas, Adelaide Plain and SE.

Bibliography. Ashton *et al.* (1996), Badman (1979), Barrett *et al.* (2003), Black & Badman (1986), Blakers *et al.* (1984), Boehm (1957, 1978), Brooker & Estergs (1976), Brooker *et al.* (1979), Burbidge & Fuller (2007), Campbell (1900), Carpenter & Matthew (1997), Close & Jaensch (1984), Colston (1974), Cooney *et al.* (2006), Davies (1982), Davies *et al.* (1988), Emison *et al.* (1987), Ford & Sedgwick (1967), Griffiths & Clarke (2002), Higgins (1999), Higgins *et al.* (2001), Hopper (1981), Johnstone *et al.* (1979), Keast (1968a), Longmore (1991a), Mathews (1924a), Matthew & Carpenter (1990), Milligan (1904), North (1906), Officer (1971), Paton, D.C. (1985b), Paton, D.C. *et al.* (1983), Paton, J.B. (1975), Pianka & Pianka (1970), Pizzey (1980), Possingham & Possingham (1997), Rix (1976), Saunders & Ingram (1995), Schodde & Tidemann (1986), Sedgwick (1949b), Sedgwick & Morrison (1949), Serventy & Whittell (1976), Start & Fuller (1983), Watson (1994, 1997), Woinarski (1989b).



Genus *MELIDECTES* P. L. Sclater, 1874

47. Bismarck Honeyeater

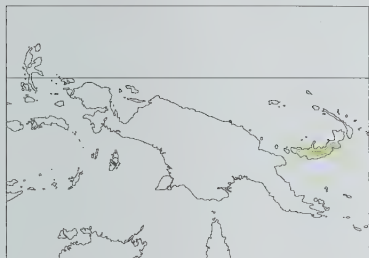
Melidectes whitemanensis

French: Méléphage de Whiteman **German:** Gilliardhonigfresser **Spanish:** Mielero de las Bismarck
Other common names: Bismarck/Gilliard's/Vose's/Whiteman (Mountain) Melidectes, New Britain/Gilliard's Honeyeater

Taxonomy. *Vosea whitemanensis* Gilliard, 1960, Wild Dog Range, Whiteman Mountains, central New Britain, Bismarck Archipelago.

Affinities uncertain, and sometimes placed in a monotypic genus, *Vosea*; further research needed. May be closest to *M. fuscus*. These two, together with *M. nouhuysi* and *M. princeps*, comprise a group of medium-sized species that differ from others in genus in size, morphology, plumage and voice. Monotypic.

Distribution. New Britain (Whiteman Mts, Nakanai Mts and Mt Talawae), in Bismarck Archipelago.



Descriptive notes. 22.5 cm; female 42–49 g. Head and neck are olive-brown, slightly darker on forehead, lores and ear-coverts, with narrow pale grey (faintly yellow-tinged) eyering and area of bare skin below and behind eye, very faint pale speckling on ear-coverts, and faint and fine paler streaking on malar region, chin, throat and side of neck; upperbody olive-brown, blackish-brown scapulars, faint dark olive scalloping on mantle and upper back, and yellowish-brown tinge on lower back to uppertail-coverts; uppertail blackish-brown, yellowish-olive central rectrices and outer edges of rest of rectrices (folded tail appearing

largely yellowish-olive); upperwing blackish-brown, prominent yellowish-olive outer webs of secondaries, yellowish-olive outer edges on all except outer few primaries, and yellowish-olive outer webs and tips of coverts (folded wing appears largely yellowish-olive; spread wing blackish-brown with conspicuous large yellowish-olive patch across remiges); underbody olive-brown with faint, fine pale streaking on upper breast (as chin and throat), merging into slightly paler and yellow-tinged rear flanks, vent and undertail-coverts; undertail dark grey; underwing-coverts dull greyish-brown, tinged yellowish, remiges dull grey; iris dark brown; bill black; legs dark grey. Sexes alike in plumage, female slightly smaller and somewhat duller than male (doubtfully distinguishable in field). Juvenile undescribed. **VOICE.** Song of 3–8 soft, mellow, whistled 2-note syllables (at rate of c. 1.4 syllables per second), first note of each syllable simple, second slightly lower in pitch, trilled or uneven and downslurred (likened to song of *M. fuscus*, but considerably shorter). **Habitat.** Primary montane forest; observed in urban gardens at Keravat. From 900 m to above 1740 m, mainly above 1300 m.

Food and Feeding. Diet includes nectar and arthropods. Forages in middle and upper levels, e.g. seen to probe long red-and-yellow mistletoe flowers (Loranthaceae) c. 8 m above ground in subcanopy. Highly active, moving abruptly and jerkily, staying at a spot for only a few seconds before moving 20–40 cm to another, either hopping along branches or suddenly taking flight. Often acrobatic, hanging vertically with head down, or hanging with body horizontal and head turned downwards, or hanging with body horizontal and twisting head almost 180 degrees to axis of body to reach upwards; grips bark with feet and claws. Also flattens and extends body to peer forwards when searching. Usually singly, occasionally in small numbers in flowering trees; sometimes associates with other species, such as *Philemon cockerelli*.

Breeding. No information.

Movements. No information.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in New Britain and New Ireland EBA. Generally widespread and common to uncommon; common around Mt Talawae, but uncommon to very uncommon in other parts of range. Considered potentially at risk as it is undergoing very slow decline in area of forest habitat.

Bibliography. Anon. (2007a), Bishop & Jones (2001), Buchanan *et al.* (2008), Coates (1990), Diamond (1971), Dutton (1997a), Gilliard (1960), Gilliard & LeCroy (1967b), Mayr & Diamond (2001), Smith (1991), Stattersfield *et al.* (1998).

48. Sooty Honeyeater

Melidectes fuscus

French: Méléphage fuligineux **German:** Buntwarzen-Honigfresser **Spanish:** Mielero Fuliginoso
Other common names: Sooty Melidectes

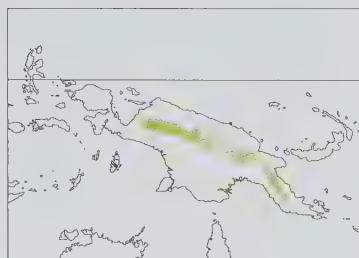
Taxonomy. *Acanthochoera fusca* De Vis, 1897, Mount Scratchley, Wharton Range, south-east New Guinea.

Study of relationships within genus needed. Present species sometimes placed with *M. nouhuysi* and *M. princeps* in a separate genus, *Melionyx*; all three, along with *M. whitemanensis*, comprise a group of medium-sized species that differ from others in genus in size, morphology, plumage and voice. Birds in Eastern Highlands proposed as a separate race, *gilliardi* (described from Mt Wilhelm, in Bismarck Range), but intermediate geographically and morphologically between *occidentalis* and nominate, and synonymized with latter. Two subspecies recognized.

Subspecies and Distribution.

M. f. occidentalis Junge, 1939 – Central Ranges of New Guinea, from Snow Mts (Nassau Range and Oranje Mts) E to Eastern Highlands (Mt Hagen, Mt Wilhelm, and Mt Giluwe and Kubor Range). *M. f. fuscus* (De Vis, 1897) – mountains of SE New Guinea E from Eastern Highlands.

Descriptive notes. 21–25.4 cm; 25–42.9 g (nominate). Male nominate race is wholly dark brownish-black above, slightly browner on wings and tail, feathers of upperbody faintly tipped paler, greyish, giving faint mottled or scaled effect (pronounced when plumage fresh, very faint with wear, often



difficult to see in field); small pale blue eye wattle (variable, sometimes pale yellow in centre), extending narrowly in front of and behind eye and dropping below eye, small spot of red to orange-red bare skin behind wattle at rear of eye (note also that face, particularly forehead, can be coloured by pollen from flowers); outer webs of remiges faintly tinged dark red-brown; black-brown to dark brown below, slightly paler than upperparts, paler brown on vent and undertail-coverts, fine pale brown to brownish-grey speckling or fine streaking on chin and throat merging into pale brown crescent-shaped scaling on underparts (except vent); some feath-

ers of breast and belly faintly tinged rufous-brown in centre; undertail black-brown, with paler, light grey-brown tips on outer feathers (lost or almost lost with wear); shafts of remiges and rectrices dark red-brown; iris dark brown (described as green on one museum label); bill black; legs blue-grey. Female is like male but smaller; suggestion that female has slightly greyer tinge on belly and smaller wattle requires confirmation. Juvenile is duller than adult, brownish-black, with little or no pale tipping on feathers of upperparts, underbody more mottled and less scaled, mottling greyer, undertail-coverts richer brown; bill probably shorter and gape yellow at first, eye wattle and skin behind eye both pale yellow, legs bluish-pink. Race *occidentalis* is very like nominate, but smaller. **VOICE.** Call a pair of rather soft, upslurred notes, “schweep-schweep”. Two song types described (possibly varying geographically): one a long and monotonous repetition of high-pitched 2-note phrase, second note trilled or slurred and lower than first, at rate of 90 phrases per minute for up to a minute or more (likened to song of *M. whitemanensis*, although repeated far more times); second type a sweet, airy, high-pitched series of whistles gradually dropping in pitch and then continuing on single pitch, “see-dee-dee-dee-dee-dee...”. Independent fledgling continually uttered “pzeep” note.

Habitat. Primary upper montane forest and high mountain forests (particularly moss forest), forest edge, secondary growth, and alpine shrubland and shrub thickets within or at edge of grassland; on Mt Albert Edward, recorded in dense secondary growth at edge of moss forest damaged by fire; in dense secondary growth in clearings in mossy beech (*Nothofagus*) forest at low altitude at Ok Tedi; at Tari Gap, observed and netted mainly in forest patches bordering grassland. On Mt Wilhelm recorded as breeding in old landslip area surrounded by forest. From 2200 m to tree-line at c. 3720 m, mainly in alpine zone above 3000 m; exceptionally down to c. 1700 m in Ok Tedi area. Recorded at 3050–3350 m on mounts Hagen, Wilhelm, Giluwe and Kubor, and breeding at 3460 m on Mt Wilhelm; at 2740–3300 m on Mt Albert Edward, 3200 m at Dokfuma (Star Mts). Co-exists with *M. belfordi* in SE New Guinea, with *M. princeps* in Eastern Highlands, and with *M. nouhuysi* on S slopes of Snow Mts. **Food and Feeding.** Diet includes arthropods (insects), nectar, pollen and fruit (including berries). Forages at all levels, from crown to understorey; often seen in shrubs and low trees in clearings in forest and in alpine shrubs. Gleans arthropods from foliage and weeds, probes flowers (often of *Rhododendron* and *Vaccinium*, also *Dimorphanthera*); seen to probe for pollen in mature male cones in crowns of *Dacrycarpus compactus*. Active, darting rapidly among twigs and foliage, and hopping along branches; often holds tail cocked. Almost always singly, occasionally in twos (possibly pairs); does not congregate in flowering trees. Described as unwary to quite tame, but very shy at Ok Tedi.

Breeding. Nest with egg in Oct, nestlings early Oct, early Nov and May, nests reported also in Apr (two) and Jun (five), and dependent fledglings in Jul; possibly bimodal, breeding at end of wet season and start of dry season and also in late dry season. Nest a bulky, deep, thick-walled cup, one made of moss and some fine grass and lined with dark feathers, another of fine rootlets and covered externally with moss and lined with tree-fern fibres, external diameter 17.5 cm, depth 19 cm, internal diameter 7.2 cm, depth 4.3 cm; placed in upright fork and usually not far from ground, one c. 3 m up in fork of *Rhododendron*, another 1.9 m up in nearly vertical fork of densely foliated sapling in small patch of shrubs. Clutch (Mt Wilhelm) 1 egg; no information on duration of incubation and nestling periods, at one nest chick fed by both parents; one juvenile fed by adult but also feeding itself c. 2 weeks after fledging, and foraging apparently independently within c. 3 weeks of fledging.

Movements. No information.

Status and Conservation. Not globally threatened. Restricted-range species: present in Central Papuan Mountains EBA. No estimates of global abundance; generally considered scarce, although locally common to abundant in SE. In English Peaks, in Wharton Range, 53 individuals mist-netted in one month.

Bibliography. Anon. (1994c), Beehler (1978a), Beehler *et al.* (1986), Bell (1969, 1971a), Clapp (1986b), Coates (1990), Coates & Peckover (2001), Coles (1995), De Vis (1897), Diamond (1972a), Filewood (1969), Frith & Frith (1992), Gregory (1995b), Gregory & Johnston (1993), Hicks (1988d), Hicks & Burrows (1989, 1992), Hopkins (1992), Mackay & Martin (1976), Mayr & Gilliard (1954), Mayr & Rand (1937), Ogilvie-Grant (1915), Rand (1936b, 1942b), Rand & Gilliard (1967), Sims (1956), Smith (1976), Stattersfield *et al.* (1998).

49. Short-bearded Honeyeater

Melidectes nouhuysi

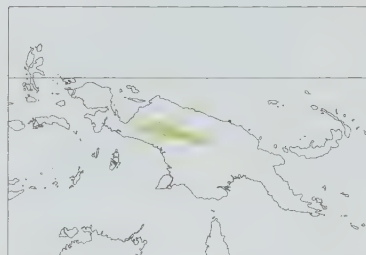
French: Méléphage à barbe courte **German:** Kurzbart-Honigfresser **Spanish:** Mielero Barbicorto
Other common names: (Short-)bearded/Nouhuys's Melidectes

Taxonomy. *Melirrhophetes nouhuysi* van Oort, 1910, Oranje Mountains, west-central New Guinea. Study of relationships within genus needed. Forms a superspecies with *M. princeps*, and both species, together with *M. fuscus*, are sometimes placed in a separate genus, *Melionyx*; these three, along with *M. whitemanensis*, comprise a group of medium-sized species that differ from others in genus in size, morphology, plumage and voice. Length of bill may vary, being longer in Star Mts than in Snow Mts; study required. Monotypic.

Distribution. Highest mountains of Central Range in Snow and Star Mts, including Nassau Range, Mt Capella and Dokfuma Meadow, in WC New Guinea.

Descriptive notes. 27–27.5 cm. Appears wholly dark blackish-brown to sooty black, tinged brownish on lower belly, with small patch of yellow to golden-yellow bare skin behind eye; indistinct white tip of tail; white chin and throat (except for black centre of throat), feathers of which slightly elongated and tufted, forming short but prominent “beard” at side of throat (not reaching close to angle of folded wing); varying greyish scalloping on breast, belly and vent, pale buff scalloping on

On following pages: 50. Long-bearded Honeyeater (*Melidectes princeps*); 51. Cinnamon-browed Honeyeater (*Melidectes ochromelas*); 52. Vogelkop Honeyeater (*Melidectes leucostephes*); 53. Belford's Honeyeater (*Melidectes belfordi*); 54. Yellow-browed Honeyeater (*Melidectes rufocrissalis*); 55. Huon Honeyeater (*Melidectes foersteri*); 56. Ornate Honeyeater (*Melidectes torquatus*); 57. San Cristobal Honeyeater (*Meliarchus sclateri*); 58. Bell Miner (*Manorina melanophrys*); 59. Noisy Miner (*Manorina melanocephala*); 60. Black-eared Miner (*Manorina melanotis*); 61. Yellow-throated Miner (*Manorina flavigula*); 62. Spiny-cheeked Honeyeater (*Acanthagenys rufogularis*).



undertail-coverts; iris dark brown to dark reddish-brown; bill black; legs pale blue-grey, but described also as brownish-black and black. Sexes alike in plumage, male larger than female. Juvenile undescribed; immature differs from adult in dull yellow wash on whitish elongated feathers of chin and throat, mixed with some off-white feathers (some appear to have white feathering much as adult), olive tinge on breast, yellowish and weaker scalloping on underbody, and buff to rufous-buff undertail-coverts. VOICE. In Snow Mts, scolding call a low, buzzy "chsh" repeated rapidly 4–6 times (sounding like call of a much smaller bird), and utters repeated, sweet scolding "sweet" during mutual chasing. In Star Mts, calls include metallic "pwik", and thin "weet-weet" in flight.

Habitat. Open high mountain forest, forest edge and scattered clumps of shrubs and trees bordering or in alpine grassland at tree-line; usually low in fringing vegetation and shrubs. Recorded from 3050 m to 4500 m; 3300–4500 m in Snow Mts, no lower than upper limit of closed forest (which it avoids); 3200 m Dokfuma Meadow, in Star Mts.

Food and Feeding. Fruit, seeds (including of sedges), arthropods (insects) and nectar. Forages mainly in shrubs or on ground in thickets or clumps, also in upper levels of trees; seen to glean from leaf litter. Secretive but not shy; when pursued by observer, hopped rapidly through shrubs, or flew from one clump of shrubs to another. At Dokfuma (Star Mts), chased by smaller but more aggressive *Lichenostomus subfrenatus*, once to canopy.

Breeding. One nest found, on 10th Aug: a loose, bulky cup-shaped structure of moss, liverworts and thread-like fungi, firmer internal cup sparsely lined with grass and fern stems, plant fibre, fern scales and some feathers, latter mainly from Salvadori's Teal (*Anas waigiensis*), external diameter 16 cm, depth 20 cm, internal diameter 7.5 cm, depth 6 cm, reasonably well concealed among multiple forks 1.2 m above ground in rather isolated shrub in open country; contained 1 egg. No other information.

Movements. No information; probably resident.

Status and Conservation. Not globally threatened. Restricted-range species: present in Central Papuan Mountains EBA. Very poorly known. Considered generally fairly common (though secretive); not uncommon at Dokfuma, in Star Mts.

Bibliography. Anon. (1994c), Beehler *et al.* (1986), Coates & Peckover (2001), Gregory & Johnston (1993), Mayr & Gilliard (1951), Ogilvie-Grant (1915), Rand (1942b), Rand & Gilliard (1967), Ripley (1964), Stattersfield *et al.* (1998).

50. Long-bearded Honeyeater

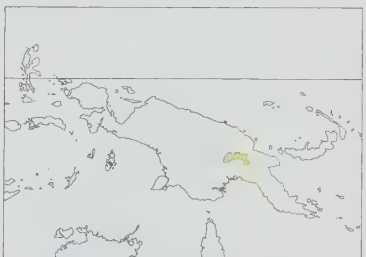
Melidectes princeps

French: Méléphage à barbe longue **German:** Langbart-Honigfresser **Spanish:** Mielero Barbilargo
Other common names: Long-bearded Melidectes

Taxonomy. *Melidectes princeps* Mayr and Gilliard, 1951, Mount Wilhelm, Bismarck Range, east New Guinea.

Study of relationships within genus needed. Forms a superspecies with *M. nouhuysi*, and both species, together with *M. fuscus*, are sometimes placed in a separate genus, *Meltonyx*; these three, along with *M. whitemanensis*, comprise a group of medium-sized species that differ from others in genus in size, morphology, plumage and voice. Monotypic.

Distribution. Mt Giluwe, Mt Hagen, Kubor Range (including Mt Kubor, Mt Kinkain and Mt Orata, and Minj-Nona Divide), Bismarck Range (Mt Wilhelm), Mt Michael and Kratke Ranges, in east-central New Guinea.



Descriptive notes. 26.5–28.8 cm; one female 42 g. Head, neck and upperparts are black-brown, slightly darker on top and side of head, slightly warmer dark olive-brown on rump and uppertail-coverts, and with sparsely feathered small patch beneath eye blackish, finely speckled with white; small patch of bare skin behind eye is orange, with some yellow and pale greenish; uppertail narrowly tipped brownish-grey on outer edges, and remiges finely edged olive-grey (tips and edges lost with wear); chin and throat covered with long, tufted off-white to white feathers, longest on chin and along side of throat, latter forming

long "beard" that reaches almost to angle of folded wing; underbody dark olive-brown, varying scalloped with grey-brown, most noticeably on breast and lower belly, with some light rufous-brown mottling or scalloping on undertail-coverts; undertail dark olive-brown; underwing dark olive-brown, some faint rufous-brown mottling on coverts, and silvery brownish-grey panel across bases of remiges; iris dark brown to dark reddish-brown; bill black; legs pale grey to pale blue-grey. Juvenile not fully described; immature (or possibly juvenile) said to be sooty black above and washed buff below, especially on belly, with beard dull yellowish-white (not white). Voice. No information.

Habitat. High mountain moss forest and woodland, and clumps of shrubs and scrubby forest thickets in alpine grassland, above and below tree-line. Mainly 3000–3800 m, but recorded to 4200 m and extends as low as 2750 m in Kubor Mts; on mounts Kubor, Hagen and Wilhelm mainly above 3050 m, and to at least 3600 m in Kubor Range.

Food and Feeding. No information.

Breeding. Nestling found in late Jul (Mt Hagen) and dependent fledgling mid-Jun (Mt Wilhelm). No other information.

Movements. No indication of any movements; presumed sedentary.

Status and Conservation. VULNERABLE. Restricted-range species: present in Central Papuan Mountains EBA. Very poorly known, and no estimates of global population or trends. Generally described as fairly common within range. Total population thought to be small, confined to a few sites within a small range, and to be declining owing to loss and degradation of its patchy and dissected habitat. The highlands where species occurs have a dense human population; although cultivation stops below altitudinal range in which the species occurs, there may be some habitat degradation from fires, usually started by hunters. No conservation measures known to be under way.

Bibliography. Anon. (2007a), Beehler *et al.* (1986), Butchart & Stattersfield (2004), Coates (1990), Coates & Peckover (2001), Collar *et al.* (1994), Diamond (1972a), Mayr & Gilliard (1951, 1954), Rand & Gilliard (1967), Sims (1956), Stattersfield & Capper (2000), Stattersfield *et al.* (1998).

51. Cinnamon-browed Honeyeater

Melidectes ochromelas

French: Méléphage à sourcils roux **German:** Rostohr-Honigfresser **Spanish:** Mielero Cejirrufo
Other common names: Cinnamon-browed/Dark-mantled/Mid-mountain Melidectes, Dark-mantled/Mid-mountain Honeyeater

Taxonomy. *Melirrhophetes ochromelas* A. B. Meyer, 1874, Hatam, Arfak Mountains, Vogelkop, north-west New Guinea.

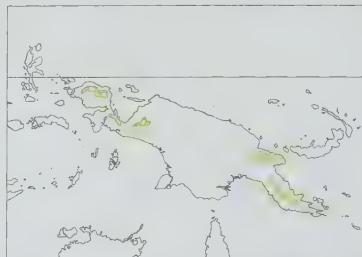
Study of relationships within genus needed. Present species and *M. leucostephes*, *M. belfordi*, *M. rufocrissalis*, *M. foersteri* and *M. torquatus* comprise a group of relatively large species that differ from others in genus in size, morphology, plumage and voice. Birds in Weyland Mts intermediate between nominate race and *batesi*, and currently included within latter. Three subspecies recognized.

Subspecies and Distribution.

M. o. ochromelas (A. B. Meyer, 1874) – mountains of Vogelkop (Tamrau Mts, Arfak Mts) and Wandammen Mts, in NW New Guinea.

M. o. batesi (Sharpe, 1886) – Weyland Mts, S slopes of Nassau Mts and mountains of SE New Guinea.

M. o. lucifer Mayr, 1931 – mountains of Huon Peninsula, in NE New Guinea.



Descriptive notes. 24–25 cm; male 61.5–65 g, female 54–62.5 g (nominate). Nominate race has top and side of head and chin and upper throat brownish-black, merging into dark brownish-grey or dusky olive-brown with diffuse whitish scaling on hindneck, side of neck and lower throat (combining to form distinct collar); short pale cinnamon supercilium bordering large patch of pale green to greenish-yellow bare skin around eye (very broad behind eye), fine streak of pale cinnamon across rear ear-coverts, grey tinge on lower ear-coverts, merging into brownish-grey side of neck; pale yellowish to yellow gape wattle, small red to

orange-red wattle at side of throat; upperbody dark brownish-grey or dusky olive-brown, heavily scaled pale grey to off-white on mantle, back and scapulars (boldest in mid-line); upperwing and tail brownish-black, broad yellow-olive outer edges on primaries and secondaries (large panel on folded wing), narrow buff tips on outer primaries, and broad greenish-olive outer edges of rectrices (folded tail appears largely yellow-olive with dark centre); underbody brownish-grey or dusky brown, with diffuse pale grey to off-white streaking (or mottling) on breast and belly, merging into broader white barring or mottling on lower belly and vent, and into rufous-buff on undertail-coverts; undertail grey-brown; iris brown to blackish-brown, described also as dark grey; bill pale bluish-grey, paler towards tip; legs pale to dull blue-grey, described also as whitish. Sexes alike in plumage, male larger than female. Juvenile undescribed. Race *batesi* is like nominate but with more pronounced supercilium, and underbody browner and less grey-toned; *lucifer* resembles previous, but darker on head and breast. Voice. Noisy. Vocalizations often comprise 4–5 nasal slurs; also loud, descending "whee oo woo", and bell-like notes like those of Blue Bird-of-paradise (*Paradisaea rudolfi*). Often duets, giving nasal slurs in perfect alternating rhythm.

Habitat. Lower to middle montane forest and forest edge. From c. 1100 m to 1800 m (Huon Peninsula) or 2000 m (SE or range), and locally as low as 770 m; possibly as high as 2590 m on Mt Albert Edward.

Food and Feeding. No details of diet. Usually forages in canopy, subcanopy and middle levels of forest. Pair seen to probe lichen on trees. Noisy and pugnacious. Usually singly, in twos (probably pairs) or in small groups; also congregates in flowering trees with other species, including *Myzomela rosenbergii* and Fairy Lorikeet (*Charmosyna pulchella*).

Breeding. Egg recorded in Jan, and dependent fledgling being fed with insects by both parents in mid-May. Nest undescribed. No other information.

Movements. No information; presumed sedentary.

Status and Conservation. Not globally threatened. Restricted-range species: present in West Papuan Highlands EBA and in Adelbert and Huon Ranges EBA and in Central Papuan Mountains EBA. Poorly known. Considered generally scarce to rare, but locally common. Unconfirmed report from Ubaigubi, in Eastern Highlands.

Bibliography. Beehler (1978a), Beehler *et al.* (1986), Coates (1990), Diamond (1972b), Draffen (1977), Eastwood & Gregory (1995), Filewood (1969), Finch (1980a), Frith (1971), Hornabrook (1985), Mayr & Rand (1937), Ogilvie-Grant (1915), Peterson (1999), Rand & Gilliard (1967), Stattersfield *et al.* (1998), Stein (1936).

52. Vogelkop Honeyeater

Melidectes leucostephes

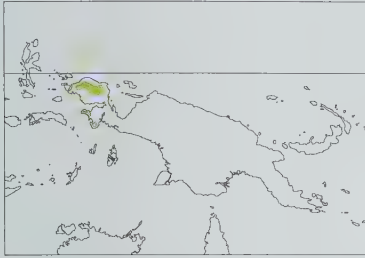
French: Méléphage à face blanche **German:** Diademhonigfresser **Spanish:** Mielero de Vogelkop
Other common names: Vogelkop/Arfak/White-fronted Melidectes, Vogelkop Wattled/White-capped/White-fronted(!) Honeyeater

Taxonomy. *Melirrhophetes leucostephes* A. B. Meyer, 1874, Hatam, Arfak Mountains, Vogelkop Peninsula, north-west New Guinea.

Study of relationships within genus needed. Forms a superspecies with *M. belfordi*, *M. rufocrissalis* and *M. foersteri*; all four, along with *M. ochromelas* and *M. torquatus*, comprise a group of relatively large species that differ from others in genus in size, morphology, plumage and voice. Sometimes treated as conspecific with *M. belfordi*. Monotypic.

Distribution. Mountains of Vogelkop (Tamrau Mts, Arfak Mts) and Bomberai Peninsula (Fakfak Mts, Kumawa Mts), in NW New Guinea.

Descriptive notes. 26 cm; male 63–97 g, female 65–78 g (Arfak and Tamrau), one female from Kumawa Mts 61 g. Head and neck are black-brown to brownish-black, merging into dark dusky brown with buff mottling on hindneck, and with white forehead; large patch of pale blue-green or pale bluish-white bare skin surrounding eye, broader and tapering to rounded point behind eye, bordered above by white rear supercilium curving over and behind rear edge of orbital patch, and below by white streak from beneath middle of eye and extending back to meet supercilium at rear of bare patch; broad white moustachial stripe continuing to below rear ear-coverts; swollen pinkish gape, and long, broad, fleshy pinkish-red to orange-red or bright red wattle extending from gape well down side of throat; mantle, back and scapulars dark dusky brown, boldly and broadly scaled or scalloped with buff to buff-white, merging to more rufous-brown and unmarked on rump and uppertail-coverts; upperwing and uppertail dark brown, yellow-olive edges on most remiges, narrow whitish tips on all except inner few primaries, and faint olive edges on rectrices; underbody largely black-brown to brownish-black, with broad off-white to buff-white tips at side of breast



and on belly, vent and undertail-coverts (strongly scaled appearance), merging to rufous-brown on vent and to creamy buff to buff on undertail-coverts; underwing pale rufous-buff, mottled with blackish-brown on coverts, and with blackish-brown trailing edge and tip; iris dark brown to black-brown; bill pale bluish-white to pale blue or bluish-grey; legs blue-grey. Sexes alike in plumage, male larger than female. Juvenile not fully known, said to lack wattle. VOICE. In Kumawa Mts, loud calls consist of 2–9 notes, slurs and disyllables, with clear and hoarse notes, screeches, gulps and high nasal notes combined in same call; resemble

loud calls of *M. ochromelas*, *M. belfordi* and *M. rufocrissalis*. Flew with loud wingbeats.

Habitat. Montane forest, and edge of forest bordering grassland. From 900 m to 1800 m; in Kumawa Mts, recorded at 1000–1800 m, possibly down to 850 m; in Fakfak Mts at c. 1200 m.

Food and Feeding. In Kumawa Mts, seen singly, in twos and in threes; probes leaves and flowers, from 5 m above ground to canopy. No other information.

Breeding. No information.

Movements. No information; presumed sedentary.

Status and Conservation. Not globally threatened. Restricted-range species: present in West Papuan Highlands EBA. Poorly known. Considered generally uncommon in Kumawa Mts.

Bibliography. Beehler *et al.* (1986), Diamond (1985), Eastwood (1966a), Gibbs (1994), Gilliard (1959), Gyldenstolpe (1955b), Mayr & Gilliard (1952a), McCarthy (2006), Peterson (1999), Rand & Gilliard (1967), Stattersfield *et al.* (1998), Stein (1936).

53. Belford's Honeyeater

Melidectes belfordi

French: Méliphage de Belford **German:** Belfordhonigfresser **Spanish:** Mielero de Belford
Other common names: Belford's Melidectes/Black-bill, Arfak White-fronted Honeyeater

Taxonomy. *Melirrhophetes belfordi* De Vis, 1890, Mount Knutsford, south-east New Guinea.

Study of relationships within genus needed. Forms a superspecies with *M. leucostephes*, *M. rufocrissalis* and *M. foersteri*; all four, along with *M. ochromelas* and *M. torquatus*, comprise a group of relatively large species that differ from others in genus in size, morphology, plumage and voice. Sometimes treated as conspecific with *M. leucostephes* and with *M. rufocrissalis*. Co-occurs with last-mentioned species on Mt Koimjim (in Schrader Mts), but the two appear to exclude each other altitudinally; the two hybridize freely, however, where they come into contact; Herzog Mts, much of Eastern Highlands, Mt Goliath (in E Star Mts) and N slopes of Snow Mts may once have supported both species, but hybrid populations now found extensively through these areas (although populations of N slopes of Snow Mts are almost pure individuals of present species, with only a few *M. rufocrissalis* characteristics). Race *brassi* and nominate race may represent different species, as they occupy same geographical range but are separated altitudinally and appear not to intergrade; further study needed. Races *joiceyi* and *kinneari* intergrade in W Nassau Mts (Wissel Lakes area). Proposed races *stresemanni* (type from Dawong, in Herzog Mts) and *griseirostris* (type from Mt Goliath, in E Oranje Mts/W Star Mts) represent hybrids. Five subspecies recognized.

Subspecies and Distribution.

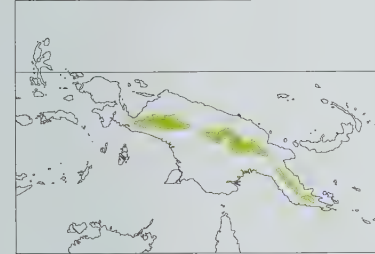
M. b. joiceyi (Rothschild, 1921) – Weyland Mts and W Nassau Mts, in W New Guinea.

M. b. kinneari Mayr, 1936 – Snow Mts (including Nassau Mts and Oranje Mts), in W New Guinea.

M. b. schradereensis Gilliard & LeCroy, 1968 – Schrader Mts, in E New Guinea.

M. b. belfordi (De Vis, 1890) – c. 3000 m to c. 3800 m in mountains of SE New Guinea (E from Bismarck–Hagen–Kubor Ranges).

M. b. brassi Mayr & Rand, 1936 – c. 2000 m to c. 2800 m in mountains of SE New Guinea.



small white gape wattle; chin and upper throat black-brown, merging into brownish-grey or pale grey with brownish mottling on lower throat; mantle, back and scapulars black-brown, heavily scaled or mottled grey, merging into dark brown on rump and uppertail-coverts; upperwing and tail black-brown, yellow-olive tips and outer edges on greater coverts, broad yellow-olive outer edges on all except outer two remiges (large yellow-olive panel on folded wing), outer 5–6 primaries also narrowly tipped yellow-brown (reduced with wear), broad yellow-olive outer edges on rectrices (folded tail appears yellow-olive with dark centre); underbody pale grey, mottled dark brown and finely streaked white on breast and belly, merging to broader white barring or mottling on lower belly and vent, which also tinged rufous-brown, and to rufous-brown on undertail-coverts; undertail dark brown; underwing dark brown, slightly paler bases of remiges; iris brown to dark red-brown; bill black to dark greyish-black, sometimes dark-grey lower mandible; legs dark grey to dull blue-grey, varying mottled with brown or brownish-grey, soles yellow. Sexes alike in plumage, male larger than female. Juvenile is like adult but upperbody darker, sooty black-brown, with only faintly paler tips (mottled or scaled effect much reduced), underbody generally darker, blackish-grey, with much-reduced mottling or scaling throughout and a rufous tinge on belly, vent and undertail-coverts, also white malar stripe smaller, less white in line behind eye above rear ear-coverts. Races differ mainly in size and in plumage tones: *brassi* differs from nominate only in smaller size; *kinneari* is smaller than nominate, also paler grey-brown upperparts with paler and olive-tinged scaling on mantle, back and scapulars, brighter more yellowish-green edges of remiges, paler grey underbody with less prominent white markings posteriorly, and bare orbital skin violet-blue, also juvenile bare parts differ from adult's, orbital skin greenish, gape yellow and legs brown (not brownish-grey to dark grey or blackish-brown); *schradereensis* differs from all others in having lemon-yellow (not blue) orbital ring, otherwise like previous in general size and coloration; *joiceyi*

is smaller than others, and with strong olive tinge above. VOICE. Very noisy, its voice an almost ubiquitous sound of higher forests; typically, the first species to call in dawn chorus (starts well before dawn), can be noisy during rainshowers. Vocalizations unmusical and varying; repeated staccato notes and jumbled gurgles or bugling common, but other sounds include repeated hoarse or querulous rasps, coughs and cackles, nasal “caw” notes, and clear, high-pitched piping notes, in alarm also a sharp whistled call, repeated several times. Some calls rendered as loud high “kee kee...”, hoarse “que que...”, loud “whit whit...”, soft “cremm”, loud clear “pip pip...”, and “kee qui qui...”. Duets; on Mt Albert Edward, two individuals faced each other on a branch and uttered “caw” notes rapidly and in perfect alternation up to 34 times.

Habitat. Primary upper montane to high mountain forests, forest edge, secondary growth and disturbed habitats, such as scattered trees in cattle pastures, patches of scrub in cleared areas and remnant forest; at high altitudes, recorded in thickets of shrubs in subalpine grassland. In upper Kaironk Valley, mainly in *Nothofagus* forest. Between Komopa and near Dauwagu, in W New Guinea, recorded also in *Pandanus* scrub and in open scrub with tree-ferns; at Dokfuma, in subalpine herbfield. Mainly above 1600 m, but recorded as low as 1400 m, and ranging up to tree-line in places, to 3800 m in SE, to at least 3350 m in CE and to above 3700 m in Snow Mts, probably up to 4000 m; in W of range, recorded at 3700–4000 m in Carstensz Mts and at 1740 m at Enarotali and 1830 m near Dauwagu; in E, not heard below 2300 m on Mt Koimjim (Schrader Mts) but common in higher forests to summit at c. 2600 m, and common on N side of upper Kaironk Valley from c. 2280 m upwards; on Mt Albert Edward from 2000 m to tree-line (at least 3350 m), but recorded down to 1600 m; in Victor Emanuel Mts at 2200–2300 m; in S foothills and slopes of Wharton Ranges, recorded at 1700–2700 m. Over much of range, replaced at lower altitudes by *M. rufocrissalis* (below 2300 m) or *M. ochromelas*.

Food and Feeding. Diet includes arthropods, mainly insects, including large ants (Formicidae) and beetles (Coleoptera); also nectar, fruit and, probably, pollen. Forages mainly in upper levels of trees, including emergents, and especially in flowering and fruiting trees (e.g. *Banksia dentata*, *Xanthomyrtus papuanus*) or flowering epiphytes (e.g. *Rhododendron*, *Dimorphanthera*); occasionally at ground level, and seen to forage at cluster (4-m diameter) of flowering *Mitrastemma yamamotoi* (a terrestrial root parasite), which birds visited mainly in mornings, usually descending cautiously and probing flowers while gripping vertical stem. Actions rather deliberate. Searches for insects by hopping along branches and up trunks, often head down, probing moss and epiphytes, and gleaning from foliage, vines and, apparently, flowers; often hangs to reach flowers, which it probes systematically. Conspicuous and pugnacious (but race *kinneari* considered surprisingly inconspicuous). Usually seen singly, sometimes in twos (probably pairs). Appears to defend resources from conspecifics and other birds; does not normally congregate in numbers in flowering trees, but may defend parts of trees. Sometimes associates with *Melipotes fumigatus*. Once seen to dive-bomb two Crested Berrypeckers (*Paramythia montium*). When foraging on *Mitrastemma yamamotoi* on ground, present species was found to be the most aggressive of four avian species, and effectively dominated and controlled foraging at the patch in the morning.

Breeding. Apparently predominantly late wet season and dry season: nest-building early Apr, late Jun and late Jul, “breeding birds” May and Aug-Oct, nestlings Apr–May and dependent fledglings early May and late Jun. Nest a deep cup of moss and twigs, densely lined with soft brownish material from base of tree-fern fronds, placed (not known whether suspended or supported) 4.5–9 m above ground in fork of branch in tree, one nest near Dauwagu c. 35 m above ground. No information on clutch size; one reported nest contained one young; both parents observed to feed nestlings and both seen with fledglings. No other information.

Movements. No information; probably largely sedentary.

Status and Conservation. Not globally threatened. Restricted-range species: present in Central Papuan Mountains EBA. Common to very common in many parts of range, e.g. upper Kaironk Valley, Mt Koimjim. At English Peaks, at 3650 m in Wharton Range, 22 individuals mist-netted in 17 days. Interbreeding with *M. rufocrissalis* over wide area in E New Guinea; suggested that some hybridization occurs naturally in undisturbed habitats in narrow altitudinal band where the two species overlap, but that large-scale hybridization is a result of extensive habitat disturbance caused initially by indigenous agriculture and possibly other human activities in more recent times. Such habitat disturbance brings the two species into contact over broader areas and permits extensive and accelerated hybridization to take place.

Bibliography. Beehler (1978a, 1994), Beehler *et al.* (1986), Bell (1971a), Clapp (1986b), Coates (1990), Coates & Peckover (2001), Coles, D. (1976b), Coles, T. (1995), Diamond (1967, 1972a, 1972b), Filwood (1969), Frith & Frith (1992), Gilliard (1959), Gilliard & LeCroy (1961, 1968), Gregory & Johnston (1993), Gyldenstolpe (1955a), Heron (1977a), Hicks & Burrows (1992), Hopkins (1992), Iova (1993), Mayr & Gilliard (1952a, 1954), Mayr & Rand (1937), McCarthy (2006), Melville (1979), Ogilvie-Grant (1915), Rand (1936b, 1942b), Rand & Gilliard (1967), Ripley (1964), Rowland (1995), Salomonsen (1967b), Schodde *et al.* (1975), Sims (1956), Stattersfield *et al.* (1998), Tolhurst (1991), Watson *et al.* (1962), Weston (1976a, 1977).

54. Yellow-browed Honeyeater

Melidectes rufocrissalis

French: Méliphage de Reichenow **German:** Reichenowhonigfresser **Spanish:** Mielero Cejamarillo
Other common names: Yellow-browed/Reichenow's Melidectes, Reichenow's Wattlebird

Taxonomy. *Melirrhophetes rufocrissalis* Reichenow, 1915, Schraderberg, Sepik Mountains – Schrader Range, north-east New Guinea.

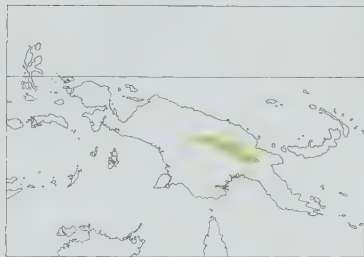
Study of relationships within genus needed. Forms a superspecies with *M. leucostephes*, *M. belfordi* and *M. foersteri*; all four, along with *M. ochromelas* and *M. torquatus*, comprise a group of relatively large species that differ from others in genus in size, morphology, plumage and voice. Sometimes treated as conspecific with *M. belfordi*, and on Mt Koimjim (in Schrader Mts) the two co-occur but appear to exclude each other altitudinally; they hybridize freely, however, where they come into contact; Herzog Mts, much of Eastern Highlands, Mt Goliath (in E Star Mts) and N slopes of Snow Mts may once have supported both species, but hybrid populations now found extensively through these areas (although populations of N slopes of Snow Mts are almost pure *M. belfordi*). Has been suggested that race *thomasi* is of hybrid origin on basis of its black forehead; this race was originally described under name *gilliardi*, but that name invalid, as preoccupied. Precise geographical limits of each race complicated by extensive hybridization with *M. belfordi*. Two subspecies recognized.

Subspecies and Distribution.

M. r. rufocrissalis (Reichenow, 1915) – Central Range of New Guinea, from E Star Mts and Hindenburg Range E to Bismarck Range, Mt Hagen and Kubor Mts.

M. r. thomasi Diamond, 1969 – S slopes of Eastern Highlands from at least Okapa to Mt Karimui and in Morobe Province (in Aseki area).

Descriptive notes. 26–29 cm; male 74–84 g and two females 61 g and 69 g (nominate); male 72.7–96.5 g and female 56–72.7 g (*thomasi*, Mt Karimui), male 70–81 g and three females 58–61 g (*thomasi*, Awande). Nominate race has forehead black, rest of head and neck dusky black-brown, merging into brownish-grey on hindneck, side of neck and lower throat (diffuse, slightly paler half-



collar or collar), with large area of light green to pale greenish-yellow or pale yellow bare skin around eye (narrow in front of and above and below eye, broad behind eye), bordered by small superciliary tuft of bright yellow, and with small yellow streak at rear edge of ear-coverts; long pale yellow to pale greenish-white gape wattle extending across malar area to side of upper throat, bordered below by narrow and wispy whitish submoustachial stripe; small orange-red wattle behind gape wattle on side of lower throat; upperparts dark brown, slightly darker upwing and tail, with broad yellow-olive to olive edges on greater coverts and all

except outer two remiges (on remiges combining to form large panel on folded wing); rectrices also broadly edged yellow-olive (folded tail appears yellow-olive with dark centre); underbody grey-brown, mottled or roughly barred with off-white to light brownish-grey, undertail-coverts rich chestnut-brown; undertail dark olive-brown; underwing dark olive-brown, slightly paler on coverts and paler across bases of remiges; iris dark brown to blackish-brown; bill pale steel blue or pale blue-grey; legs steely blue-grey to very pale blue, soles yellow. Sexes alike in plumage, male larger than female. Juvenile undescribed. Race *thomasi* is like nominate, except for black (not white) forehead. VOICE. Noisy. Common vocalizations include a series of "caw" notes, either piercing and nasal or hoarse and raucous, repeated at even rate of 2–3 per second, notes either on same pitch or slightly rising and falling (alternating between slightly higher-pitched clear note and lower-pitched and more complex one); and a series of bugled notes alternating between two pitches. Performs antiphonal duets: two birds face each other, less than 1 m apart on branch, and give descending series of alternating "caw" notes at normal rate, but notes of one bird filling gaps between notes of the other.

Habitat. Lower and middle montane forest, forest edge and secondary growth; also gardens. In Schrader Mts, abundant in clumps of trees (mostly native-planted casuarinas) in grasslands and in trees bordering streams through grasslands; also in disturbed forest edge. In upper Kaironk Valley, found in timbered garden areas, bush-fallow and forest. Thought to be common in or to prefer disturbed areas, thus increasing rate of hybridization with *M. belfordi* where habitat disturbance by humans increasing. Mainly 1400–2450 m, occasionally down to 1100 m; 1280–2420 m on S slopes of Eastern Highlands; in upper Kaironk Valley recorded to c. 2280 m and occasionally to 2375 m where clearings made and forest disturbed by human activity.

Food and Feeding. Diet includes insects, nectar and fruit. Usually in middle and upper storeys, often foraging high in canopy; commonly seen in flowering or fruiting trees. Noisy and conspicuous, with rather deliberate actions. Usually seen singly, sometimes in twos (probably pairs). Mutual chases in treetops.

Breeding. Nestlings recorded early Oct, fledglings mid-Jul and early Feb, and unspecified breeding in Apr. Nest a woven open basket of fine grass and fern stems, covered externally with green moss, supported or suspended in thin fork towards end of branch 2.4–4.6 m above ground. One nest contained a single nestling. No other information.

Movements. Resident; no indication of any movements.

Status and Conservation. Not globally threatened. Restricted-range species: present in Central Papuan Mountains EBA. General status unclear; said to be fairly common to common, but claimed also that "pure individuals" are uncommon to rare in most of range. Interbreeding with *M. belfordi* occurs over wide area of range; suggested that some hybridization occurs naturally in undisturbed habitats in narrow altitudinal band where the two species overlap, but that large-scale hybridization is a result of extensive habitat disturbance caused initially by indigenous agriculture and possibly other human activities in more recent times. Such habitat disturbance brings the two species into contact over broader areas and permits extensive and accelerated hybridization to take place.

Bibliography. Beehler *et al.* (1986), Coates (1990), Coates & Peckover (2001), Coles (1995), Diamond (1967, 1969, 1972a), Diamond & Terborgh (1968), Gilliard (1959), Gilliard & LeCroy (1961, 1968), Gregory (1995b), Gyldestolpe (1955a), Mayr & Gilliard (1952a, 1954), McCarthy (2006), Murray (1988b), Rand & Gilliard (1967), Sims (1956), Stattersfield *et al.* (1998), Tolhurst (1991), Wahlberg (1988), Weston (1977).

55. Huon Honeyeater

Melidectes foersteri

French: Méléphage de Foerster **German:** Foersterhonigfresser **Spanish:** Mielero de Foerster
Other common names: Huon Wattled/Foerster's Honeyeater, Huon (Wattled)/Foerster's Melidectes

Taxonomy. *Melirhophetes foersteri* Rothschild and E. J. O. Hartert, 1911, Rawlinson Mountains, Huon Peninsula, north-east New Guinea.

Study of relationships within genus needed. Forms a superspecies with *M. leucostephes*, *M. belfordi* and *M. rufocrissalis*; all four, along with *M. ochromelas* and *M. torquatus*, comprise a group of relatively large species that differ from others in genus in size, morphology, plumage and voice. Considered a race of *M. belfordi* by some authors, but may be closer to *M. leucostephes* or *M. rufocrissalis*. Monotypic.

Distribution. Huon Peninsula (Saruwaged Mts), in NE New Guinea.



Descriptive notes. 28–32 cm. Has forehead white, rest of head and neck mostly dusky black, merging into sooty brown with heavy but diffuse whitish scaling on nape, hindneck, side of neck and lower throat (forming paler collar), with large area of pale blue bare skin around eye (broader behind eye), and fine white streaking over eye, below eye and on ear-coverts; pale pink gape wattle bordered below by narrow whitish submoustachial stripe; small orange-red to red wattle behind gape wattle on side of lower throat; upperparts sooty brown to brownish-black, conspicuous greyish-white scalloping on mantle, back and

scapulars; dark yellowish-olive edges of remiges (large panel on folded wing); broad dark yellowish-olive edges of rectrices (folded tail appears yellow-olive with dark centre); underbody dark greyish-brown to dusky grey, merging into off-white in centre of belly, and spotted or scaled off-white on breast; undertail-coverts cinnamon-brown; iris pale brown; bill pale; legs greyish. Sexes alike in plumage, male larger than female and with larger gape wattle. Juvenile undescribed. VOICE.

No detailed information. Noisy. Vocalizations said to be similar to those of *M. belfordi*.

Habitat. Upper montane and high mountain forest, to tree-line; 1600–3700 m.

Food and Feeding. Few details. Noisy and conspicuous; forages in canopy and middle levels of forest. Otherwise, habits said to be like those of *M. belfordi*.

Breeding. No information.

Movements. No information; presumed sedentary.

Status and Conservation. Not globally threatened. Restricted-range species: present in Adelbert and Huon Ranges EBA. Poorly known. Considered generally common.

Bibliography. Beehler (1978a), Beehler *et al.* (1986), Coates (1990), Gilliard (1959), Hammersley & Hammersley (1983), Mayr & Gilliard (1952a), Rand & Gilliard (1967), Stattersfield *et al.* (1998).

56. Ornate Honeyeater

Melidectes torquatus

French: Méléphage maquillé **German:** Zimtbrust-Honigfresser **Spanish:** Mielero Maquillado
Other common names: Ornate/Ornamental Melidectes, Cinnamon-breasted Honeyeater/Melidectes/Wattlebird

Taxonomy. *Melidectes torquatus* P. L. Slater, 1874, Hatam, Arfak Mountains, Vogelkop Peninsula, north-west New Guinea.

Study of relationships within genus needed. Present species and *M. ochromelas*, *M. leucostephes*, *M. belfordi*, *M. rufocrissalis* and *M. foersteri* comprise a group of relatively large species that differ from others in genus in size, morphology, plumage and voice. Six subspecies recognized.

Subspecies and Distribution.

M. t. torquatus P. L. Slater, 1874 – mountains of Vogelkop, in NW New Guinea.

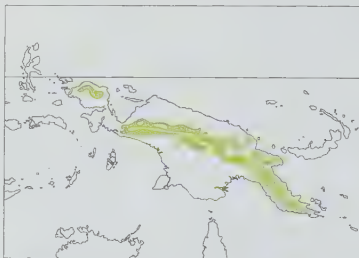
M. t. muchalis Mayr, 1936 – Weyland Mts and S slopes of Nassau Mts and Oranje Mts, in W & WC New Guinea.

M. t. mixtus Rand, 1941 – upper slopes of Central Ranges of C New Guinea from Oranje Mts (Balim R region) E to Victor Emanuel Mts and Telefomin area.

M. t. polyphonus Mayr, 1931 – mountains of NE inland New Guinea, including Adelbert Mts, and from Bismarck Range (upper Wahgi region) E to Herzog and Kuper Ranges.

M. t. cahni Mertens, 1923 – mountains of Huon Peninsula, in NE New Guinea.

M. t. emilii A. B. Meyer, 1886 – mountains of SE New Guinea.



Descriptive notes. 23 cm; one male 48 g and female 39–45 g (nominate), male 40–58 g and female 34–44 g (*polyphonus*), one female 41.5 g (*mixtus*). Male nominate race has head and neck largely black-brown, merging to dark brown with blackish mottling on hindneck; large patch of bright orange-yellow bare skin surrounding eye (broader and tapering to rounded point behind eye), bordered above by rufous-buff rear supercilium curving over and behind rear edge of orbital patch; large rufous-brown patch behind ear-coverts; pinkish-red to red gape wattle (sometimes bordered by some rufous-brown feathering); fine silvery

streaking on ear-coverts (visible only at close range); mantle, back and scapulars greyish-brown, broadly scaled off-white to pale grey (most sparsely in centre of mantle), merging into brown on lower back, rump and uppertail-coverts (and diffusely mottled darker on lower back); upwing dark brown, olive edges of remiges (except outer two) and faint olive edges on some greater coverts (seemingly quickly lost with wear), all except inner few primaries with light brown tips; uppertail dark brown, faint olive edges of rectrices and diffuse pale tip (lost or almost lost with wear); broad white crescentic patch across throat, bold black upper breastband bordered below by pale rufous-tinged brown lower breast and centre of upper belly, this grading to buff on centre of belly and to off-white on rest of underbody, with bold black blotches on side of breast (can appear as second partial breastband) and belly and along flanks (sometimes some scattered patches elsewhere), and diffuse blackish mottling on undertail-coverts; undertail brown; underwing very pale rufous-brown with brownish-grey trailing edge and tip; iris blackish-brown; bill light blue-grey, becoming pale green-blue near base; legs blue-grey. Female is similar in plumage to male but much smaller, and bare parts somewhat duller, iris dark brown, bill steel-grey to pale blue, legs steel-grey, bare facial skin bright yellow (less orange), gape wattle slightly paler. Juvenile is like adult but duller, with less prominent pale scaling above, buff (not rufous-brown) breast, dusky dark blotches on underbody, bill pinkish-grey with orange-yellow cutting edges and gape, legs greyish-pink, gape wattle apparently as adult. Races differ mainly in presence or absence of throat wattle, in darkness of plumage, particularly rufous-brown of breast, and in size of white throat patch: *polyphonus* is larger than nominate, slightly darker above, with rufous-brown supercilium, rufous-brown hindneck and black-brown mantle to back (birds in Adelbert Mts larger and slightly paler above), noticeably darker and more rufous below, has pinkish wattle along side of throat; *mixtus* is large, with mixture of racial characters (but not intermediate), differs from previous in having rudimentary or no throat wattle, slightly darker upperparts lacking rufous tinge on nape, more blackish rump, and much paler rufous-brown to rufous-buff breast; *nuchalis* is smaller than preceding two races, similar to nominate (and lacks throat wattle), from which differs in stronger rufous supercilium, darker upperparts, with sooty-brown nape and blacker (less greyish) mantle, back and scapulars with narrower and less conspicuous white scaling, slightly smaller white crescent on throat, paler rufous-brown breast, bolder blackish markings on side of belly and flanks; *emilii* differs from others in reduced white throat patch (confined to centre of throat), and long, broad orange-yellow throat wattle adjoining gape wattle, otherwise similar to nominate but with stronger rufous-brown below (juvenile lacks throat wattle, and birds in otherwise adult plumage with no throat wattle likely to be immatures; not known when adult wattle attained); *cahni* is fairly small and comparatively dark above, particularly on head and hindneck, but paler rufous below, has obvious throat wattle smaller than that of last race. VOICE. Noisy at times, with loud raucous vocalizations. Song of repeated loud, rollicking but varied phrases, e.g. in Wahgi Valley c. 8 throaty, hollow, staccato notes with rises and falls in pitch, lasting c. 2 seconds, "tok-tar-chii-cher-chu-chii-cher-chu", or a variant shortened to 5 notes, "chii-cher-chu-chii-cher"; described also as complex disyllabic gurgles, the first higher-pitched. Also brief, mellow, whistled "top", "tip" or "tup" repeated several times at intervals of 3–5 seconds, wheezy whistled note, short rasping "whogh", and repeated "too-ouu".

Habitat. Lower and middle montane forests, forest edge, open secondary growth, scrub, agri-gardens and cultivation, and trees in gardens of towns and villages, especially of inland montane valleys; typically prefers semi-open habitats or secondary growth and other disturbed habitat. From c. 950 m (occasionally 750 m, e.g. in Tabubil region) to 1900 m in E New Guinea, to 2200 m in Snow Mts; mainly 1200–1700 m in Central Ranges (to 1800 m at Simbai); c. 900–1700 m in Huon Peninsula and c. 1300–1600 m (summits) in Adelbert Mts; to c. 1600 m in Vogelkop. Co-exists with *M. belfordi* at 1800 m on Mt Kaindi.

Food and Feeding. Diet invertebrates, mainly insects and their larvae, including Lepidoptera, bugs (Hemiptera) and beetles (Coleoptera); also nectar and small fruits, and also takes pulp from larger and hard-shelled fruits opened by Rainbow Lorikeets (*Trichoglossus haematomodus*). Needles from an introduced pine (*Pinus*) recorded in stomach contents. Forages from canopy to lower middle stages of forest and in flowering or fruiting trees, searching among foliage, at flowers (of trees, epiphytes, bananas) and at fruits; occasionally at ground level, and seen to forage at cluster (4-m diameter) of flowering *Mitrastemma yamamotoi* (a terrestrial root parasite), which birds visited persistently in mornings but more frequently in afternoon, usually descending cautiously and probing flowers while gripping vertical stem. Active, and conspicuous in gardens of villages and towns, also commonly in forest interior. Forages at a site for short time before flying to new site 30 m or more distant. Usually singly, in twos (probably pairs) or in small groups of 3–6 or more individuals, and sometimes congregates in flowering or fruiting trees; sometimes feeds with other species, including small parrots (Psittacidae) and Sclater’s Whistler (*Pachycephala soror*). Will defend food trees, or parts of them, attacking and driving off conspecifics and other species, e.g. in fig tree (*Ficus*), rapid aggressive responses towards *Melilestes megarhynchus*, *Pycnopygius cinereus* and Fan-tailed Berrypecker (*Melanocharis versteri*) prevented these species from using the tree for more than a few moments at a time. When foraging on *Mitrastemma yamamotoi* on ground was often attacked by *M. belfordi*, which appeared to control foraging at the patch in mornings.

Breeding. Few reliable data. Appears to breed in most months from late wet season through to late dry season: nestlings late Mar to early May, and fledglings late Mar to Apr, Jun, Aug–Sept and early Nov. Nest a neat cup (external diameter of one was 12 cm), placed moderately high up in horizontal fork, one c. 20 m above ground near top of tree. No other information.

Movements. No indication of any movements; probably sedentary.

Status and Conservation. Not globally threatened. Generally fairly common to common in some regions, and scarce to rare elsewhere. Suggested that, in view of preference for forest edge, open second growth and trees in gardens, this species is, along with Brown-breasted Gerygone (*Gerygone ruficollis*), probably one of the mid-montane bird species that have profited most from human activities.

Bibliography. Anon. (1988), Beehler (1978a, 1980b, 1994), Beehler *et al.* (1986), Coates (1990), Coates & Peckover (2001), Diamond (1972a), Eastwood (1996a), Eastwood & Gregory (1995), Gilliard (1950b), Gilliard & LeCroy (1961), Gregory (1995b), Gylstenstolpe (1955a), Heron (1977a), Iova (1993), Lamothe (1979), Mackay (1980), Mayr (1936), Mayr & Gilliard (1954), Mayr & Rand (1937), Murray (1988b), Ogilvie-Grant (1915), Pratt (1982, 1984), Rand (1936b, 1941, 1942b), Rand & Gilliard (1967), Ripley (1964), Stein (1936), Terborgh & Diamond (1970), Wahlberg (1988), Watson *et al.* (1962).

Genus *MELIARCHUS* Salvadori, 1880

57. San Cristobal Honeyeater

Meliarchus sclateri

French: M  liphage de San Cristobal **Spanish:** Mielero de San Crist  bal
German: Rostschwanz-Honigfresser

Other common names: San Cristobal/Makira Melidectes, Graceless Honeyeater

Taxonomy. *Philemon Sclateri* G. R. Gray, 1870, San Cristobal, Solomon Islands. Relationships uncertain; has sometimes been placed in genus *Melidectes*, and has also been placed close to monotypic *Acanthagenys*. Monotypic.

Distribution. San Cristobal, in E Solomon Is.



down side of neck olive-brown, heavily streaked or mottled off-white to creamy buff on malar area (malar area sometimes appears wholly off-white to creamy buff at base of bill), more finely and sparsely streaked off-white on ear-coverts; mantle to rump dark olive-brown with varying olive-green wash, blackish scaling on middle back; uppertail-coverts and uppertail rufous-brown (rufous-brown shafts of rectrices), fine and faint olive edges of rectrices (seemingly readily lost with wear); upperside dark olive-brown to blackish-brown, with diffuse olive tips on marginal and median coverts, and fine olive-green outer edges of greater coverts and remiges (strong olive-green wash on folded wing); chin and throat off-white to very pale grey-brown, finely and sparsely streaked olive-brown, and merging into slightly darker grey-brown breast, belly, vent and flanks, boldly streaked olive-brown across breast and merging to more diffuse and fainter brownish streaking or mottling on rest of underparts; undertail-coverts and thighs light rufous-brown; undertail light grey-brown; iris off-white to pale greenish-grey or pale greenish-brown, eyelid pale blue or whitish with yellow, green or brownish tinge; bill cream to pale creamy yellow, base of upper mandible pale greenish, gape whitish; legs pale grey to blue-grey, sometimes with yellow wash. Sexes alike in plumage, male larger than female. Juvenile is like adult, but ground colour of head, neck and side of throat paler and less strongly olive, dark olive-grey, with yellowish tinge on side of head and underbody, streaking below more diffuse, and rump and uppertail-coverts more strongly rufous. **VOICE.** Noisy, with large variety of mostly harsh and loud, twangy whistles, honks and croaks. Calls include loud, sonorous and twangy “che  k che  k che  k”, “chichichichi”; clear, melancholy disyllabic whistles, “tee woo”, “cheowi” or “oo-ow ooup”, sometimes preceded by rapid squeaky “whichichi”; high-pitched, shrill mewing “chew  k” or “duit, duit, duitw  it”; loud “wit...wit...wit...” from exposed perch during rain while calling or counter-calling with other birds; in alarm, undulating “chrr-  r-  r-  r” ending in squawk. One call described as a repeated series of loud, raucous and nasal slurs possibly refers to one of aforementioned calls.

Habitat. Primary forest, less often tall secondary forest and forest edge, occasionally foraging out into coconut plantations. In primary forest, most abundant in hill forest, with lower densities in

montane and lowland forests. Sea-level to at least 900 m, mainly above 450 m; uncommon in coastal lowlands except near rivers.

Food and Feeding. Diet includes insects and probably nectar. Forages within dense forest canopy, less often in substages; also in isolated trees and coconut plantations. Searches at inflorescences and clumps of flowers; often appears to be seeking insects, but seen to probe flowers. Movements ungainly. Seen singly, in twos and in small parties of up to five individuals; occasionally in mixed-species flocks. Pugnacious, often chasing one another; seen also to displace other species, including Chestnut-bellied Monarch (*Monarcha castaneiventris*), Golden Whistler (*Pachycephala pectoralis*) and *Myzomela tristrami*.

Breeding. No information.

Movements. Resident; occasional local movement between foraging habitats.

Status and Conservation. Not globally threatened. Restricted-range species: present in Solomon Group EBA. Confined to a single island, where common to abundant. Maximum daily counts of 37 individuals between 450 m and 900 m. Abundant in hill forest, where 220 encounters/km  ; 110 encounters/km   in montane forest and 24/km   in lowland forest; in secondary forest and coconut plantations combined, 5 contacts/km  .

Bibliography. Buckingham *et al.* (1995), Cain & Galbraith (1956), Doughty *et al.* (1999), Finch (1985), Galbraith & Galbraith (1962), Gray (1870), Hartert (1929), Mayr (1932, 1945b), Mayr & Diamond (2001), Parkes (1980), Rothschild & Hartert (1908), Stattersfield *et al.* (1998).

Genus *MANORINA* Vieillot, 1818

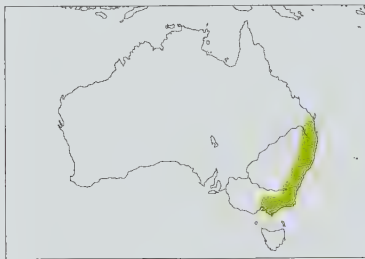
58. Bell Miner

Manorina melanophrys

French: M  liphage    sourcils noirs **German:** Glockenhonigfresser **Spanish:** Mielero Cejinegro
Other common names: Bellbird, Bell Minah/Mynah

Taxonomy. *Turdus melanophrys* Latham, 1801, Nova Hollandia = region of Port Jackson, New South Wales, Australia. Monotypic.

Distribution. E & SE Australia on and E of Great Divide, from SE Queensland (S from Gympie) S to E Victoria (W as far as E Melbourne, and with isolated colony just NW of Melbourne).



Descriptive notes. c. 18.5 cm; male 24.2–45 g, female 25–33 g. Robust honeyeater (but smallest of genus). Plumage is mostly olive-green above and slightly paler yellowish-green below, with grey suffusion on crown and ear-coverts, blackish forehead and malar stripe, yellow loreal patch, and triangular patch of bare red-orange skin behind eye; upperside-coverts and primaries grey-brown, with fine grey outer edges and tips on all except outermost primaries, greyish-olive tertials and secondaries with fine yellowish-olive outer edges and tips, tertials also with dark grey-brown fringe on inner web; undertail greyish olive-green, underwing brownish-grey;

iris dark brown; bill and legs yellow to orange-yellow. Sexes alike in plumage, male slightly larger than female. Juvenile is duller and browner than adult, and without bright bare facial skin behind eye, largely olive-brown above, forehead and malar stripe contrasting little with crown, loreal patch dull yellow, gape puffy and yellow, upperside-coverts brown with yellowish-brown fringes, yellow-olive underbody heavily mottled with light grey-brown on breast and lightly mottled elsewhere; immature as adult, but bare skin behind eye initially yellow to pale orange, gradually becoming rich orange to red-orange by c. 9 months. **VOICE.** Repertoire complex; 18 adult calls described (six given only by female, one only by male), many with variants. Most conspicuous call a loud, musical and pure bell-like “tink”, “ting” or “ping”, loud and pure, carries well and can be difficult to locate, given incessantly through day (although colonies may be quiet for periods) and a characteristic sound of Australian bush; appears to be a general interspecific territorial call, as well as an intraspecific contact call. Other calls predominate during dawn and dusk choruses. Those given by both sexes are “Mew call”, in variety of circumstances when near nest or young; highly varying “Chip call” when alarmed or mobbing, but also as morning call (c. 35 minutes before dawn), during intraspecific chases, and during displacements; loud “weeek” often given after an alarm and may attract birds to mobbing, also commonly at dawn and dusk (may help to co-ordinate roosting), often given antiphonally; “cek” in response to aerial predator, when suddenly startled or during intraspecific chases; “mmm” in response to ground predators, including humans near nest or young, or when startled; “brurr” when physically contacting another bird (of same or another species); “waw”, usually given with wings held raised during mobbing, sometimes when displacing another or during intraspecific chases; “screeet” occasionally given when handled; shrieking “scree” when nest or young approached by human; and “In call” (possibly only by male). Female calls (“Chuk-a-choo”, “Wheel”, “Whistle”, “Wee”, “Ip” and “Whit”) given during courtship (and not when attending nestlings or in non-breeding periods), thought to function in courtship of males, in synchronizing reproduction between mates, in reinforcing pair-bond, in mate-guarding and in maintaining contact. Adult male has one sex-specific call (“Oar call”), thought to function in establishing and reinforcing pair-bond; varies individually, given mainly during courtship, sometimes during incubation; usually preceded by In call, and may be given immediately after Chuk-a-choo of female. Gradations between different calls appear to exist. For most calls, individual differences in some characteristics (strong evidence of individuality in Chuk-a-choo of female, Oar of male, and Mew calls).

Habitat. Mainly open sclerophyll forests and woodlands, and adjacent vegetation with dense shrubby understorey, in broad gulleys in foothills or coastal plains; usually concentrated in patches of forest where eucalypts infested with psyllids and, sometimes, showing signs of dieback. Prefers dry open eucalypt forest and woodlands, usually with sparse shrub layer, sometimes with secondary layer of trees; wet sclerophyll forest supporting lower layers of trees and shrubs, and including stands regenerating from logging (but not wet montane forests); and riparian eucalypt forests and woodlands, especially open woodlands with dense shrub layer, also other open eucalypt woodlands bordering creeks and rivers and with dense understorey of native shrubs (e.g. *Leptospermum* and *Acacia*) or exotic shrubs such as blackberry (*Rubus*) or sapling eucalypts. Often at ecotones with preferred habitats and rainforest, but rarely in rainforest proper. Commonly in remnant bushland, or in parks and gardens with retained eucalypts, dense understorey vegetation (native and exotic),

and natural watercourses in city suburbs. Occasionally in coastal scrub, or scrubby gulleys with *Lantana camara* thickets.

Food and Feeding. Diet primarily invertebrates; also nectar (usually when abundant), manna and honeydew, occasionally fruit. Invertebrates mainly insects, including larvae and insect products, particularly psyllids and their lerp; also some spiders (Araneae) and pseudoscorpions (Pseudoscorpiones). Forages mainly in canopy, typically above 8 m (and to 15 m or more); often descends to middle storeys and undergrowth in low trees and saplings; occasionally on ground. In Victoria, used height stages more evenly where dense shrub layer and lower layer of trees present than in vegetation with little understorey. Forages mainly among foliage, less often on bark, on twigs or at flowers. Main methods gleaning and probing (mainly into crevices of bark), less often sallying, including sally-strikes at prey in air and sally-hovering to take items from flowers and foliage, and occasionally by flush-pursuit; often hangs upside-down to reach prey. When feeding on lerp, does not always take the psyllid larvae (but many are detached along with lerp and are ingested); removes lerp with bill and draws it into mouth with tongue; also licks leaf surface around lerp, where honeydew accumulates. At Yellingbo (Victoria), spent 10–26% of daytime in foraging, and 60–97% of that time in feeding on lerp; at Olinda (Victoria), spent 36% of daylight hours in eating lerp. Within colonies, individuals reduce predation rates on psyllids by aggressively excluding other birds and by defending colony territories of sufficient size so as not to consume entire psyllid populations themselves, and removal experiments have shown that large psyllid populations are rapidly consumed by other species when present species absent; was therefore suggested that this miner farms psyllids, but others interpret the behaviour as little different from defence of any renewable resource; relationship between this species and psyllids perhaps more subtle than this, especially if the birds are intentionally taking lerp and protecting the psyllid. Non-breeding members of colony occupy foraging ranges that overlap with those of one or more breeding pairs. Mean individual ranges 0.22–0.25 ha, and size appears not to vary greatly with age, sex or breeding status.

Breeding. Breeds throughout year, with peaks in Aug and Jan–Apr and little breeding May–Jul; at two sites in Victoria recorded in all months, mostly Aug–Jan at Bundoora (where positively correlated with rainfall) but most breeding activity Aug–Apr at Healesville (wetter than Bundoora, peak coincided with period of lowest rainfall and highest temperatures, in Jan–Feb); usually multi-brooded, breeding females at one site in Victoria made 0.65 nesting attempts per month. Obligate co-operative breeder, living all year in permanent colonies of 8–200 or more individuals, complex social organization consisting of a number of monogamous breeding pairs, each occupying discrete core area, and non-breeding members; colony defended by all members; nesting within colony may not be strongly synchronized, but seems fairly synchronous among females within a coterie (discrete aggregation of individuals within colony). Female appears to select nest-site and she alone builds nest, a thin and often transparent cup of dry grass culms, spider web, fine twigs and rootlets, sometimes lined with pieces of fresh leaves (other materials used in construction include fine shreds of bark, cocoons, broad soft leaves, flowers, seed pods, casuarina needles, lichen, moss, feathers, hair, plastic, plant down), external diameter 7.6–10.2 cm, depth 5.1 cm, internal diameter 6.4–7 cm, depth 3.8–4.4 cm; suspended by rim 0.3–2.5 m (mean in various studies 2.07–2.8 m) above ground, usually in horizontal (less often upright) fork in dense undergrowth, usually not at edge of nest plant. Clutch 1–3 eggs, usually 2 (mean in various studies 1.8–2.01), 4 eggs in one nest almost certainly the product of two females; incubation by female, usually beginning when clutch complete, incubation period at Healesville 12–18 days, mean at Bundoora (from laying to hatching of last egg) 14.4 days; chicks fed by both breeding adults and by auxiliaries (up to 20 attend nest), nestling period at Healesville 10–15 days, mean at Bundoora (between hatching of last egg and fledging of last nestling) 11.7 days; fledglings fed by parents and auxiliaries. Nests parasitized by Pallid Cuckoo (*Cuculus pallidus*) and possibly by Fan-tailed Cuckoo (*Cacomantis flabelliformis*). From several studies, success (young fledged per egg laid) 41–57%; of 153 nests at Bundoora, 58 (37.9%) fledged at least one young, mean 0.62 fledglings per attempt; of 243 nests at Healesville, 84 (34.6%) fledged at least one young; at Bundoora, mean of 3.83 fledglings per female lifetime. During six-year study in Victoria, more than 70% of young disappeared before mean age of dispersal (8 months after fledging), and probability of nestling surviving to mean age of first breeding (15.4 months) 0.07, but a bird that survived to age of first breeding would live an average 1.7 more years; mean annual survivorship of breeding males 67.5% and of breeding females 59.4%.

Movements. Sedentary. Colonies usually permanent, occupying sites for many years, members rarely moving beyond colony boundary. Distribution of colonies can vary over time, and all or part of colony may move to new site, e.g. part of colony at Bundoora moved between Nov and Mar to new site 400 m away, and another colony shifted 110 m over two years. Small movements in territorial boundary of colony thought to result from changes in quality of vegetation or interactions with other species, such as *M. melanocephala*. New colonies sometimes established near or distant from existing ones (e.g. up to 10 km from nearest colony). Vagrants occur up to c. 320 km from nearest known colonies.

Status and Conservation. Not globally threatened. Locally common. At Yellingbo (Victoria), recorded density of 6.4 birds/ha; at Bundoora colony, densities of 7.9–17.9 birds/ha (1994) and 12.5 birds/ha (1984). Historical records from W of Great Divide in New South Wales, and historical reports of “bellbirds” on Murray R were possibly of this species. Individuals imported into New Zealand in 1874, but not known if any were released into the wild; if they were, they did not become established. Can be adversely affected by natural processes and human activities, including fire (both wildfire and controlled or intentional burning), clearing, and stream modification, resulting in loss of understorey in preferred habitats; colonies have been lost and created at sites throughout range. This species has become closely linked to large-scale eucalypt dieback in forests of E Australia (“Bell Miner-Associated Dieback”) which has resulted in loss of tens of thousands of hectares of forest and is of special concern to commercial forestry interests. Psyllids thrive in colonies of this meliphagid, often to detriment of trees; when miners are removed, colony site is invaded by many other insectivores, which within a few months greatly reduce abundance of lerp-producing psyllids. Mechanisms of this dieback, however, not fully understood, and habitat disturbances, such as hydrological stress, soil pathogens and changed fire regimes, are implicated in creating conditions suitable for psyllid infestations and subsequent colonization by this miner, leading to dieback; certainly, removal of the miners does not always result in forest recovery. Overall, Bell Miner-Associated Dieback thought to be a significant threat to sustainability of moist eucalypt forests of NE New South Wales and SE Queensland, and thus to biodiversity conservation on a national scale.

Bibliography. Anon. (2005), Archard *et al.* (2006), Barrett *et al.* (2003), Blakers *et al.* (1984), Campbell (1900), Clarke (1984a, 1984b, 1987, 1988, 1989), Clarke & Fitz-Gerald (1994), Clarke & Heathcote (1988, 1990), Clarke & Schedvin (1999), Clarke *et al.* (2007), Conrad *et al.* (1998), Cooney *et al.* (2006), Dunn (1989), Emison *et al.* (1987), Ewen *et al.* (2003), Florence (2005), French (1990), Gannon (1962), Gosper & Baker (1997), Griffiths & Clarke (2002), Heathcote (1989), Hewish (1985), Higgins (1999), Higgins *et al.* (2001), Jurisevic & Sanderson (1994a), Lill & Fell (1990), Long (1981), Loyn (1980, 1985c, 1987b, 1995), Loyn *et al.* (1983), Mac Nally (1997), McDonald *et al.* (2007), North (1907), Painter (1997), Painter *et al.* (2006), Paton (1980), Poiani (1990, 1991a, 1991b, 1992a, 1992b, 1992c, 1993a, 1993b, 1993c, 1993d, 1993e, 1994, 1995, 1997), Poiani & Fletcher (1994), Poiani & Yorke (1989), Poiani *et al.* (1990), Schodde & Mason (1999), Smith (1984, 1985a), Smith & Robertson (1978), Stone (1996, 2005), Storr (1984), Swainson (1970), Tzaros (1992), Vernon (1968), Wardell-Johnson & Lynch (2005), Wardell-Johnson *et al.* (2005, 2006), Wykes (1982).

59. Noisy Miner

Manorina melanocephala

French: Méléphage bruyant **German:** Weißstirn-Schwatzvogel **Spanish:** Mielero Chillón
Other common names: Southern Black-backed Minah/Mynah

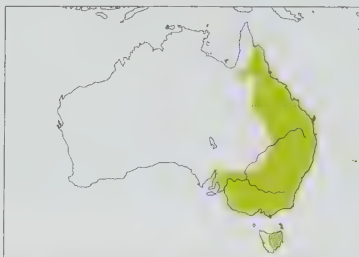
Taxonomy. *Gracula melanocephala* Latham, 1801, Nova Hollandia = region of Port Jackson, New South Wales, Australia.

Forms a superspecies with *M. melanotis* and *M. flavigula*. Rarely, hybridizes with latter. Geographical variation on mainland apparently clinal, N populations tending slightly paler above (with little or no yellow-olive wash, more contrasting blackish and white tones) than S ones (more pronounced yellow-olive wash); also, wing becomes progressively longer from N to S (though one study found no significant regional differences in lengths of wing, tail and culmen). Two additional races recently proposed are *titaniota* (described from 47 km W of Fairview Station, in Cape York Peninsula) and *lepidota* (from 17 km W of Nyngan, in New South Wales), but much further study required in order to determine validity of these. Two subspecies recognized.

Subspecies and Distribution.

M. m. melanocephala (Latham, 1801) – E & SE Australia from NE Queensland (E base of Cape York Peninsula) S, extending W to inland slopes and plains of Great Divide, to SE South Australia (E from Mt Lofty Ranges) and Victoria.

M. m. leachi (Mathews, 1912) – N & E Tasmania.



Descriptive notes. 24–28 cm; male 40–91 g, female 46–74 g and unsexed 54–90 g (nominate), male 70–87 g, one female 72 g and unsexed 64–1–94.2 g (*leachi*). Nominative race has head, neck, upperbody and breast largely grey, with off-white forehead, lores, chin and throat; broad black band extending over crown, through eye and in crescent around rear ear-coverts, joining black malar stripe from base of bill; bold patch of bare yellow skin behind eye; grey-black line down centre of throat; fine white scaling on nape and hindneck grading to slightly broader dusky-and-white scalloping on throat and upper breast, and to fine dusky mottling and

narrow white scaling on mantle, back and scapulars (saddle also faintly tinged olive-yellow); uppertail grey, feathers with narrow olive-yellow edges and bold white tip; tertials and most of upperswing-coverts grey, contrasting with dull blackish-brown lower edge of inner wing (outer coverts) and rest of remiges, olive-yellow edges of outermost tertial, secondaries and inner primaries (narrow panel on folded wing), outer primaries narrowly tipped white; underbody below breast white, pale grey wash on flanks and thighs; undertail dark grey with broad white tip; underwing dark grey, slightly darker wingtip and diffuse off-white patch on bases of primaries; in worn plumage, mantle, back and scapulars become darker and lose white scaling, upperswing more uniformly dark; bill darker and contrasts with paler rump and uppertail-coverts; iris red-brown to dark brown; bill orange-yellow to yellow; legs orange to brownish-orange. Sexes alike in plumage, male larger than female. Juvenile is very similar to adult, but band over crown duller and finely scaled paler, merging into black-brown on nape and hindneck, with upperbody suffused brown, only obscure white scaling on hindneck, side of neck and breast, median and greater upperswing-coverts finely tipped brownish (diffuse narrow wingbars), white primary tips broader, bill tipped dusky, gape initially puffy orange-yellow, and bare skin behind eye duller, yellowish-grey. Race *leachi* is larger than nominate, plumage very similar but off-white scalloping on hindneck finer, yellow-olive wash on scapulars and back stronger, off-white fringes at tips of scapulars and feathers of mantle and back indistinct, and white tips on outer 3–4 rectrices broader. **VOICE.** Noisy, with complex repertoire. Detailed study described twelve adult vocalizations, and dawn song, which comprises combinations of various other vocalizations. Main adult calls are: “Tiu call”, consisting of repeated rhythmic phrases of 2–5 “tiu” notes, with many variants, e.g. low whistled “teu-teu...teu-teu”, difficult to locate; “Woo”, of repeated whistled “woo” notes, also with many variants, e.g. up to 12 notes, or repeated phrases of 2–6 “woo” notes; “Aerial predator alarm call”, a series of high-pitched upslurred whistled “woo” notes; “Wee call”, a series of “wee” notes; “Chur”, a series of “chur” notes, like previous but lower-pitched and harsher, at high intensity sounding like nasal miaowing, as alarm in response to ground predator and non-predatory bird and during mobbing; “Yammer”, a rapid rhythmic series described as a soft staccato plaintive yammering; “Long flight call”, a series of 4 ascending notes, or constant low chatter; “Harsh wee call” of 5–7 notes, like those of long flight call but harsher; “Cue”, a series given by bird when chased; “Q4 call”, a rhythmic throaty chuckling of usually 4 (sometimes 5) notes, difficult to locate; a varying “Chip call”; and “Distress call” when bird held in the hand. Dawn song a chorus (from colony) of clear whistled notes, including antiphonal singing and with Tiu, Woo and Wee calls and others, lasts for up to 20 minutes and audible over long distance; mainly before sunrise but also at dusk, and sometimes by single individuals. Other calls include rapid twittering “tse-tse-tse...” during copulation, and soft chuckling. Much individual variation. Some calls differ little in structure within colonies, but markedly between colonies. During breeding the Tiu calls of male are often answered, usually within 4 seconds, by a Q4 call from a female.

Habitat. Mainly dry open sclerophyll forests and woodlands, especially grassy associations with few or no shrubs in understorey, including savanna woodlands, and typically dominated by *Eucalyptus*, or mixed associations dominated by *Eucalyptus* with cypress-pine (*Callitris*), or *Acacia* or casuarina or, less commonly, *Melaleuca* and *Erythrophloeum*, or *Banksia*. Sometimes in open riparian or floodplain-woodlands with understorey of chenopods (*Atriplex*), *Acacia* or lignum (*Muehlenbeckia*). Not commonly in mallee eucalypt woodlands or shrublands. Often at edges of wooded habitats, or in open areas within or bordering forests and woodlands, such as roadsides; also in remnant forests and woodlands surrounded by cleared land, and often more abundant in such habitats than within large undisturbed patches. Commonly in modified habitats, particularly lightly wooded agricultural land, and common in cities and towns. Sometimes in other habitats, including wet sclerophyll forest, *Acacia* shrubland or woodland, e.g. remnant brigalow (*Acacia harpophylla*) scrub, or coastal heathland or scrub. Plains to c. 1200 m, and commonly along watercourses on inland slopes and plains.

Food and Feeding. Primarily invertebrates and nectar; also fruit, seeds, occasionally small vertebrates (frogs, reptiles). Invertebrates mainly insects, but also spiders (Araneae), annelids, centipedes (Chilopodidae) and pseudoscorpions (Pseudoscorpiones). Forages at all levels, from canopy to low shrub layer, searching among foliage, at flowers, on large and small branches, twigs and trunks, and often on ground. In study in SE Queensland, foraging behaviour and use of substrates found to differ with density of colony, presence of other species and complexity of habitat. Invertebrates taken by gleaning or by sallying, including sally-hovering, from plant substrates or ground; nectar taken by probing flowers. On ground, walks or hops, searching in soil or litter, even turning litter or animal droppings. Occasionally hangs upside-down to reach food items. Conspicuous,

confiding. Highly social: colonial and usually gregarious in all activities; forages almost solely within colony boundaries throughout year. Usually seen in small groups of 5–25 individuals, occasionally alone or in twos; sometimes in larger numbers at sources of abundant nectar. Once seen to forage with *M. flavigula*. One of the most aggressive honeyeaters, nearly always attacks and sometimes kills other avian species (including non-predatory birds) crossing colony boundaries, resulting in almost exclusive use of area and its resources by colony; a few, often larger, species, such as Grey Butcherbird (*Cracticus torquatus*) and Laughing Kookaburra (*Dacelo novaeguineae*), reside in low numbers in colonies, usually close to edges.

Breeding. Recorded in all months, with peak apparently in winter–spring; in SE Queensland mostly Jul–Nov, possibly slightly later farther S; multi-brooded, laying up to six clutches per year. Obligate colonial and co-operative breeder, colonies ranging in size from a few individuals to several hundred (c. 400 birds in one colony), and up to 22 males and one female attending a single nest; both males and females promiscuous; laying not highly synchronized in colony. Nest built by female alone, a deep but frail cup (sometimes sturdier) of twigs or grasses or both, occasionally incorporating rootlets, bark, leaves, vine tendrils, hair, wool or fur, spider web, feathers and insect egg cases, lined with wool, hair, fur, fine rootlets and bark, and occasionally feathers, flowers, plant down or fine grasses, sometimes includes artificial materials; in SE Queensland, outside of cup usually of small twigs and interior of grasses, bound with spider web, and lining usually a rounded pad of fibres from cocoons of processional caterpillar (Lasiocampidae); external diameter 15–17.8 cm, depth 9–11.4 cm, internal diameter 8–8.9 cm, depth 5.5–6.4 cm; usually supported in fork or on twigs or branchlets, often near end of low branch, 0.2–30 m (mean 6.3 m) above ground. Clutch 2–4 eggs (larger clutches almost certainly the product of two females), mean throughout range 2.9; incubation by female alone, period 15–18 days; chicks brooded by female, fed by both parents and by auxiliaries, nestling period c. 13–16 days (usually 16 days); fledglings fed by breeding male (rarely by breeding female) and by auxiliaries, in SE Queensland began to obtain own food 26–30 days after fledging but still fed by others in group until 35 days (occasionally longer); young often return to nest for several days. Nests parasitized by Pallid Cuckoo (*Cuculus pallidus*). For 270 eggs in 105 nests where outcome known, 0.89 fledged young per nest; of 378 nests, 284 (75%) produced at least one fledged young; of 41 nests at one site in SE Queensland, 24 (59%) produced at least one fledged young, and mean number of fledglings/nest significantly lower in harsh season (1.11) than in good season (2.44).

Movements. Sedentary. Some limited dispersal to and from colonies.

Status and Conservation. Not globally threatened. Common; one of the commonest native birds in cities and towns. Recorded densities of 7.8–10.4 birds/ha in SE Queensland; at several mainland sites 0.02–4.9 birds/ha, and at one site in SE Tasmania 0.01–0.05 birds/ha. Has largely benefited from clearing and fragmentation of native vegetation, preferentially occupying small remnants (size less than 20 ha) of forest and woodland and edges of larger blocks; has increased in such habitats, and appears to have spread to new sites within its overall distribution (which appears not to have changed markedly). Dominates many urban and rural habitats, and has adverse effect on avian diversity and abundance by aggressive exclusion of other birds from colony area; experimental removal of this miner is followed by influxes of other meliphagids and other insectivorous birds. Further, present species may contribute to decline of rural trees and spread of eucalypt dieback through its maintenance (by excluding of other insectivorous birds) of high levels of herbivorous insects in such landscapes. Dominates edge habitats, too, effects penetrating as far as 150–300 m from edges, which has major effect on width of corridors or expanse of remnants needed to ensure areas free of this species; can devalue conservation effort if corridors and remnants of insufficient width to provide suitable habitat for other species. Studies have shown that eucalypt plantings can be made less susceptible to dominance by this miner by the addition of a shrubby understorey combined with *Acacia* species; similarly, in revegetating slow-growing buloke (*Allocasuarina luehmannii*) woodland, fast-growing eucalypts are often included, resulting in domination of replantings where eucalypt density 5/ha or greater. Has been suggested that dominance of remnant woodland and forest by present species is now the most important threat to certain bird communities in E & SE Australia. The only meliphagid known to have been introduced outside its country of origin: released in Three Sisters Is (off San Cristobal), in SE Solomons, in 1950s, but doubtfully extant (not recorded during surveys in 1990, and no evidence of continued presence); possible unsuccessful attempted introduction in New Zealand in 19th century, but reports may have confused this species with Common Myna (*Acridotheres tristis*).

Bibliography. Abbott *et al.* (2002), Barrett, Ford & Recher (1994), Barrett, Silcocks *et al.* (2003), Blakers *et al.* (1984), Buckingham *et al.* (1995), Cain & Galbraith (1952), Cameron (1970), Campbell (1900), Catterall (2004), Catterall *et al.* (2002), Clarke & Oldland (2007), Clarke & Schedvin (1997), Clarke, Grey *et al.* (1995), Clarke, Taylor *et al.* (2007), Colston (1974), Cooney *et al.* (2006), Doughty *et al.* (1999), Dow (1970, 1971a, 1972, 1975, 1977a, 1977b, 1978, 1979a, 1979b), Dow & Whitmore (1990), Egan *et al.* (1997), Emison *et al.* (1987), Er & Tidemann (1996), Evans *et al.* (1997), Fitzsimons (2003), Ford (1981b), Ford & Bell (1981), Ford *et al.* (1985), French (1957), Galbraith & Galbraith (1962), Gannon (2002), Gepp & Fife (1975), Gosper (1992), Green, R.H. (1989), Green, R.J. & Catterall (1998), Grey *et al.* (1997, 1998), Griffioen & Clarke (2002), Hannah *et al.* (2007), Hastings & Beattie (2006), Higgins (1999), Higgins *et al.* (2001), Hobbs (1961), Howard & Crawford (1989), Howe (1984), Hudson *et al.* (1997), Jurisevic & Sanderson (1994a, 1994b), Keast (1968a, 1968b), Leach & Watson (1994), Ley *et al.* (1997), Long (1981), Loyn (1980, 1985b, 1987a), Maron (2007), Martin *et al.* (2006), Mayr & Diamond (2001), McCarthy (2006), McFarland (1994b), Morris (1975a), Morris *et al.* (1981, North (1907), O'Brien & Dow (1979), Paton (1985b), Paton *et al.* (1994), Piper & Catterall (2003), Pöldmaa & Holder (1997), Pöldmaa *et al.* (1995), Porter & Henderson (1983), Possingham & Possingham (1997), Ratkowsky & Ratkowsky (1980), Recher (1975), Reid *et al.* (1997), Schodde & Mason (1999), Schodde & Tidemann (1986), Taylor, M. (1992), Taylor, R. *et al.* (1997), Terrill & Rix (1944), Thomas (1979), Thomson (1922), Whitmore, M.J. (1984, 1986), Whitmore, M.J. & Dow (1982), Whitmore, M.J. *et al.* (1983), Woodall (1995).

60. Black-eared Miner

Manorina melanotis

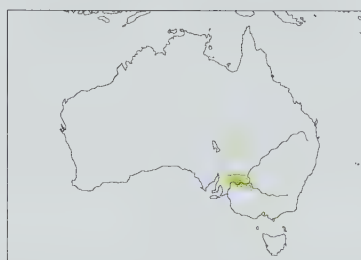
French: Méléphage à oreillons noirs **German:** Malleeschwartzvogel **Spanish:** Mielero Orejinegro
Other common names: Dusky Miner/Minor

Taxonomy. *Myzantha melanotis* F. E. Wilson, 1911, Mallee, Victoria = c. 30 km north of Cowangie (Kow Plains), north-west Victoria, Australia.

Forms a superspecies with *M. melanocephala* and *M. flavigula*. Often treated as conspecific with latter, and hybridizes extensively with it (to extent that genetic introgression threatens survival of present species); analyses of mitochondrial DNA, however, suggest that the two should be treated as separate species. Monotypic.

Distribution. Semi-arid mallee in lower Murray–Darling Basin of NW Victoria and CE South Australia.

Descriptive notes. 23–26 cm; 43.5–60 g. Plumage is largely grey above, with dull olive forehead merging into grey of crown, black facial mask (from bill narrowly over and below eye to ear-coverts) bordered below by indistinct yellow moustachial stripe, grey submoustachial stripe and thin blackish



malar stripe, and small patch of bare yellow skin at rear of eye (extending narrowly above and below rear half of eye); in fresh plumage, fine greyish scaling on side of neck and mantle, back and scapulars; uppertail mostly grey-black, broad paler grey tip and narrow olive-yellow edges at bases of rectrices; upperwing black-brown, secondary coverts and tertials contrastingly dark grey, fine paler grey tips on median and greater coverts, greater also with narrow olive-yellow edges, olive-yellow outer edges of remiges (prominent diffuse yellowish panel on folded wing), outer primaries also have thin white tips when fresh; chin to breast with black-

ish-and-white scalloping merging into white below, grey wash on flanks and thighs; sometimes yellowish tinge on chin; undertail dark grey with slightly paler grey tip; underwing dark grey, diffuse whitish patch across bases of primaries; iris dark brown; bill and gape yellow to orange-yellow; legs orange to brownish-orange. Sexes alike in plumage, male larger than female. Juvenile is very like adult, differing in pale brown suffusion on upperbody, no white scaling on side of neck, brownish suffusion on tail tip, more uniformly grey breast with less obvious scalloping and varying brown wash, narrow pale brown tips on median and greater upperwing-coverts (narrow wingbars), clearer whitish fringes at tips of primaries, and bill and eye patch slightly duller yellow. Voice. Poorly described. Most calling in early morning and during breeding. Calls harsh and grating, include a series of quiet single notes given at intervals of 1–2 seconds; alarm calls not unlike those of *M. flavigula* when flushed; one bird approaching nest to incubate uttered low warble.

Habitat. Mature intact tracts of semi-arid mallee eucalypt woodland, unburnt for at least 45 years, on a range of soil types including deeper sandy dune and sandy swale areas with good cover of spinifex (*Triodia*), and in swales on heavier soils with little spinifex. Suitable habitat includes both mallee–*Triodia* associations and mallee with open shrubby understorey (e.g. of *Acacia*, *Beyeria*, *Westringia*, *Olearia* or chenopods such as *Atriplex*) in continuous tracts at least 2 km from natural or artificial clearings, and aforementioned vegetation with total continuous area of at least 13,000 ha (regardless of age since fire); absence of grazing also important.

Food and Feeding. Diet primarily invertebrates (mainly insects, also spiders), occasionally nectar. Forages at all levels, from canopy to ground. Searches among foliage of trees and shrubs, at flowers (e.g. of *Melaleuca*, *Eucalyptus*, *Eremophila*), on and under bark of branches and trunks of mallee trees (usually eucalypts), and often on ground among leaf litter. Forages mainly by probing and gleaning, less often by sallying; on ground, appears not to turn leaf litter but to search among it. “Pure” individuals tended to forage in one place for 10–90 seconds and then fly off, whereas hybrids foraged at sites for longer periods (up to 4 minutes). Colonial, and normally in small groups.

Breeding. Not well known. Recorded in Sept–Dec, probably extending into autumn. In loose colonies, nests sometimes as little as 25 m apart; usually (possibly always) breeds co-operatively. Nest made of twigs, pieces of dodder (*Cassytha*), grasses and spider web, lined with grasses, including spinifex, 1.5–4.5 m above ground in vertical fork of larger branch or in dense epicormic growth, usually in denser foliage in tall mallee but sometimes among small twigs or in dodder (usually growing on eucalypt), mainly in mallee eucalypt but also in *Myoporum*, *Santalum*, *Melaleuca*, *Acacia* or *Callitris*. Clutch 2–3 eggs; incubation by at least three individuals at one nest; no information on duration of incubation and nestling periods. Nests parasitized by Pallid Cuckoo (*Cuculus pallidus*).

Movements. Colonies sedentary, apparently within fairly large ranges, but few hard data. Tends to stay within area of c. 10 ha when breeding, but appears to range more widely outside breeding season. In Victoria, one colony of two “pure” individuals and nine hybrids ranged over area of at least 60 ha. In the past transitory individuals were reported, possibly indicating wider dispersal or movement at times. Seen to move through *Allocasuarina* woodland and across clearings, indicating that small areas of non-mallee habitat are not a barrier to dispersal.

Status and Conservation. **ENDANGERED.** Restricted-range species: present in South-east Australia EBA. Rare and local; one of Australia’s rarest bird species. Most of remaining colonies confined to mallee NW of Renmark, in E South Australia. Discovery of significant numbers N of Murray R in E South Australia has greatly enhanced this species’ prospects of survival. Bookmark Biosphere Reserve, which holds most of known populations, is estimated to support 501 colonies containing c. 3758 phenotypically pure individuals, c. 2255 hybrids, and small numbers of *M. flavigula*; smaller population in Murray-Sunset National Park, in NW Victoria, consisting of 53 pure or hybrid colonies. Estimated effective population, however, is an order of magnitude smaller owing to male-biased sex ratio and the species’ complex colonial and co-operative social organization: in Bookmark estimated to consist of 390 pure individuals and 234 hybrids. Was once more widespread, but now lost from much of former range (which included SW New South Wales). Decline a direct result of hybridization with *M. flavigula*. It is thought that, before European settlement, present species occupied dense, continuous and extensive tracts of mature mallee, with *M. flavigula* in more open and fragmented habitats within mallee (e.g. edges and natural clearings, as well as other habitats bordering or within extensive stands of mallee); subsequent broad-scale clearing and provision of watering points and associated modifications resulted in tracts of mallee becoming fragmented, creating much suitable habitat for *M. flavigula* and extensive zones of overlap between the two species; this was followed by widespread hybridization between the two, and genetic swamping of the present species’ population. Wildfire remains a major threat to the survival of this miner, which appears to require mallee vegetation unburnt for at least 45 years; in late 2006, c. 100,000 ha of mallee habitat within Bookmark Biosphere Reserve was burnt. Recovery plan has included translocations of colonies from Bookmark to the Murray-Sunset National Park; five colonies translocated in 2001–2002 have bred, and they persist. A captive-breeding programme is under way, and in 2003 a trial release of 45 captive-bred individuals, in two groups, resulted in breeding in the wild almost immediately and, over following years, establishment of at least three breeding colonies; some birds have joined the remnant wild population at release site.

Bibliography. Anon. (2007a), Backhouse *et al.* (1997), Barrett *et al.* (2003), Blakers *et al.* (1984), Butchart & Stattersfield (2004), Christidis (1995), Clarke, M.F. (2007), Clarke, R.H., Boulton & Clarke (2002, 2005), Clarke, R.H., Boulton, Even *et al.* (2002), Clarke, R.H., Gordon & Clarke (2001), Collar *et al.* (1994), Cooney *et al.* (2006), Emison *et al.* (1987), Even *et al.* (2001), Favaloro (1966), Ford, H.A. (1981b), Ford, J.R. (1987b), Franklin (1996), Garnett & Crowley (2000), Higgins *et al.* (2001), Joseph (1986), McCarthy (2006), McGilp (1956), McLaughlin (1990, 1992, 1993a, 1993b, 1994, 1996a, 1996b), Muir *et al.* (1999), Ross (1912), Schodde (1975, 1981), Schodde & Mason (1999), Schodde & Tidemann (1986), Sibley & Monroe (1990), Silveira (1995), Starks (1987), Stattersfield & Capper (2000).

61. Yellow-throated Miner

Manorina flavigula

French: Méléphage à cou jaune **German:** Gelbstirn-Schwartzvogel **Spanish:** Mielero Goligualdo

Other common names: White-rumped/Yellow Miner; Dusky/Sombre Miner (*obscura*)

Taxonomy. *Myzantha flavigula* Gould, 1840, Namoi River, New South Wales, Australia.

Forms a superspecies with *M. melanocephala* and *M. melanotis*. Often treated as conspecific with latter, and hybridizes extensively with it; analyses of mitochondrial DNA, however, suggest that the two should be treated as separate species. Rarely, hybridizes with *M. melanocephala*. Dark race *obscura* has sometimes been regarded as a separate species. Races intergrade where they meet. Additional proposed races are *clelandi* (from Broome Hill, in S Western Australia), included in *obscura*; *casuarina* (Mt Casuarina, in N Western Australia) and *alligator* (Alligator R, in Northern Territory), both subsumed in *lutea*; and *pallida* (Tietkens Creek, in Musgrave Ranges of C Australia), synonymized with *wayensis*. Five subspecies recognized.

Subspecies and Distribution.

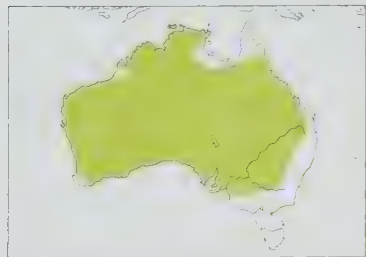
M. f. melvillensis (Mathews, 1912) – Melville I (Northern Territory).

M. f. lutea (Gould, 1840) – N Western Australia (Kimberley Division, including some coastal islands) and N Northern Territory (E to W Arnhem Land) S to eucalypt-acacia transition zone (c. 20° S).

M. f. wayensis (Mathews, 1912) – most of inland Australia from Western Australia and Northern Territory (S of Kimberley Division and Arnhem Land and, in S, NW of inner Wheatbelt) E to Murray–Darling Basin (N of Flinders–Grey Ranges) and S of E Gulf of Carpentaria.

M. f. obscura (Gould, 1841) – SW Western Australia from N Swan Coastal Plain S through inner Wheatbelt to Esperance district (mainly absent from far SW corner).

M. f. flavigula (Gould, 1840) – inland E Australia (W of Great Divide) from Queensland (SE Gulf of Carpentaria and base of Cape York Peninsula E to near Townsville), S to South Australia (S to Flinders Ranges and Adelaide Plains) and NW Victoria.



Descriptive notes. 22–28 cm; 55 g. Nominata race has olive-yellow forehead merging into grey on crown, hindneck and side of neck, with fine whitish scaling on hindneck and side of neck and yellow suffusion on side of neck; black mask bordered below by yellow gape stripe, small patch of bare yellow skin at rear of eye (extending narrowly over and below rear half of eye), small cream spot on rear ear-coverts behind mask; prominent white sub-moustachial stripe, long, narrow orange-yellow bare malar stripe; most of upperbody grey with varying diffuse darker brownish-grey mottling and indistinct fine white scaling, merging over

rump to prominently off-white to greyish-white uppertail-coverts (prominent in flight); tail dark grey, broadly tipped white, rectrices narrowly edged olive-yellow; secondary upperwing-coverts and tertials grey, contrasting with black-brown rest of wing, with fine olive-yellow edges on greater coverts, olive-yellow edges on most remiges (panel on folded wing), and fine white tips on outer primaries; upper chin yellow (visible only with good view), throat and breast off-white to greyish-white, breast with dark grey and white scalloping, diffuse yellow suffusion across upper breast (continuous with that on side of neck); rest of underbody off-white, very pale greyish wash on belly, flanks and thighs; undertail dark grey with white to off-white tip; underwing dark grey, diffuse off-white patch across bases of primaries; iris brown to dark brown; bill yellow to orange, gape slightly paler; legs orange to brownish-orange. Sexes alike in plumage, male larger than female. Juvenile is very like adult, in good view separable by pale pinkish-brown suffusion on crown, neck and upperbody, no white scaling on neck, pinkish-brown wash on tail tip, brown wash across breast (only indistinct scalloping), narrow, indistinct and broken pale pinkish-brown wingbars across tips of median and greater coverts, clearer whitish fringes around tips of outer primaries, and slightly duller yellow bill. Races differ in size, plumage and bare parts: *wayensis* is very similar to nominate but slightly smaller, slightly paler above, with only faint scalloping, paler grey wing-coverts and brown remiges, and paler greyish breast, plumage varies subtly over range, paler inland; *lutea* is larger than nominate, very similar in appearance to previous, but with slightly larger and pale yellow postauricular spot, more extensive yellow suffusion on side of neck and breast, yellow-olive upper lores, paler grey anterior ear-coverts, more prominent bare malar stripe; *melvillensis* is darker and more heavily patterned than preceding races, distinguished from nominate by slightly larger pale yellow postauricular spot (much as in *lutea*), more extensive yellow on side of neck and breast, brownish-grey upperparts more heavily mottled dark brown and diffusely scalloped with light grey, merging across rump into light brownish-grey uppertail-coverts (finely scaled off-white) contrasting much less with rest of upperside, and tip of tail usually washed light brown; *obscura* is darkest, differs from *wayensis* in darker grey upperparts and breast, little or no contrast between rump and rest of underbody, heavier scalloping on breast, narrower pale tail tip, more extensive grey wash below usually covering upper belly (and sometimes more of underbody), darker head pattern with less extensive olive-yellow on forehead, narrower mask with only trace of cream postauricular spot (sometimes absent), shorter and paler moustachial stripe, much darker submoustachial, much darker and uniformly grey throat, no whitish scaling on neck, and smaller and darker olive-yellow patch on side of neck (sometimes absent). **VOICE.** Noisy, but repertoire unstudied. Calls include monosyllabic screams, squeaks and squawks in alarm (apparently identical to those of *M. melanocephala*); rather slow, miaowing “mew-mew-mew”; low guttural “aahh”; melodious chuckle. Tuneful dawn song, heard most often in breeding season, a chorus of whistled notes from members of group. One possibly mimicked a butcherbird (*Cracticus*) call.

Habitat. Nearly all wooded habitats, particularly *Acacia* woodlands and shrublands and open eucalypt woodlands and forests. Commonly in low *Acacia* habitats, e.g. those dominated by mulga or myall (*Acacia papyrocarpa*), usually with understorey of shrubs (e.g. *Eremophila*, *Cassia*, *Grevillea* or chenopods) and ground cover of grasses; and dry open eucalypt woodland, typically with understorey of low shrubs and ground cover of grasses including spinifex (*Triodia*), and riparian woodlands of river red gum (*Eucalyptus camaldulensis*) or coolibah (*Eucalyptus coolabah*); also open eucalypt forests with understorey of tall to low shrubs, including *Banksia*, paperbarks (*Melaleuca*), tea-trees (*Leptospermum*) and casuarinas. Commonly in open tropical sclerophyll woodlands and forests, especially of Darwin woollybutt (*Eucalyptus miniata*) and Darwin stringybark (*Eucalyptus terodonta*), with middle storey of smaller trees including *Erythrophloeum*, *Terminalia*, fern-leaved grevillea (*Grevillea pteridifolia*), paperbarks and *Acacia*, and dense grass layer; and mixed swamp-woodlands of long-fruited bloodwood (*Corymbia polycarpa*), fern-leaved grevillea, yellow-barked paperbark (*Melaleuca nervosa*) and swamp box (*Lophostemon lactiflorus*), or mixed open forests of *Bauhinia*, *Erythrophloeum*, *Atalaya* and eucalypts with tall grass layer; riverine forest of weeping paperbark (*Melaleuca leucadendra*), typically with screw-palms (*Pandanus*) and *Acacia* in understorey. Although rarely in dense mature mallee, found commonly in open regenerating mallee or at edges of mallee and open areas, such as roads and farmland. Often in farmland with scattered trees or remnant patches of native vegetation; sometimes in parks, gardens, orchards and vineyards in towns and homesteads. Also, open woodlands dominated by casuarinas, e.g. belah (*Casuarina cristata*) or buloke (*Allocasuarina luehmannii*), or cypress-pines (*Callitris*);

and chenopod shrublands on plains and lakebeds, and other semi-arid and arid shrublands or thickets. Occasionally in coastal thickets or shrublands dominated by *Banksia*, *Melaleuca* or *Lambertia*, and in or at edges of monsoon rainforests in tropics.

Food and Feeding. Primarily invertebrates, nectar (frequently of *Eucalyptus*), occasionally fruit, e.g. of mistletoe (Loranthaceae), *Rhagodia* and *Copparis*; invertebrates mainly insects, also spiders (Araneae) and pseudoscorpions (Pseudoscorpiones). In South Australia, estimated ratio of insects to nectar in diet 70:30. Forages at all levels, from canopy to ground, occasionally in air. Searches in inner and outer foliage, at flowers, on bark, on herbs, and among stones, leaf litter and dried animal droppings on ground. In Northern Territory, 54% of 119 foraging observations were at flowers, 24% in foliage, 15% on bark, and 7% in air. Nectar taken directly by probing flowers; invertebrates gleaned from vegetation or from ground, or taken by probing into crevices in bark, and under loose bark or debris; occasionally sally-strikes insects in air, and observed also to glean dead insects from cars. On ground, turns over material by probing with bill and lifting head and opening bill wide. Gregarious, noisy and active. Usually in small groups of 5–10 individuals, and adjoining groups sometimes coalesce to form larger flocks of up to 50, exceptionally 100 birds (possibly more often in non-breeding periods); less often in twos (probably pairs), and rarely singly; in the past a flock of more than 1000 individuals noted. Aggressive towards other birds (but said to be less so than *M. melanocephala*), but sometimes associates with other honeyeaters, e.g. seen to feed with *M. melanocephala* on fruits of *Rhagodia*, and fed on ground with *Lichenostomus penicillatus*. In NE Australia recorded in mixed-species feeding flocks with up to ten other meliphagid species.

Breeding. Over entire range recorded in all months, with apparent peak late winter to summer, and concentrated in spring and early summer, most clutches (87%) Aug–Oct; often more than one brood in a season. Nests in loose colonies and breeds co-operatively; suggested that not an obligate co-operative breeder, but breeding attempts by pairs without auxiliaries normally fail. Nest a large deep cup, occasionally a bowl, usually of grass, sticks and wool, often bound with spider web or hair, lined with wool (less frequent materials used in cup include plant stems and rootlets, hair, feathers, flowers, cocoons, bark, leaves, string, cotton thread, fishing line and paper; in lining, grass, rootlets, plant down, flowers, fur and hair, feathers, silky fibre from seed pods, string, cotton, leaves, once lids of trapdoor-spider burrows); external diameter 17.8–20.3 cm, depth 9.5–10.2 cm, internal diameter 7.6–9.5 cm, depth 4.1–7 cm; placed 1.2–1.6 m (mean 4.4 m) above ground, usually in vertical fork amid dense foliage or branchlets of shrub, sapling or small tree, sometimes in coppice growth from middle to upper trunk level of eucalypt, in mistletoe, or close to trunk of tree, sometimes suspended from horizontal limb, once on three upright stalks. Clutch 2–4 eggs, rarely 5 (mean 3.16); incubation by breeding female, very occasionally assisted by breeding male, period c. 15–16 days; chicks fed by three or more birds, probably parents and auxiliaries, nestling period at least 15–16 days, once young appeared to leave nest prematurely at c. 13 days; fledglings fed by at least three individuals. Nests parasitized by Common Koel (*Eudynamis scolopacea*) and Pallid Cuckoo (*Cuculus pallidus*). From 148 eggs in 55 nests at which outcome known, 1.05 young fledged per nest, of 144 nests, 102 (71%) fledged at least one young; nests late in season in semi-arid areas often fail owing to high ambient temperatures.

Movements. Resident. Said to be less sedentary than other miners, with some movements or changes in abundance or occurrence noted. Most changes in numbers probably result of local movements, and may in part reflect dispersal to breed and some post-breeding flocking, e.g. in Victoria discrete colonies sometimes coalesce into larger groups in autumn–winter. Some movements attributed to changes in food availability. Casual visitor at some sites at periphery of range, e.g. records in Broome area (Western Australia) in most months but not every year, and minor influx Jul–Oct 1990. Vagrants occasionally hundreds of kilometres from nearest known populations.

Status and Conservation. Not globally threatened. Common but somewhat patchily distributed, e.g. largely absent from Simpson Desert regions (in C Australia) and from Great Sandy Desert (in N Western Australia). Recorded densities of 0.01–1.4 birds/ha. Range has expanded and populations increased in many regions, chiefly in response to clearance for agriculture (e.g. in Murray–Mallee of inland SE Australia, and in S Western Australia); numbers on Swan Coastal Plain (Western Australia), however, have declined since European settlement. Range expansion in inland SE Australia has resulted in widespread hybridization with *M. melanotis*, to extent that latter species now Endangered. Present species appears to be having similar impact to that of *M. melanocephala* in semi-arid and arid zones, dominating roadside strips or other patches of remnant vegetation and excluding most other small insectivorous birds that would use these corridors or patches. Formerly shot as a pest in orchards and vineyards.

Bibliography. Aumann (1991), Barrett *et al.* (2003), Black & Badman (1986), Blakers *et al.* (1984), Briggs & Tooth (1994), Brooker *et al.* (1979), Burbidge & Fuller (2007), Campbell (1900), Carnaby (1954), Chandler (1944), Clarke, M.F. *et al.* (2007), Clarke, R.I.L., Boulton, Ewen *et al.* (2002), Close & Jaensch (1984), Collins (1995), Colston (1974), Cooney *et al.* (2006), Deignan (1964), Dow (1975, 1980b), Emison *et al.* (1987), Ford, H.A. (1979, 1980, 1981b), Ford, J.R. (1987b), Franklin (1996, 1997), Franklin & Noske (1998, 1999, 2000a), Gee *et al.* (1996), Goodwin (1967), Grifflioen & Clarke (2002), Hannah *et al.* (2007), Higgins (1999), Higgins *et al.* (2001), Hornsby (1997), Johnstone & Burbidge (1991), Johnstone & Storr (2004), Johnstone, Dell *et al.* (1977), Johnstone, Smith & Fuller (1981), Joseph (1986), Keast (1968a), Kitchener *et al.* (1975), Matthew & Carpenter (1990), McCarthy (2006), McCulloch (1966), McKeown (1936), McLaughlin (1990, 1992, 1993a, 1993b, 1994), Mules (1932), North (1907), Paton (1975), Pizzey & Knight (1997), Possingham & Possingham (1997), Quin (1998), Quin & Briggs (1995), Sage (1994), Saunders & Ingram (1995), Schodde & Mason (1999), Secomb (1995), Sedgwick (1964), Serventy (1948), Serventy & Whittell (1976), Starks (1987), Storr (1977, 1984), T aylor, P.W. (1987), Woinarski & Fisher (1995b), Woinarski, Press & Russell-Smith (1989).

Genus ACANTHAGENYS Gould, 1838

62. Spiny-cheeked Honeyeater

Acanthagenys rufogularis

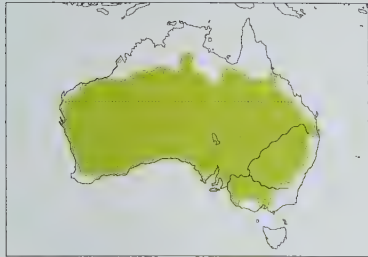
French: Méléphage à bavette **German:** Braunkehl-Honigfresser **Spanish:** Mielero Golicanelo
Other common names: Spiny-cheeked Wattlebird, Spring-checked Honeyeater

Taxonomy. *Acanthagenys rufogularis* Gould, 1838, New South Wales, Australia.

Genus formerly merged with *Anthochaera* by some authors. Specimen supposedly from an island in Torres Strait described as a geographical race, *parkeri*; locality, however, considered doubtful and specimen probably mislabelled. Monotypic.

Distribution. Australia mainly S of c. 19–20° S (only scattered records in far SW, in S Victoria and E of Great Divide).

Descriptive notes. 22–27 cm; male 39–77 g, female 34–57 g. Plumage is mostly olive-grey above, finely mottled blackish on crown and hindneck and streaked blackish on mantle, back and scapulars,



with dirty-white patch on rump and uppertail-coverts, and blackish tail with obvious narrow white tip; facial pattern distinctive, vivid pink base of bill and gape continuous with vivid pink strip of bare skin extending beneath eye to just behind eye, bordered above by blackish eyestripe and below by bold white cheek-stripe of dense long spiny feathers, cheekstripe broadening down side of neck, where finely streaked blackish, dusky malar stripe with fine whitish streaking anteriorly and becoming broader and darker on side of lower throat; upperwing blackish, white fringes on tertials and median and greater secondary coverts (edges of outer greater coverts tinged yellow-green), fine pale grey edges of primaries, yellow-green edges of secondaries; chin to upper breast pinkish-buff to orange-buff; rest of underbody cream, bold dark brown streaks on lower breast grading finer below (vent unstreaked); undertail black-brown with broad white tip, underwing pinkish-buff to cream-buff with grey-black trailing edge and tip; iris light blue to blue-grey; bill black, base pink; legs black-brown to black. Sexes alike in plumage, male larger than female. Juvenile is similar to adult, but top of head browner, cheekstripe mainly yellow with less bristly texture, underbody slightly duller and with much finer dark streaking, fringes of upperwing-coverts pale buff, and iris brown; immature as adult, but cheekstripe softer and less spiny (often some adult-like feathers admixed), short streak of bright yellow just below and behind gape-line, iris light blue but often with brown inner ring. **VOICE.** Generally noisy, with often reedy and liquid vocalizations; heard throughout day, more in morning. Song, lasting 5–6 seconds, of varied but pleasant liquid whistling phrases, and repeated at intervals; given in flight and while perched, by both sexes. Plaintive but loud, musical, reedy trill, and clear “tok-tok” or “quock” as contact or alarm. Other calls include quiet “click” at intervals during feeding; “taw-tawer” in flight, repeated several times; loud chattering in display-flight, and chuckling notes when dropping back into vegetation after song flight; quiet “cluck” sounds when flushed from nest, and squeaks and squawks during distraction displays. Pairs perform antiphonal duets. Reportedly mimics a range of species, including Grey Shrike-thrush (*Colluricincla harmonica*), Olive-backed Oriole (*Oriolus sagittatus*) and *Anthochaera phrygia*. Snaps bill during chases.

Habitat. Arid and semi-arid shrublands and woodlands, mainly those dominated by *Acacia*, especially mulga (*Acacia aneura*), and often with emu-bush (*Eremophila*) and other shrubs in understorey and grassy ground layer. Also commonly in mallee eucalypt woodlands, shrublands and heathlands, and in mixed acacia–eucalypt associations, often with shrubs (especially *Eremophila*) in understorey; also dry open eucalypt woodlands and forests, especially riparian associations on plains around wetlands or watercourses, such as those dominated by river red gum (*Eucalyptus camaldulensis*), coolibah (*Eucalyptus coolabah*) or black box (*Eucalyptus largiflorens*), with shrubby understorey including *Acacia*, paperbarks (*Melaleuca*), *Myoporum*, chenopods and lignum (*Muehlenbeckia*). Less often in other sclerophyllous habitats, including woodlands of banksias, paperbarks, casuarinas, especially belah (*Casuarina cristata*), or cypress-pine (*Callitris*) or mixed associations of these; or other arid and semi-arid shrublands or heathlands dominated by *Eucalyptus*, casuarinas, *Hakea*, *Banksia*, *Grevillea*, *Dodonaea*, *Geijera*, *Leptospermum* or *Melaleuca*, especially thickets of broombush (*Melaleuca uncinata*) in mallee. Sometimes in heathland; occasionally in wet sclerophyll or mangroves. Sometimes in parks and gardens, vineyards or agricultural land with scattered remnant vegetation.

Food and Feeding. Mainly fruit, nectar and arthropods (mainly insects, some spiders); also seeds; occasionally small vertebrates (including lizards and nestling birds). In one study, ratio of nectar to insects 50:50. Forages mainly in shrubs and trees, among branches and foliage, and on bark; frequently takes nectar and fruit of mistletoes (Loranthaceae) growing on diverse range of plants; sometimes forages on ground or aerially. Probes flowers for nectar, and gleans (plucks) fruits; arthropods obtained by gleaning and sallying, e.g. flying c. 2 m from perch to catch prey and usually returning to same perch. When feeding on fruit of the mistletoe *Amyema preissii*, pecks distal part of fruit to remove some skin, then pecks and swallows exposed fleshy seeds, leaving basal part of skin

attached to stalk, and taking 2–5 seconds to eat single fruit; when feeding on the mistletoe *Lysiana exocarpi*, plucks and swallows fruit whole, taking less than 2 seconds. Usually singly, in twos (possibly pairs) and in small flocks of up to ten individuals; occasionally in larger parties, e.g. up to 100 birds feeding on fruit of *Lysiana exocarpi*. Sometimes associates with other species at food sources. Will defend feeding territories; one appeared to defend territory jointly with *Anthochaera humulata*. **Breeding.** Recorded in all months, eggs in Jun–Mar (75% in late Aug to mid-Nov); in E of range (Queensland S to South Australia and Victoria) eggs Aug–Mar, whereas in W (Western Australia and Northern Territory) eggs mid-Jul to Dec; season possibly prolonged after good rains. Nest a neat, strong but delicate-looking cup, usually of pliant grass, leaves, plant stems and twigs, egg sacs of spiders, plant down and, occasionally, other soft material (e.g. rootlets, flowerheads, feathers), bound with spider web or sometimes wool, lined typically with wool, less often fur, plant down or hair, or other soft material, external diameter 8.9–14 cm, depth 5.1–13 cm, internal diameter 5.5–8.9 cm, depth 4.5–6.5 cm; suspended among branches or twigs 0.8–14 m (mean 2.7 m) above ground, often strongly attached, sometimes with foliage or twigs of nest plant woven into nest, and usually well concealed, generally in live tree or shrub, less often vines or mistletoe. Clutch 2–3 eggs, mean 2.22; role of sexes in incubation of eggs and brooding of young not known; incubation period 14–15 days; chicks fed by both adults, nestling period 14 days to c. 19 days (and recorded as leaving nest prematurely when at least 13 days old); fledglings fed by both adults for at least 12 days. Nests parasitized by Pallid Cuckoo (*Cuculus pallidus*). Throughout range 0–65 fledged young per nest; of 100 nests at which outcome known, 57 fledged at least one young and 43 failed. **Movements.** Apparently mainly resident, or present throughout year, over much of range. Possibly partly migratory in some areas, with changes in numbers or occurrence through year, some of which appear seasonal; widely described as nomadic or dispersive in inland regions, although many such reports likely relate to changes associated with local movements. Patterns appear similar in N, C & S parts of range, with no constant differences between regions or latitudes. Some apparent seasonal movements described, e.g. at sites in CS Victoria small numbers regularly spend autumn to early spring away from breeding areas, and possibly undertake some movement to N of range (but also present all year in most such areas, and in some N parts appears to be more common in spring–summer than in winter). Some seasonal occurrence related to flowering, e.g. at one site in mallee heath numbers increased when nectar abundance greatest (Jul–Oct) and low when nectar production lowest (Feb–Jun). Vagrant or sporadic at edge of range; has reached Barrow I, 50 km off Western Australia coast; some vagrant records attributed to drought inland. Occasionally moves in large numbers: in Western Australia, estimated 150 individuals per hour once recorded at Eyre Bird Observatory as part of large movement of birds E along coast (with *Purnella albifrons* and *Anthochaera carunculata*), and 100 or more seen flying SE at Hamelin Pool.

Status and Conservation. Not globally threatened. Rather uncommon to locally common. Densities of up to 0–13 birds/ha in Big Desert (NW Victoria), and 0–07–1–15 birds/ha at Eyre Bird Observatory and 0–006–0–011 birds/ha at L Disappointment (both Western Australia). Claim that a 1883 specimen was from Friday I, in Torres Strait, considered improbable, and specimen thought more likely to have come from Karumba, in NW Queensland; has been suggested, however, that it may have represented an extinct, relict population. Species is adversely affected by clearing of habitat, and may have declined in Wheatbelt of SW Australia. Sometimes considered a pest in vineyards.

Bibliography. Atchison (1993), Badman (1989), Barrett *et al.* (2003), Bellchambers & Carpenter (1990), Black & Badman (1986), Blakers *et al.* (1984), Boehm (1978), Briggs & Tooth (1994), Brooker & Estberg (1976), Brooker *et al.* (1979), Buchanan (1997), Burbidge & Fuller (2007), Campbell (1900), Close & Jaensch (1984), Colston (1974), Cooney *et al.* (2006), Cox & Pedler (1977), Davies (1982), Davies *et al.* (1988), Dow (1971b), Draffan *et al.* (1983), Dymond (1988), Emison *et al.* (1987), Ford, H.A. (1979), Ford, J.R. (1974, 1987c), Gee *et al.* (1996), Gould *et al.* (2004), Griffiths & Clarke (2002), Hannah *et al.* (2007), Henle (1989), Hewish (1994), Higgins (1999), Higgins *et al.* (2001), Hobbs (1961, 1986), Hornsby (1997), Howard (1986), Immelmann (1961), Johnstone & Storr (2004), Johnstone *et al.* (1979), Keast (1968a), Longmore (1978, 1991a), Martin *et al.* (2004), McEvey & Middleton (1968), McGill (1944), McKeown (1936), Morris (1986), Morris *et al.* (1981), Mules (1932), North (1907), Officer (1971), Parkes (1980), Paton (1986), Paton & Ford (1977), Pianka & Pianka (1970), Possingham & Possingham (1997), Robertson & Woodall (1983), Saunders & Ingram (1995), Schodde & Glover (1955), Schodde & Mason (1999), Serventy & Whittell (1976), Storr (1977, 1984), Taylor, P.W. (1987), Woinarski (1989b), Wyndham (1978), Yan (1993).



Family MELIPHAGIDAE (HONEYEATERS)
SPECIES ACCOUNTS

PLATE 43

Genus *ANTHOCHAERA* Vigors & Horsfield, 1827

63. Little Wattlebird

Anthochaera chrysoptera

French: Méléphage à gouttelettes **German:** Zimtflügel-Honigfresser **Spanish:** Mielerito Alirrojo
Other common names: Brush/Mock Wattlebird, Brush Mockbird, Mock, Mockingbird

Taxonomy. *Merops chrysotus* Latham, 1801. Nova Hollandia = Port Jackson, New South Wales, Australia.

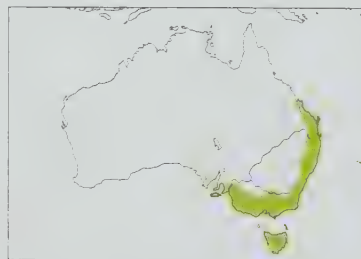
Often considered conspecific with *A. lunulata*. Three subspecies recognized.

Subspecies and Distribution.

A. c. chrysoptera (Latham, 1801) – coastal SE Australia on and E of tablelands of Great Divide from SE Queensland (Dawes Range) S. including Fraser I., Stradbroke I. and other islands, to SE Victoria, and W through SE South Australia to Adelaide.

A. c. halmaturina (Mathews, 1912) – Kangaroo I., off South Australia.

A. c. tasmanica (Mathews, 1912) – N & E Tasmania (and scattered records in SW & W and inland).



Descriptive notes. 27–35 cm; male 57–85 g and female 44–82 g (nominate), male 76–95 g and female 55–63 g (*tasmanica*), male 75–82 g (*halmaturina*). Large, slender honeyeater with long, graduated tail and moderately long and gently decurved bill; no wattles (despite English name). Nominat race has head, neck and upperparts largely dark brown-grey, fine white streaking over top of head merging into longer streaking on hindneck, upper side of neck and upper ear-coverts; prominent cheek-stripe densely streaked silvery white, extending across malar area and lower ear-coverts to side of neck; fine pale spots on lores, chin and

throat; prominent fine white streaks and spots on upperbody, narrow white scalloping on uppertail-coverts; prominent white tip on uppertail; upperwing dark brown-grey, broken white wingbar across tips of median coverts and fine white bar across tips of greater coverts (wingbars lost with wear), broad diffuse grey edges and fine white tips on tertials, diffuse olive panel on secondaries, and fine pale edges and narrow tips on primaries, bases of all except outermost primaries with broad rufous-brown inner edges (in flight, prominent rufous patch in primaries and prominent white tips of outer

primaries); underbody largely brownish-grey, paler than upperparts, fine white streaking on upper breast grading to coarser white streaking and spotting on lower breast, flanks and most of belly, white centre of lower belly and vent faintly washed creamy yellow (stronger in S of range than in N), dark brown undertail-coverts broadly scaled white; also diffuse whitish tuft at side of upper breast (sometimes hidden by folded wing); undertail dark brown-grey with broad white tip; underwing dark brown-grey, broad white scaling across coverts, large rufous patch across base of primaries, and prominent white tips on outer primaries; iris grey, but can change to reddish-brown when bird stressed; bill black (sometimes faintly paler at very tip); legs dark red-brown to black-brown. Sexes alike in plumage, male larger than female (size dimorphism often discernible when partners directly compared). Juvenile is slightly duller and browner than adult, with more diffuse and duller off-white streaking above, buffy (not white) wingbars, off-white streaking (not spots) on chin and throat, duller off-white streaking on breast (and almost no pale streaking elsewhere on underbody), at fledging further distinguished by shorter tail (not fully grown) and small yellowish gape. Races differ only little: *tasmanica* is very like nominate but significantly larger, has top of head to mantle, back and scapulars slightly more olive-toned, belly always washed creamy yellow (but much overlap with nominate), and white tips of outer primaries on average broader; *halmaturina* also is much larger than nominate, from which differs further in distinctly darker, blackish-grey to black-brown, ground colour, and thus white streaking and spotting more contrasting (almost black-and-white appearance), sometimes lacks creamy-yellow suffusion on belly, and olive panel on secondaries diffuse and slightly weaker (but present). VOICE. Noisy, especially in spring–summer, but calls throughout year with typically loud and raucous, harsh, guttural vocalizations. Song loud, harsh and explosive “cooked-apple cooked-apple” or “kok-kra-kwok” or “kok, kok, kra kwok, kra-kwok, kra-kwok” or “wak, wak, keik-keik, keik-kewick”; of wide frequency range and given in bouts of varying duration. Dawn song a prominent feature of dawn chorus, varies geographically: in CE Australia comprised 2 notes of wide frequency combined with single-note, double-note or triple-note calls, whereas at Victor Harbour (South Australia) more musical notes of narrower frequency combined with harsh notes. Other vocalizations include quiet, whimpering, single-note calls during foraging or when close to conspecifics; harsh cackles of 2 or more notes of wide frequency range (1–6 kHz) by lone birds or groups; harsh calls, often from exposed perch for long periods; explosive “kwok”, often with nasal “shairt” in alarm; and agonistic call, consisting of noisy pulses of wide frequency. At one site in non-breeding season, most calls were a repetitive “yekop” and harsh barks, and a repeated sharp “ark” and harsher coughs. Anecdotal reports (possibly referring to some of above calls) also describe short sharp “clock”, given occasionally when foraging; occasional musical notes and high-pitched musical whistles; conversational chucklings and soft calls at nest; and quick nervous call by bird flushed from nest and its mate. Sexes perform antiphonal duets in breeding season, e.g. one calling “kok”, the other answering “kra-kwok”; duets said often to begin with high-pitched metallic shrieks from female, then lower-pitched chuckling squawks from male; may also duet when defending feeding territory. Mimicry noted: one individual associating with *A. carunculata* over four or so days was not heard to give any of its own calls, only those of its congener (though not so loudly). Often rapidly and loudly snaps or clatters bill before or after calling, and loudly snaps bill in aggression towards other species.

Habitat. Mainly sclerophyllous heathlands, shrublands, forests and woodlands, often dominated by *Banksia* or *Leptospermum* or with *Banksia* in understorey: in wet and dry coastal heathlands and mallee heathlands; and dry open sclerophyll forests and woodlands dominated by species such as *Eucalyptus*, *Angophora* or *Banksia* and with dense understorey of sclerophyllous shrubs, often heath, though only occasionally in mallee woodlands. Common in urban gardens, parks and reserves, and in other modified areas such as vineyards and orchards. Occasionally in other habitats, such as coastal wet sclerophyll forest, low coastal casuarina woodland, cypress-pine (*Callitris*) forest, and flowering mangroves. In dry sclerophyll forest in SE Queensland, more abundant in forest with dense understorey of tall and low shrubs and protected from fire than in forest with sparse understorey burnt every 2–5 years or annually. Usually coastal and subcoastal, but extends to tablelands and ranges, especially sandstone ridges, to c. 1000 m.

Food and Feeding. Diet mainly nectar (from wide range of plants but especially *Banksia* and *Eucalyptus*), but also takes manna, fruit, arthropods (especially insects), and insect products (honeydew); recorded also as taking a lizard (*Tiliqua scincoides*). In one study in South Australia, ratio of nectar-feeding to insect-eating estimated at 79:21. Forages mainly in canopy and understorey, very occasionally on ground (e.g. to feed on fallen fruit). Mainly at flowers, probing for nectar, but gleans invertebrates, manna and insect products from foliage, branches and trunks of trees and shrubs; sometimes sallies for flying insects, and sallying can at times comprise large proportion of foraging. In one study in Victoria, of 418 observations of foraging throughout year, 79% involved feeding on nectar, 8% on manna and 13% on insects. Also observed to feed on sap-flows from trees damaged by yellow-bellied gliders (*Petaurus australis*), and seen at beehive and among swarm of bees (Apoidae). In one study in New South Wales c. 8.5% of time spent in foraging, whereas in Victoria spent mean of 42% of time in foraging. Usually forages singly, in twos (probably often pairs) or, less often, in small flocks; occasionally forms large flocks of up to 50–100 birds during autumn–winter at rich sources of food. Will forage with other meliphagid species, including *A. carunculata*, *A. paradoxa* and *Phylidomyris novaehollandiae*. Defends larger feeding territories with higher proportions of flowers than those defended by smaller honeyeaters; at one site, defended feeding territories in areas of abundant nectar, and the trees most used for nectar-foraging were those with most inflorescences.

Breeding. Season mainly spring–summer; eggs recorded in all months, most (58%) early Sept to late Dec; usually two, sometimes three, attempts per season. Usually solitary, but occasionally nests at high densities, and once two nests in one tree; possibly breeds co-operatively at times. Nest normally built by female only, accompanied by male, a shallow open cup or bowl or saucer, sometimes a deeper cup or even roughly domed, reasonably well made of sticks, grass or other plant stems, sometimes with other plant material (e.g. leaves, rootlets, bark, moss), wool, rope or twine or other artificial materials, usually lined with shredded bark, plant down and feathers, less often other soft material, external diameter 7.5–15 cm, depth 7–15 cm, internal diameter c. 7.5 cm, depth c. 3–8 cm; in upright fork, occasionally horizontal or multi-stemmed fork, 0.08–15 m (average 3 m) above ground, usually in small live tree or understorey shrub, occasionally in mistletoes (Loranthaceae), and well concealed among foliage; very occasionally in other site, such as between bark and trunk of tree, and shallow burnt-out hollow of eucalypt. Clutch 1–3 eggs, usually 2 (mean 1.65); roles of sexes in incubation not certain, by both sexes or by female only, male said to feed sitting mate, incubation begins after final egg laid, intermittent, with stints of c. 4 minutes and absences of c. 5 minutes once noted, incubation period 12–15 days; nestlings fed by both parents, sometimes assisted by helpers, nestling period 14–16 days, once 10–12 days (and once, exceptionally, 18 days or more); juveniles fed for 1–3 weeks after fledging, in Tasmania, said that male cares for fledglings while female incubates next clutch. Nests parasitized by Fan-tailed Cuckoo (*Cacomantis flabelliformis*) and Pallid Cuckoo (*Cuculus pallidus*). For 130 eggs in 82 nests, overall breeding success 0.30 fledged young per nest.

Movements. Resident over most of mainland range (nominate race), where present throughout year at most sites, though with local movement. Appears to undertake regular seasonal movements in some areas, and considered migratory or partly migratory at some sites, e.g. mainly autumn–winter visitor at some sites in SE Queensland and South Australia. Seasonal occurrences, however, typically within overall range of apparently resident populations, and distances involved not known; may represent local or regional shifts in population, rather than migration, e.g. individuals at Aireys Inlet (Victoria) make local seasonal movement from eucalypt forest to secluded gulleys in spring. Irregular at and beyond normal range, especially inland of Great Divide and to W of limits of range in South Australia. In Tasmania (*tasmanica*) partly resident and partly dispersive, and often described as nomadic, but little hard evidence of patterns of movements; occurrence erratic at some sites, and sometimes forms conspicuous flocks in autumn–winter; vagrant to King I. Sedentary on Kangaroo I (*halmaturina*), but part of population moves towards coast in spring. Throughout range, movements probably in part influenced by availability of nectar.

Status and Conservation. Not assessed. Probably not globally threatened. Common. No estimates of global numbers; recorded densities of 0.09–0.32 birds/ha. In both mainland Australia and Tasmania, some populations appeared to decline in past, and currently losing natural habitat through extensive development in coastal areas. Populations elsewhere appear to have increased and range expanded, e.g. became established in suburban Melbourne in early 1980s and has since increased in numbers. Increases probably due in part to establishment of native gardens. A minor pest in commercial orchards (stone fruits, pears) in Tasmania. Killed by feral and domestic cats; birds feeding on refined sugar in gardens sometimes die from thiamine deficiency.

Bibliography. Abbott (1974), Ashton (1985, 1996), Barrett *et al.* (2003), Baxter (1989, 1995), Blakers *et al.* (1984), Bonnin (1989), Browne (1990), Bryant (1928), Campbell (1900), Chan (1995c), Clayton (1981), Coleman (1974), Colston (1974), Cooney *et al.* (2006), Cooper (1975b), Dove (1935), Dow (1980b), Dowling *et al.* (1994), Dunn (1989), Egan (1997), Emison *et al.* (1987), Fearnley (1956), Fielding (1979), Fletcher (1911), Ford (1979, 1980), Frith (1969), Gannon (1953, 1966), Gepp (1986), Gepp & Fife (1975), Gibson (1977), Gosper, C.R. (1999), Gosper, D.G. (1986), Green, R.H. (1989, 1995), Green, R.J. (1984, 1986), Griffiths & Clarke (2002), Hewish (1988), Higgins *et al.* (2001), Hindwood (1930c, 1966), Jones, M.V. (1981), Jurisevic & Sanderson (1994a, 1994b), Keast (1968a, 1985a, 1993), Lill & Fell (1990), Littler (1910), Lord (1943, 1956), Marshall (1932b), McCarthy (2006), McFarland (1983a, 1984c, 1988), McFarland & Sale (1986), Mellor (1914, 1918), Morgan (1919), Morris (1975a, 1986, 1989), Morris *et al.* (1981), Mules (1932), North (1907), Paton (1979, 1980, 1986, 1991), Paton *et al.* (1994), Pizzey & Knight (1997), Porter & Henderson (1983), Prendergast (1987), Price (1977), Pyke (1985), Pyke & Recher (1988), Ratkowsky (1993b), Recher *et al.* (1971), Rix (1976), Roberts & Ingram (1976), Rose (1975), Schodde & Tidemann (1986), Sharland (1958), Smith, P. (1984), Storr (1984), Stove (1994), Taylor (1992), Terrill & Rix (1944), Thomas (1979), Turner (1992), Vernon & Barry (1972), Vernon & Martin (1975), Winslet & Winslet (1987), Wolstenholme (1924, 1927, 1929), Wood (1995).

64. Western Wattlebird

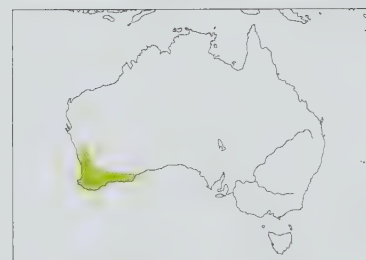
Anthochaera lunulata

French: Méléphage mineur **German:** Zwerghonigfresser **Spanish:** Mielero Lunulado
Other common names: Brush/Lunulated/Mock Wattlebird, Brush Mockbird, Brush Mockingbird

Taxonomy. *Anthochaera lunulata* Gould, 1838, Swan River, south Western Australia.

Often considered conspecific with *A. chrysoptera*. Monotypic.

Distribution. Coastal and subcoastal SW Australia, roughly S of a line from N Gairdner Range to Hopetoun and E to Cape Arid National Park.



Descriptive notes. Male 29–33 cm, 65–78 g; female 27–30 cm, 47–57 g; unsexed 45.5–83 g. Large, slender honeyeater with long, graduated tail, moderately long, gently decurved bill, and no wattles (despite English name). Head, neck and upperparts are largely dark brownish-grey, with narrow olive-grey scalloping and fine spotting on top and side of head and neck (spotting reduced or lacking with wear); diffuse black-brown eyestripe, pale cheek patch densely streaked silvery white, extending down side of neck; fine white triangular spotting on lower throat; fine white streaks and spots on upperbody, narrow white scaling on uppertail-coverts, and prominent white tip of uppertail; upwearing dark brownish-grey, broken white wingbar across tips of median secondary coverts and fine white bar across tips of greater coverts (wingbars lost with wear), greater coverts also narrowly edged olive, broad and diffuse grey edges and fine white tips on tertials, diffuse olive panel on secondaries, and fine pale edges on primaries, bases of all except outermost primaries rufous-brown on inner webs (in flight, large rufous patch on outer wing); underbody brownish-grey, paler than upperparts, dense fine white streaking and spotting on breast grading to coarser streaking and spotting over side of belly, vent and flanks, with white to creamy centre of lower belly and vent, and broad white scaling on undertail-coverts; also a small white tuft at side of breast (can be hidden by folded wing); undertail dark brownish-grey with bold white tip; underwing dark brownish-grey, broad white scaling across coverts and large rufous patch across bases of primaries; iris crimson to dark red-brown; bill black; legs black-brown. Differs from very similar *A. chrysoptera* in narrower, less bold, white streaks on upperparts and underparts, more triangular streaks on throat, less white on side of throat, no white tips on inner webs of primaries, and longer bill. Sexes alike in plumage, male noticeably larger than female. Juvenile is like adult but duller, browner and slightly paler above and below, with more diffuse and duller, off-white (not white), streaking on upperbody, fine off-white streaking (not white spots) on forehead and crown, distinct buff fringes on greater coverts of upwearing, rounded pale spotting on lower throat, and more diffuse pale streaking on breast. VOICE. Noisy and conspicuous; one of the first species to call in the morning. Calls of female usually higher-pitched than those of male. Most common call a loud croaking “chwaak”, said to be male territorial call. Male also has repeated rhythmic song that begins with clattering “chok” notes mixed with bill-snapping and develops into long, ringing cacklings and chucklings (like those of *Philemon*), repeated often. Other calls include high-pitched twittering, said to be female territorial call; and cheeping “weep” during foraging. Duets common, typically beginning with twitter by female, and include song by male.

Habitat. Mainly open *Eucalyptus*-dominated forests and woodlands with diverse understorey comprising such genera as *Dryandra*, *Banksia* and grass-trees (*Xanthorrhoea*); also in shrublands dominated by *Dryandra* and *Banksia*. Common in city parks with many native trees, uncleared roadside

vegetation, and shelter-belts of non-indigenous eucalypts in farmland. Sometimes in riparian or gully thickets of paperbarks (*Melaleuca*) or saplings.

Food and Feeding. Diet mainly nectar and insects; insects include bugs (Hemiptera) and Hymenoptera, and in one sample mainly ants (Formicidae). At one site, fed on insects more often in Aug–Sept than in May–Jul. In overall time budget in May–Jul, mean of 9.37% of time spent in foraging. Forages mainly in tall shrubs, less often in crowns of trees. Nectar taken from flowers by probing; insects, and probably manna and lerp, gleaned from bark or foliage; also sallies for insects. When foraging for nectar from *Dryandra sessilis*, worked mainly at partly opened (rather than unopened or fully opened) inflorescences; and at *Banksia menziesii* landed on unopened florets at distal end of inflorescence, and leant over to probe most recently opened florets. When foraging for nectar from flowers of *Eucalyptus stoeati*, birds perched or hung from branch near a pendulous flower, and then probed upwards or at an angle through central hole in dome stamens to reach nectar in floral cavity above, sometimes rapidly moving bill in circular motion at base of style. When taking nectar, appears to feed on plants at peak of their production of nectar. At one site, when exploiting flowers of *Dryandra sessilis*, preferred inflorescences 1–2 days old (which produce more nectar than do inflorescences of other ages), and foraged more commonly in large plants, growing in clumps. At inflorescences of *Banksia ilicifolia* (which change colour from yellow to pink to red during maturation), preferred to feed on yellow inflorescences, which had highest nectar content. Usually seen singly, in twos or in small parties, occasionally in flocks of up to 50 individuals; sometimes gathers at sources of abundant food. Often forages with *A. carunculata*. Pugnacious, attacking smaller and larger birds, and will defend nectar sources against other meliphagids, including conspecifics and *Phylidonyris novaehollandiae*; one seen once to defend nectar sources jointly with an individual of *Acanthagenys rufogularis*.

Breeding. Jun–Nov and Feb (late austral winter to summer), with records of eggs Jul, Aug and mid-Feb and of nestlings Jul–Oct. Usually nests solitary. Nest a shallow to rather flat, open cup, moderately well made, of grass, twigs, wool, feathers and occasionally flowers and spider egg sacs, lined with plant down, bark, twigs or grass, external diameter 10.2–15.2 cm, depth 3.8–7.6 cm, internal diameter 6.4 cm, depth 3.2 cm; usually placed in fork of horizontal branch 1.7–15 m (average 3.5 m) above ground in tall shrub or small tree (usually live), sometimes in dense or outer foliage, in vines or in clumps of mistletoe (*Loranthaceae*) growing in shrub. Clutch invariably 1 egg (claims of 2-egg clutches require confirmation), record of three young in nest probably included nestlings of cuckoo (*Cuculidae*); no information on incubation and nestling periods; both parents feed nestling and fledglings. Nests parasitized by Pallid Cuckoo (*Cuculus pallidus*).

Movements. Apparently mainly resident, with some local movements. Possibly some seasonal movement towards coast in summer, and inland return in winter and early spring, but few data. Appearance at some sites erratic, but no studies of movements. e.g. occurrence in Eucla Division said to be related to flowering of trees and shrubs, and influx recorded in Darling Range in one year when eucalypts flowering, although numbers fluctuated much. Vagrant at some sites N & E of core range.

Status and Conservation. Not assessed. Probably not globally threatened. Even when treated as specifically distinct from *A. chrysoptera*, does not qualify as a restricted-range species. No estimates of global abundance; recorded densities of c. 0–1.2 birds/ha near Manjimup. Large-scale clearing of native vegetation in Wheatbelt has caused population declines and range contraction; numbers around Perth thought also to have declined in first half of 20th century. In study of effects of logging and burning in karri (*Eucalyptus diversicolor*) forests near Pemberton, found to be most abundant in mature forest, including forest that had not been burnt for at least three years.

Bibliography. Abbott & van Heurck (1985), Arnold (1989), Ashby & Le Souëf (1928), Barrett *et al.* (2003), Blakers *et al.* (1984), Buchanan (1997), Campbell (1900), Carter (1924), Collins & Newland (1986), Collins & Rebelo (1987), Congreve & Congreve (1985), Cooney *et al.* (2006), Ford (1971), Grey (1985), Higgins *et al.* (2001), Hopper (1981), Hopper & Moran (1981), Job (1969), Johnstone & Storr (2004), Keast (1968a), Kitchener *et al.* (1975), Lamont & Collins (1988), Loaring & Serventy (1952), Masters & Milhinch (1974), Mathews (1925), Milligan (1902, 1903), Nichols & Nichols (1984), North (1907), Orton (1918), Ramsay (1989), de Rebeira & Congreve (1982), Recher & Davis (1998), Saunders & Ingram (1995), Schodde & Mason (1999), Schodde & Tidemann (1986), Sedgwick (1940, 1962), Serventy (1948), Serventy & Whittell (1976), Shannon (1984), Storr (1991), Tingay & Tingay (1983), Wardell-Johnson (1984), Wooller (1981).

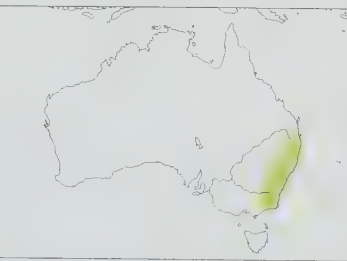
65. Regent Honeyeater

Anthochaera phrygia

French: Méléphage régente **German:** Warzenhonigfresser **Spanish:** Mielero Regente
Other common names: Embroidered/Mock-Regent/Warty-faced Honeyeater, Embroidered Bee-eater/Merops, Mock Regent-bird

Taxonomy. *Merops phrygius* Shaw, 1794, Sydney, New South Wales, Australia. Long placed in a monotypic genus, *Zanthomiza* (often erroneously emended to *Xanthomyza*), but found to be closely related to wattlebirds in current genus. Monotypic.

Distribution. SE Australia from extreme SE Queensland (small numbers in most years) S through New South Wales (mainly on tablelands of Great Divide and N & C inland slopes and plains) to NE Victoria. Throughout range, occasionally reported E or S of Great Divide in coastal and subcoastal districts.



Descriptive notes. 20.4–24 cm; male 41–45.5 g, female 33–45 g. Distinctive, medium-large honeyeater with fairly heavy, decurved bill. Male is mostly black, with large patch of normally dirty yellow (rarely, with pink tinge or dusky pink) bare warty skin on lores and around eye, and bold pale yellow scalloping on upperbody (except upper mantle); upperwing black, pale yellow scaling on coverts, and three bold yellow panels, one on greater primary coverts, one on secondaries and one on outer primaries (in flight, pale yellow on inner webs of primaries also conspicuous); uppertail black with yellow sides and tip (in flight, appears yellow with broad black centre); breast and upper belly black with pale yellow to whitish chevrons, these small and sparse on upper breast and merging into broad and rounded scaling on lower breast and upper belly, which can appear largely pale yellow and finely scalloped black; rest of underbody pale yellow; underwing dark brown to black-brown, with pale yellow fringes of coverts and yellow outer edges at tips of remiges; undertail appears mostly yellow, undertail-coverts covering most of black base; iris dark red-brown; bill black, light grey-brown base of lower mandible, gape black to grey or flesh-coloured; legs dark brown in front, pinkish behind. Female is similar to male but smaller, duller overall, with whole mantle black, upper breast more profusely marked yellow and not so black as male, and yellow of undertail duller; smaller patch of bare skin

on face (still larger than on some young males), slightly shorter and less heavy bill. Juvenile is much duller than adult, dusky brown with small patch of grey to blue-grey bare facial skin (almost smooth, lacking warty texture of adult), cream suffusion on ear-coverts, cream scaling on rump and uppertail-coverts and cream belly and vent merging to pale yellow on undertail-coverts, wing much as adult but ground colour dark brown, and yellow panels duller and less obvious (yellowish-white and smaller on primary coverts, reduced to only one obvious brownish-yellow panel on folded wing), tail as adult but ground colour dark brown and yellow areas duller and often flecked brown, bill initially orange-yellow with brown tip of upper mandible, quickly becoming dark brown, gape orange-yellow and swollen, legs grey-brown; immature like adult female but duller, retains juvenile remiges, rectrices and some upwing-coverts, which strongly contrast with rest of plumage, patch of bare facial skin smaller, smooth (develops warts at c. 9 months of age) and blue-grey, and gape fleshy and yellow at first. Voice. Typically begins calling in morning some 10–15 minutes after most other species. In CE & S New South Wales, very vocal until start of incubation, vocalizing progressively less as nesting progresses; in NE vocalized little during breeding season but called much when in loose flocks in non-breeding periods. Song distinctive, described as a contact vocalization (and uttered often), consisting of soft and penetrating ringing, swelling, slurred syllables, slightly trilled, repeated 2–3 times, sometimes with bubbling quality, and with intricate variation in volume and interval; bill-snaps sometimes included in song. Other vocalizations include: single high-pitched, urgent trill, rising up scale and lasting less than 1 second; meowing, drawn-out single or double note; single-note “plink” or “plink” and variants; quiet bell-like call, consisting of single syllable repeated several times, “ding, ding, ding...” or “whi, whi, whi”; and deep aggressive bark or harsh “chak” when defending roosting site or threatened. Also utters subsong. Mimics calls of larger meliphagid species when associating with them in non-breeding season (utters mimicry also when in non-breeding flocks of conspecifics), and occasionally mimics during breeding season; mimicry usually very close to that of model, but quieter; able to mimic almost whole repertoire of *A. carunculata* and *A. chrysoptera*, also individual calls of *Philemon corniculatus*, *Philemon citreogularis*, Olive-backed Oriole (*Oriolus sagittatus*), Grey Shrike-thrush (*Colluricincla harmonica*) and White-browed Babbler (*Pomatostomus superciliosus*). Bill-snapping during some displays and when chasing.

Habitat. Prefers dry sclerophyll box–ironbark *Eucalyptus* woodlands and forests on inland slopes, especially in moister sites along creeks, river valleys and lower slopes of foothills, and typically dominated by reliable nectar-producing trees including mugga (*Eucalyptus sideroxylon*), yellow box (*Eucalyptus melliodora*), white box (*Eucalyptus albens*) and yellow gum (*Eucalyptus leucoxylon*); also commonly in more open savanna-type woodland of such eucalypt species, or in remnants of such associations in cleared or partly cleared agricultural land. Of 168 observations of habitat across range, 80% were eucalypt woodland or dry sclerophyll forest. Less often in riparian casuarina forests dominated by river sheoak (*Casuarina cunninghamiana*), usually with heavy load of the mistletoe *Amyema cambagei* (and sometimes mixed with eucalypts), and in coastal or subcoastal eucalypt associations, mainly dry sclerophyll forests dominated by swamp mahogany (*Eucalyptus robusta*) and spotted gum (*Eucalyptus maculata*); and more rarely in other coastal associations such as riparian forest dominated by manna gum (*Eucalyptus viminalis*), low open eucalypt forest with heath understorey, or wet sclerophyll forest. Occasionally visits urban parks, gardens and reserves with mature or remnant *Eucalyptus*, and orchards; rarely, riparian shrubland of *Callistemon* and *Leptospermum*, coastal heathland or shrubland, and mallee shrubland. Formerly occurred in dry sclerophyll forest and savanna woodland on ranges and lowland plains in W of range and dominated by combinations of yellow gum, peppermint box (*Eucalyptus odorata*), pink gum (*Eucalyptus fasciculosa*), river red gum and native pine.

Food and Feeding. Predominantly nectar, arthropods (mainly insects), and insect and plant exudates, such as manna, lerp and honeydew; occasionally fruit. Forages mainly among foliage and flowers in crowns of trees, especially *Eucalyptus*, less often at lower levels, including shrub layer, rarely on ground; sometimes on trunks and branches of trees, including beneath bark, or in air. Nectar taken from flowers by probing; insects taken mainly by sallying, but insects, and lerp, honeydew and manna, also gleaned from foliage, from bark of branches and trunks, and from ground. Proportion of time spent in foraging, and proportions in foraging for nectar and in seeking other food items, vary between locations and years: when nectar abundant tends to feed almost solely on flowering species, but when nectar scarce becomes more generalized and forages from a range of tree species and on variety of foods, including lerp and honeydew. From various studies, proportion of time spent in foraging 21–52%, and proportion of foraging time devoted to nectar 6.3–88% and to insects 2–25%; at site where nectar-feeding only 6.3%, much of rest of time (88%) was spent in feeding on lerp and honeydew. At three sites in New South Wales in non-breeding periods, birds spent similar proportions of time in foraging during morning, around midday and in afternoon, except at one site, where significantly less time in afternoon than in other two periods of day. In N New South Wales, in non-breeding season, concentrated on nectar and lerp and honeydew in morning, on insects and lerp and honeydew in middle of day, and on nectar again in afternoon. In breeding season, concentrated on nectar and lerp and honeydew in morning, and mainly on lerp and honeydew (but still with reasonable level of nectar-feeding) in middle of day. In two breeding seasons there was no significant difference in diet between males and females. Conspicuous and aggressive, especially when congregating at food. Active and acrobatic, climbing over thin branches to reach pendulous flowers, and hanging upside-down. Typically gregarious; forages singly, in pairs, or in small to large flocks of 3–50 birds (though individuals in flocks appear to prefer foraging in separate trees); sometimes with other species, e.g. *A. carunculata*. Often defends temporary feeding territories, e.g. one defended territory in flowering stand of mugga from other species, including conspecifics, *Lichenostomus peticillatus*, *A. carunculata* and Musk Lorikeets (*Glossopsitta concinna*).

Breeding. Mainly Sept–Nov but recorded in all months except Apr; in Capertee Valley (CE New South Wales) breeding may begin as early as Jul and continue to as late as Dec (in 1995 laying highly synchronized, in early Oct, but in 1996 and 1997 spread from early Aug to mid-Nov); timing varies significantly between regions in Victoria; seasonal patterns of breeding appear to correspond to regional patterns in flowering of key eucalypt and mistletoe species, and breeding effort also varies significantly between years; reneating after success or failure observed, but apparently not common. Nests as simple pair, partners remaining together for at least one season. Solitary or in small loose colonies or groupings; regularly colonial in Capertee Valley, possibly because population density greater than elsewhere. Female collects material and builds nest, male staying nearby, rarely both sexes collect material and build, work taking 4–9 days; nest an open, rounded, thick-walled cup made of combinations of strips or flakes of soft bark, coarse dry grass, casuarina needles or a few fine twigs, bound with spider web and sometimes cocoons, lined with fine material such as bark shreds, grass, rootlets, wool and hair, external diameter 10.1–12.7 cm, depth 5–6.4 cm, internal diameter 6.4 cm, depth 3.2–5 cm; placed 1–30 m (averages in different studies 11–14.5 m) above ground, usually in vertical fork or on horizontal or angled branch, sometimes supported by vertical twigs, typically in foliage close to edge of canopy (most commonly a near-horizontal limb where two or three smaller vertical branches shoot off), in crown of tall tree (mostly eucalypt or casuarina), sometimes in mistletoes, sometimes close to ground in sapling or shrub, occasionally in artificial site such as top of fence post or rafter of open shed; once built in

old mud nest of Magpie-lark (*Grallina cyanoleuca*). Clutch usually 2 eggs, sometimes 3, mean in New South Wales (Capertee Valley) 2.2; incubation by female only, at one site sitting for average of 65% of daytime (average 5.5 bouts per hour), incubation period 12–15 days (mean 14 days); chicks brooded by female, fed by both sexes at about equal rates, male sometimes contributing more, nestling period 13–17 days (mean c. 16 days), but up to 21 days in wet weather; both sexes also feed fledglings, juveniles partly independent 2 weeks after leaving nest and fully independent c. 1 week later, or fully independent on average 27.6 days after fledging.

Movements. Movements complex, poorly understood, and apparently largely governed by flowering of *Eucalyptus* species that produce large volumes of nectar. Suggested that this species may combine seasonal movements between regions with local movements. Detailed analyses reveal three main trends: movement into parts of N New South Wales and SE Queensland (formerly, also South Australia) in autumn, with contraction into core breeding areas on inland slopes of Great Divide in NW, CW & SW New South Wales in late winter and in NE Victoria in middle to late autumn; a corresponding movement out of S Victoria and highlands of SE Australia from late autumn to early spring; and regular use of sites with predictable annual peaks in nectar production. Recorded as leaving sites or moving with *Philemon corniculatus*. Most ringing recoveries or resightings are close to site of ringing, but some long-distance movements recorded, e.g. two adult males breeding at Canberra in Dec 1995 were resighted in Capertee Valley (258–269 km N) in Oct 1997 and Mar 1998 (one bred at both sites), and one adult moved 176 km in maximum of 20 days. Young may also disperse some distance, e.g. two nestlings and an adult male resighted 20 km NW of ringing site 19 days after young fledged, and one colour-ringed nestling that fledged in late Nov was recaptured 17 days later (and still being fed by parents) 3.4 km away. A few records beyond normal range, e.g. singletons near Eulo, in SW Queensland, Aug 1980, and at Mystic Park, in NW Victoria, Oct 1979.

Status and Conservation. ENDANGERED. Total population estimated at 500–1500 individuals, within range smaller than 300,000 km². Thought to have a small and highly mobile population, and appears to have declined markedly and continues to do so. Formerly widespread in E & S Australia but range and numbers have contracted greatly, mainly as a result of loss, fragmentation and degradation of habitat. Declines probably began in c. 1940s, mainly following clearance and fragmentation of preferred high-quality habitat for agricultural purposes; degradation of remaining habitat through increased dieback and decline of trees in pastoral areas, lack of regeneration of *Eucalyptus* owing to grazing by livestock and rabbits (*Oryctolagus cuniculus*), and silvicultural practices that promote dense pole regrowth of immature trees and remove large spreading trees, and removal of trees for fence posts, firewood and timber. Estimated c. 75% of original habitat has been cleared, particularly lowland habitat on most fertile and productive sites, resulting in poorer and unreliable supplies of nectar. Remnants, including much of what currently exists in the conservation reserve system, are highly fragmented and often degraded. Further, loss and degradation of habitat may have facilitated expansion of large aggressive honeyeaters, such as *Philemon* and *Manorina*, possibly resulting in interference with present species at food sources and nesting sites. In 19th century was recorded in large numbers, occasionally in very large flocks (even of thousands) during influxes. Very few current records of large flocks, e.g. largest one noted 1977–1985 was of 37 birds; and in New South Wales and Victoria, 1988–1990, 61% of observations were of 1–2 birds, and largest flock of 23 birds; larger flocks (32–151 birds) recorded 1994–1997. Range has also contracted, e.g. formerly recorded farther N in Queensland. In New South Wales, recorded less often and in smaller numbers than previously, although overall range appears not to have contracted greatly, but apparently now absent from Riverina. In Victoria, less common or vagrant in several regions where formerly regular, including coastal E & S Gippsland and parts of SC Victoria; not recorded around Bendigo (where formerly common) or W of there since late 1980s. Probably extinct in South Australia; last recorded in 1977 but formerly widespread and abundant in S, with most records around Adelaide and in Mt Lofty Ranges. Formerly caused much damage to orchards during irruptions. Recent conservation efforts focused on protecting and restoring habitat at sites regularly used by the species. Also, captive-breeding has produced some success: in 2008, 27 individuals of this species (all fitted with radio transmitters) were released in Chiltern National Park, in Victoria, and very soon thereafter one was observed next to a wild individual, the first seen in the park for 18 months.

Bibliography. Allan (1989), Anon. (2007a), Baldwin (1975), Barrett *et al.* (2003), Blakers *et al.* (1984), Bounds & Lepschi (1988), Bounds, Brookfield & Delahoy (1996), Bounds, Clayton & Taws (1999), Butchart & Stattersfield (2004), Campbell (1900), Chaffer (1931), Collar *et al.* (1994), Collison (1959), Cooney *et al.* (2006), Cooper (1975a), Davidson (1992), Davis & Recher (1993a), Emison *et al.* (1987), Ford, Davis *et al.* (1993), Ford, Geering & Ley (2000), Franklin & Menkhurst (1988), Franklin & Robinson (1989), Franklin *et al.* (1987, 1989), Gannon (1962), Garnett & Crowley (2000), Geering (1997, 1998), Geering & French (1998), Geering & Herman (1999), Gosper (1986, 1992), Griffiths & Clarke (2002), Hewish (1995), Higgins *et al.* (2001), Keast (1968a), Ley (1990), Ley & Williams (1992, 1994, 1998), Ley, Cook & Williams (2002), Ley, Oliver & Williams (1996, 1997), Macarthur (1930), Menkhurst (1994, 1997), Morris & Kurtz (1982), Munro & McFadden (2005), Munro *et al.* (2003), North (1907), Oliver (1998a, 1998b, 1998c, 1998d, 2000), Oliver, Ley, Ford & Williams (1999), Oliver, Ley & Williams (1998), Peters (1979), Robertson & Woodall (1983), Ryan (1981), Saunders *et al.* (2003), Schedvin (1996), Schodde *et al.* (1992), Stanger *et al.* (1998), Stattersfield & Capper (2000), Taylor (1992), Terrill & Rix (1950), Traill *et al.* (1996), Veerman (1992, 1994), Webster & Menkhurst (1991, 1992), Wolstenholme (1924, 1927, 1929).

66. Red Wattlebird

Anthochaera carunculata

French: Méléphage barbe-rouge **Spanish:** Mielero Carunculado
German: Rotlappen-Honigfresser
Other common names: (Common) Wattlebird, Wattled Honeyeater

Taxonomy. *Merops carunculata* Shaw, 1790, region of Port Jackson, Sydney, New South Wales, Australia.

May form a superspecies with *A. paradoxa*. Nominate race and *woodwardi* intergrade in broad zone across SE South Australia and W Victoria. Three subspecies recognized.

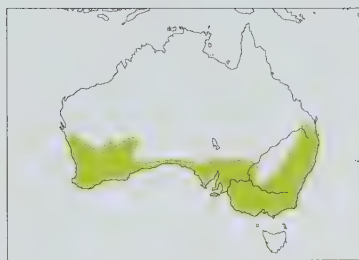
Subspecies and Distribution.

A. c. woodwardi Mathews, 1912 – S Western Australia E to S South Australia (E to Mt Lofty Ranges).

A. c. carunculata (Shaw, 1790) – SE Queensland S (mainly on and E of Great Divide) to Victoria and SE South Australia (W to about Mt Lofty Ranges).

A. c. clelandi (Mathews, 1923) – Kangaroo I, off South Australia.

Descriptive notes. Male 33–37 cm, 90–140 g; female 34–37 g, 82–133 g. Nominate race has head and neck black-brown, densely streaked white on nape and hindneck, uniformly dark cap bordered below by silvery white facial patch, this in turn edged below with bold black-brown submoustachial stripe that curves up behind ear-coverts (narrow strip of pink skin sometimes visible in front of black border of rear ear-coverts), and with fairly large reddish wattle hanging from lower rear ear-coverts and whitish line down side of neck from behind ear-coverts; chin and throat white, coarsely



and vent; undertail brownish-grey with bold white tip; underwing brownish-grey, scaled and mottled white on coverts, pinkish-buff bases and white tips on primaries; iris red; bill black, gape grey-black; legs pink-brown or pink. Sexes alike in plumage, female usually slightly smaller than male. Juvenile is like adult but slightly duller and browner, with fine white streaks on duller brown cap, finer white streaking on body, usually smaller and paler yellow patch below, fringes of coverts and remiges pink-buff at first (soon fading to adult appearance), submoustachial stripe as adult or silvery white and bordered by thin dark moustachial and malar stripes, iris dark brown, bill duller with tiny pale tip, puffy yellow-orange gape, wattle much smaller and paler, legs much brighter pink, strip of bare skin at rear of ear-coverts duller pink. Race *woodwardi* is like nominate but slightly smaller (wing of male significantly shorter), slightly richer yellow on belly; *clelandi* is similar in size to nominate (but male bill significantly longer and tarsus shorter), slightly darker overall (dusky feathering even on cheek patch), but some adults identical in plumage to some nominate. **VOICE.** Range of loud, harsh, raucous vocalizations; particularly noisy when congregating at food source. Calls throughout year, most often in spring or during breeding; often calls when flying from tree to tree. Common vocalizations include: loud, raucous and guttural cackle or coughing consisting of series of notes of wide frequency range, usually with emphasis on final note, "yak, yaak, yakyak" and "yakayak", usually (or only) by male, when foraging alone, during communal gatherings or in territorial encounters; varying series of rapidly repeated single whistled notes, "pleu, pleu, pleu..." or "tew-tew-tew-tew", 3–4 times per second, usually by female; emphatic single note, sounding like "cook", "chock" or "quok", some harsh and raucous, others with more harmonic structure, thought to be contact call. Other calls include: both narrow-band and broad-band alarm calls used alternately when mobbing a predator, narrow-band ones a rapid succession of low-pitched pulses with narrow frequency range, and broad-band ones loud, harsh and rasping with wide frequency range; harsh distress calls when handled; harsh call similar to broad-band alarm, given during agonistic encounters with conspecifics or other species; soft clucking call sometimes given when approaching nest with food, or when about to feed young; chatter by both members of pair before chasing each other in flight. Pair-members appear to duet, female giving whistle while male gives cackle; also, when partners meet at foraging site where other birds present, female often gives whistle in reply to male's cackle. Sometimes snaps bill in aggressive circumstances or when bathing.

Habitat. Wide variety of dry to moist sclerophyllous forests and woodlands, usually dominated by *Eucalyptus*, with understorey of grass or sclerophyllous shrubs; also in remnants of these associations in agricultural land, though recorded also in healthy forests and woodlands more often than in those affected by dieback. Sometimes in wet sclerophyll forest, e.g. mature stands or regrowth of mountain ash (*Eucalyptus regnans*) and alpine ash (*Eucalyptus delegatensis*) with rainforest or sclerophyllous understorey; and in mallee and coastal shrublands and heathlands, and thickets of broombush (*Melaleuca uncinata*) in mallee. Common in urban and rural parks and gardens, on golf courses, and sometimes in vineyards and orchards. Very occasionally in other habitats, e.g. riparian paperbarks (*Melaleuca*), riparian casuarina forest with much mistletoe (*Loranthaceae*), cool and warm temperate rainforest, exotic pine (*Pinus*) plantations, acacia or cypress-pine (*Callitris*) woodland or shrubland; also high-altitude herbfield or alpine heathland during snow-free months. In karri (*Eucalyptus diversicolor*) forests in SW Australia most abundant in mature forest, including forest not burnt for at least three years. Sea-level to c. 1900 m.

Food and Feeding. Diet mainly nectar, also invertebrates (mainly insects), lerp, honeydew and manna, and fruit; rarely, small reptiles (Scincidae) and eggs and nestlings of small birds. Proportions of main categories and methods of foraging vary. Ratio of nectar-feeding to insect-eating in one study 67:33. Forages from upper canopy to understorey, in air, and occasionally on ground. Obtains nectar by probing flowers (sometimes while standing on ground) of wide range of trees and shrubs, especially those that produce large volumes of nectar (including *Eucalyptus*, *Banksia*, *Eremophila* and *Xanthorrhoea*). Invertebrates taken mostly by probing bark and sallying (sometimes for long distances), but these and lerp, manna and honeydew also gleaned from bark and foliage or other substrates. Also pounces from low shrubs on to insects, and searches from ground and then hops to attack prey. Readily eats soft fruits, such as peaches, figs and plums, in orchards. Seen to feed on sap exuding from scars on *Eucalyptus* trees gouged by sugar gliders (*Petaurus breviceps*). Will feed at artificial feeding stations. Active, noisy, aggressive and conspicuous, but can be quiet and wary at times; clambers among branches, and often stretches and hangs to reach flowers. In C Victoria, two phases of foraging activity: one in early morning, with high levels of nectar-feeding and little insectivory, and a second over rest of day, with reduced nectar-feeding and increased insectivory (switch between the two usually in mid-morning). Forages singly, in pairs or in small groups; occasionally in large flocks of up to 100 or more individuals on Kangaroo I. Associates with many species at food sources, especially other meliphagids, including *Phylidomyris novaehollandiae*, *Philemon corniculatus*, *Philemon citreogularis*, *A. lunulata* and *A. chrysoptera*, and lorikeets (of genera *Trichoglossus* and *Glossopsitta*). Often defends feeding territories, either solitary or in pairs, from other nectarivorous birds.

Breeding. Eggs late May to Jan (mostly early Sept to early Nov) and breeding noted in all months except Apr and early May; at Imbota (in N New South Wales) first eggs Aug and last fledglings Feb, and 90% of 105 nests in Sept–Nov; probably normally double-brooded, and sometimes three attempts in a season. Solitary, but occasionally communal nester. Apparent co-operative breeding observed occasionally. Nest built by both sexes, sometimes by female only, work can take 2 weeks or more, large but varying in shape, from almost flat or saucer-shaped to deep open cup (possibly flattened during nesting attempt), in E Australia consists of three parts, a concave substructure of long thin sticks or grasses, a cup of smaller sticks, bark or grass in hollow of substructure, and a soft lining usually of bark but also of wool or fur, fine grasses, plant down, feathers, occasionally rootlets, small twigs or spider web (in W Australia, nest typically unlined), other materials used in nest include leaves, plant stems, or string, external diameter 15–23 cm (in W Australia, two nests 80 cm across), depth 9.5–12.5 cm, internal diameter 8.9–10.2 cm, depth 5.1–6.2 cm; placed 0.33–30 m (mean 6.4 m) above ground, usually supported by horizontal or sloping branch, vertical fork or branchlets in tall live shrub or tree (especially *Eucalyptus*), or in mistletoe (29% of nests in Imbota); twice built in old nest of Magpie-lark (*Grallina cyanoleuca*). Clutch 2 eggs, occasionally 1 or 3,

mean for whole range 1-97; incubation by both sexes or by female only, possibly from laying of first egg, period 16–21 days, once 15 days; chicks brooded by both sexes, mostly by female, fed by both about equally, immatures (assumed from previous brood) occasionally make small contribution to feeding of young; nestling period estimated at 15–20 days, but once 14 days and once 26 days (and in four other nests more than 20 days), period may be extended in cold, wet weather; fledglings fed by both parents, typically for 2–3 weeks after leaving nest, adult observed to be incubating clutch while fledglings of previous attempt still being fed. Nests parasitized by Pallid Cuckoo (*Cuculus pallidus*) and, less often, by Common Koel (*Eudynamis scolopacea*). For 272 eggs in 143 nests throughout range, overall success 0.51 fledged young per nest; of 90 nests over eight seasons in Imbota, 33.3% fledged at least one young; many nests probably fail in poor weather.

Movements. Complex and few clear patterns. At least partly seasonal and partly migratory. At study sites on Great Divide and on coast of New South Wales, no seasonal trends and no evidence of long-distance N–S movement. Considered resident (or recorded all year) at many sites throughout range, but movements (or, at least, changes in numbers or presence) also reported throughout range, and even where present all year numbers may fluctuate. At several locations, resident populations augmented by non-breeding visitors or passage migrants. Often described as nomadic or partly nomadic, usually on basis only of presence/absence at sites and with no study or evidence of genuine movement; where considered erratic or nomadic extent of movements involved unknown, and may be largely local. Considered partial N–S migrant in Western Australia and possibly in S coastal New South Wales, but migration routes not properly known; birds moving annually through coastal New South Wales possibly include individuals from Victoria. Altitudinal migration from areas above 1500 m in highlands of SE in autumn–winter. Some evidence of autumn–winter movement inland in E & S of range. Records outside normal range usually in winter. Many local or regional movements may be response to flowering of foodplants. Sometimes apparent passage observed (e.g. hundreds moving along ridgetops) and recorded with large numbers of *Lichenostomus chrysops* and *Meliphreptus lunatus*. Nominate race vagrant in New Zealand: two records North I (at Matakana c. 1865; and Rohutu, Taranaki, c. 1885), and unverified report at Motupiko before 1938. **Status and Conservation.** Not globally threatened. Locally common. Many estimates of density, ranging up to 3 birds/ha. Local or regional populations adversely affected by loss or degradation of habitat, e.g. in Wheatbelt of SW Australia has declined or disappeared in areas that have been widely cleared. Conversely, common in some urban areas and thought to have benefited from establishment of urban gardens. Formerly shot in large numbers, for sport and for food; also because considered a pest in orchards and vineyards, although true extent of damage probably low. Often killed by feral and domestic cats, and sometimes killed in collisions with vehicles or when flying against house windows. Can die from thiamine deficiency when fed on refined sugar in gardens.

Bibliography. Armstrong (1992b), Ashton (1996), Baldwin (1973), Barrett *et al.* (2003), Baxter (1989), Bedgood (1973, 1980), Bell (1964), Blakers *et al.* (1984), Bonnin (1989), Burbidge (1985), Campbell (1900), Carpenter & Matthew (1986, 1997), Coleman (1974), Colston (1974), Cooney *et al.* (2006), Cooper (1975b), Davis & Recher (1993b), Dove (1911), Dowling *et al.* (1994), Egan (1997), Emison & Porter (1978), Emison *et al.* (1987), Favaloro (1966), Ford, H.A. (1976, 1977, 1979, 1980, 1981a, 1983, 1999), Ford, H.A. & Bell (1981), Ford, H.A. & Debus (1994), Ford, H.A. & Paton (1976c, 1977), Ford, H.A. & Trémont (2000), Ford, H.A., Bridges & Noske (1985), Ford, H.A., Noske & Bridges (1986), Ford, H.W. (1908), Friend (1982), Frith (1969), Gall & Longmore (1978), Gepp & Fife (1975), Gibson (1977), Gosper (1999), Green, R.J. (1984, 1986), Griffioen & Clarke (2002), Henle (1989), Higgins (1999), Higgins *et al.* (2001), Hobbs (1969), Hopper (1980b, 1981), Hopper & Burbidge, A.A. (1982b), Hopper & Burbidge, A.A. (1978, 1986), Horrocks & Brown (1993), Johnstone & Storr (2004), Jurisevic & Sanderson (1994a, 1994b), Keast (1968a), Keast & Condon (1968), Kikkawa *et al.* (1965), Lamm & Calaby (1950), Lamm & Wilson (1966), Lenz (1990), Ley *et al.* (1997), Lill & Fell (1990), Longmore (1973), Loyn (1980, 1985a, 1985b, 1985c), Mac Nally & Timewell (2005), Mathews (1925), Matthew & Carpenter (1993), McEvey (1965), McCarthy (2006), McEvey & Middleton (1968), McFarland (1983c, 1984b, 1985, 1986b, 1986c, 1996), McKeown (1936), McLean *et al.* (2005), Milledge & Recher (1985), Moncrieff (1938), Morris (1975a), Morris *et al.* (1981), North (1907), Officer (1971), Oliver (1955), Osborne & Green (1992), Passmore (1982), Paton (1980, 1986), Paton & Paton (1980), Paton, Dorward & Fell (1983), Paton, Tucker *et al.* (1988), Pizzey & Knight (1997), Possingham & Possingham (1997), Prendergast (1984, 1987), Recher (1975, 1981), Recher & Abbott (1970a), Recher & Holmes (1985), Recher *et al.* (1985), Reilly (1991a, 1991b), Rix (1976), Rose (1975), Saunders, A.S.J. (1993), Saunders, A.S.J. & Burgin (2001), J. Saunders, A.S.J. *et al.* (2003), Saunders, D.A. & Ingram (1995), Saunders, J. (1983), Sedgwick (1949a, 1973a, 1973b, 1984, 1986, 1988a), Serventy (1937), Serventy & Whittell (1976), Sibson (1987), Smith, L. *et al.* (1984), Smith, P. (1984), Sonter (1980), Storr (1984), Talmage (1993), Taylor, I. (1987), Taylor, M. (1992), Taylor, P.W. (1987), Terrill & Rix (1944), Thomas (1969), Tidemann *et al.* (1988), Timewell & Mac Nally (2004), Tokue & Ford (2006, 2007), Traill (1985), Traill *et al.* (1996), Turner (1992), Vaughton (1990), Woinarski (1989b), Woinarski, Cullen *et al.* (1989).

67. Yellow Wattlebird

Anthochaera paradoxa

French: Méliphage à pendeloques

Spanish: Mielero Ventriamarillo

German: Gelblappen-Honigfresser

Other common names: Tasmanian/Long Wattlebird, Great-wattled Honeyeater

Taxonomy. *Corvus paradoxus* Daudin, 1800, Nouvelle Zélande; error = south-east Tasmania, Australia. May form a superspecies with *A. carunculata*. Two subspecies recognized.

Subspecies and Distribution.

A. p. kingi (Mathews, 1925) – King I, in Bass Strait.

A. p. paradoxa (Daudin, 1800) – C & E Tasmania.



Descriptive notes. Male 44–50 cm, 135–260 g; female 37–43 cm, 104–190 g. Largest honeyeater, with long, graduated tail. Nominate race has face, chin and throat largely white, contrasting strongly with white-streaked blackish-brown cap and hindneck; diffuse dusky grey loreal stripe, diffuse dark grey moustachial stripe, long (up to 6 cm) pendulous yellow to orange-yellow wattle dangling from rear ear-coverts, and narrow dark grey malar stripe that broadens along side of throat and merges with grey-black side of neck behind wattle (wattle varies seasonally: white basally, grading to yellow on distal third or so, but in breeding season engorged and brighter yellow, grading to orange-yellow or orange at tip); most of lower side of neck whitish, finely streaked brown; upperbody dark brown with fine pale grey-brown streaking and (in fresh plumage) fine greyish scaling; uppertail dark brown, washed

grey in centre, with bold white tip; upperwing dark brown, fine white tips on median secondary coverts and narrow white fringes on greater coverts, broad diffuse pale grey fringes on tertials, and fine pale grey edges on remiges broadest on secondaries (prominent pale panel on folded wing), white tips on primaries (prominent in flight); underbody mostly white, fine dark brown streaking in middle of upper breast merging into coarser dark brown streaking over rest of breast and fore-flanks, and to more diffuse and paler grey-brown streaking on rest of underbody, with large yellow to orange-yellow patch on belly; undertail dark brownish-grey with bold white tip; underwing dark brownish-grey, white scaling on coverts, pale buff patch across bases of primaries; iris black-brown (conspicuous in pale face); bill black; legs pink-brown to dull pink. Sexes alike in plumage, male much larger than female. Juvenile is plainer and browner than adult, top of head to neck and upperbody uniformly light brown, finely streaked off-white, dusky loreal, moustachial and malar stripes less distinct, wattle rudimentary, upperwing with bolder white streaks on marginal secondary coverts, buff fringes on median coverts, and duller buff-white tips on primaries, chin and upper throat off-white, light grey lower throat merging to uniformly light brown breast, rest of underbody cream with light brown wash on flanks, smaller and paler yellow belly patch, gape yellow-orange, iris paler than adult; immature separable from adult for short period after post-juvenile moult by combination of adult-like plumage and small wattles (much as on juvenile), inseparable when wattles approach full length (within 6 months of fledging). Race *kingi* is similar in size to nominate but slightly duller, with slightly greyer crown to upper mantle, brown back more distinctly streaked, pale fringes of tertials and secondaries finer and white tips of remiges and tail narrower, breast slightly browner, yellow belly patch smaller and paler (lacking orange tinge), wattles finer. Voice. Noisy, especially foraging flocks, and calls audible over some distance, but vocalizations poorly known. Starts calling at first light. Calls loud, harsh and guttural, comprising discordant coughing “kuk”, “wok”, “quok”, “cagh”, “ca-wok” or “ku-kuk”; or single notes in series interspersed with guttural, gargling-like notes. Also a harsh and discordant alarm call. Partners appear to duet, gargling or gurgling notes by female interspersed with harsh croaks from male.

Habitat. Mainly *Eucalyptus*-dominated sclerophyll forests and woodlands, particularly dry sclerophyll forest, preferring unburnt or mature forest, especially with dry understorey of grasses or sedges and with *Banksia* in middle storey. Also wet sclerophyll forest, e.g. dominated by mountain ash (*Eucalyptus regnans*) or alpine ash (*Eucalyptus delegatensis*) with understorey of either sclerophyllous vegetation or cool temperate rainforest; also open eucalypt woodland (sometimes with heathy understorey); and subalpine forest, usually with diverse shrub layer. More rarely, in closed, shrubby dwarf coniferous forest above subalpine zone. Common also in urban parks and gardens and other open spaces with some trees (such as golf courses), and orchards. Less often in cool temperate rainforest of Antarctic beech (*Nothofagus cunninghamii*), or coastal or inland heathland or shrubland; a few records in low open habitats, such as sedge-lands of button grass (*Gymnoschoenus sphaerocephalus*), snow grass (*Poa*) or perching lily (*Astelia alpine*). Sea-level to c. 1350 m, mostly below 1000 m.

Food and Feeding. Nectar (mainly from *Eucalyptus* and *Banksia*); some arthropods (insects and spiders) and fruit. Forages at all levels, from crowns to shrub layer near ground, and occasionally on ground, but mainly in canopy more than 10 m above ground; mostly at flowers or among foliage, but also on small and large branches and trunks of trees, including under loose bark. Nectar obtained by probing flowers; invertebrates gleaned from foliage, branches and trunks, or taken from beneath bark by probing or after pulling off strips of bark; occasionally sallies for insects or feeds at sap-flows of eucalypts. Visits gardens and orchards to feed at flowers or for fruit; usually takes over-ripe or fallen fruit, but sometimes eats ripe fruit. Active, conspicuous and aggressive. Singly, in twos (probably pairs), and in small to large flocks of up to 40 individuals, latter sometimes forming at sources of abundant food; sometimes with *A. chrysoptera* or other honeyeaters.

Breeding. Season Aug–Jan, laying Sept–Nov, and dependent fledglings noted Oct and Jan; season later in Central Highlands than on coast; often two broods in coastal regions. Nests as solitary pairs. Nest built by female, male sometimes carrying material, varies from rather flat and open bowl to a shallow to deep but substantial cup, made of thin sticks and bark, sometimes with grass, wool, rootlets, feathers or leaves included, lined with fine bark, rootlets and grass, feathers, paper, wool or marsupial fur, external diameter 18–25 cm, depth c. 8 cm; placed 4.5–45 m (usually 3–20 m, mean 18 m) above ground, often in partly exposed position, usually in vertical (less often horizontal) fork of live tree (mostly *Eucalyptus*) or shrub, sometimes on branch, top of stump, in niche in side of tree, or suspended among foliage or epicormic growth. Clutch typically 2 or 3 eggs, but records of single egg (clutch size not known with certainty); incubation probably by female, male possibly taking smaller share of duties, beginning on evening after second egg laid, period 14–16 days, possibly as short as 12 days; chicks brooded and fed by both parents, nestling period 18–21 days; fledglings fed by both parents, dependent for up to several weeks. Often only one young raised from brood of two, or two from three.

Movements. Not properly understood. Most movements appear erratic, especially in non-breeding periods; sometimes linked with local flowering of plants, especially *Eucalyptus*. Apparently sedentary in some areas, with stable numbers throughout year, or part of population appears to undertake regular seasonal movements. Altitudinal shifts in some areas, e.g. increased records at some higher-lying sites in late summer and early autumn, or movement to foothills and plains during winter and away in spring; tends to visit suburban gardens more often in autumn–winter. Autumn–winter flocks commonly reported, but not known whether these represent general altitudinal shift or other movements. Irruption of “hundreds of thousands” reported around Riversdale, on E coast, in winter 1894. Occasional records outside normal range, e.g. in W & SW, and on Three Hummock I and Hunter I (off NW coast); historical report from Furneaux Group considered doubtful; unconfirmed report S mainland Australia (Victoria).

Status and Conservation. Not globally threatened. Restricted-range species: present in Tasmania EBA. King I race (*kingi*) “vulnerable”: adversely affected by clearance of habitat, but population there probably stable, although thought to number fewer than 1000 mature adults. Nominate race locally common, recorded densities of 0.08–0.53 birds/ha (near Woodsdale), and 0.25–0.99 birds/ha (near Campbell Town); numbers thought to have declined up to 1950s, possibly as a result of hunting. Prefers older stands of dry sclerophyll forest, with densities significantly higher in mature forest than in younger regrowth; similarly, appears to prefer unburnt forest. Was formerly legally shot during an open season (May–Jul), the most recent of which was in 1972; often eaten, and sold in markets. So many were killed in early years that species was thought to be in danger of extinction, and was fully protected in 1902–1903, but was later legally hunted again.

Bibliography. Ashby (1925), Barrett *et al.* (2003), Blakers *et al.* (1984), Campbell (1900), Fielding (1977, 1979), Fletcher (1910, 1911, 1924), Gannon (1962), Garnett & Crowley (2000), Green (1969, 1989, 1995), Green & McGarvie (1971), Griffioen & Clarke (2002), Harris (1980), Henderson & Green (1982), Higgins *et al.* (2001), Hingston (1994), Keast (1968a), Le Souëf (1902b), Littler (1903a, 1903b, 1910), Mathews (1925), McGarvie & Templeton (1974), Mellor (1907), Napier (1967, 1969), North (1907), Ratkowsky (1979, 1983, 1993a, 1993b), Ratkowsky & Ratkowsky (1977, 1980), Recher *et al.* (1971), Ridpath & Moreau (1966), Rose (1980), Rounsevell *et al.* (1977), Schodde & Tidemann (1986), Sharland (1925, 1944, 1958), Slater (1994), Taylor *et al.* (1997), Thomas (1972, 1979, 1986), White (1985), Wilson (1950).



Genus *RAMSAYORNIS* Mathews, 1912

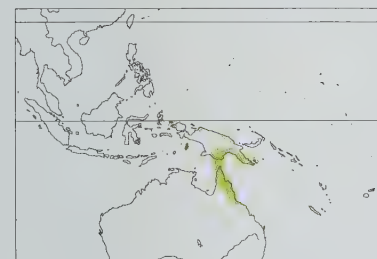
68. Brown-backed Honeyeater

Ramsayornis modestus

French: Méliphage modeste **German:** Sumpfhonigfresser **Spanish:** Mielero Modesto
Other common names: Modest/Unadorned Honeyeater

Taxonomy. *Glyciphila modesta* G. R. Gray, 1858, Aru Islands. Suggestions that populations from NE Australia are intermediate between present species and *R. fasciatus* are not supported by any studies. Monotypic.

Distribution. West Papuan Is (Waigoe, Batanta, Salawati); Aru Is; coastal S & SE New Guinea, and also very locally in W Vogelkop (Sorong) and along N coast, with isolated records at Mamberamo R, Wewak and Madang; D'Entrecasteaux Archipelago (Goodenough I, Fergusson I); islands of N Torres Strait (including Boigu, Saibai, Daru and Yam); and NE Australia (Cape York Peninsula S to about Aurukun on W coast, and along E coast S to Bowen, with occasional records on islands off E coast).



Descriptive notes. 12–13 cm; male 11–14 g, female 8–5 g. Rather drab, small and plump honeyeater with short tail. Plumage is mostly brown above and white below, with blackish-brown mottling on forehead and crown, diffuse dark loreal stripe, narrow white facial stripe from bill to below and just behind eye bordered below by thin brown moustachial stripe; off-white area of malar, chin and throat extending in notch up behind ear-coverts (in fresh plumage, ear-coverts finely frosted with white barring); upperwing and upperpart dark brown, fine paler brown fringes on secondary coverts and tertials, paler brown edges on remiges and rectrices (edges of secondaries forming diffuse pale stripe on folded wing); faint and diffuse light brown barring across breast merging into diffuse streaking along flanks; undertail dark grey, underwing pale buff with dark grey trailing edge and tip; iris deep red-brown; bill wholly dirty pink or with dusky upper mandible; legs dirty pink. Sexes alike in plumage, male slightly larger than female. Juvenile is like adult, but no dusky mottling on top of head (some have fine brown barring in white facial stripe), has brown on side of breast merging into gorget of diffuse brown streaking (not barring) that continues along flanks, median and greater upperwing-coverts have slightly broader and buff fringes, tertials fringed buff and rest of remiges edged buff, also bill blackish-brown with dirty pink base of lower mandible, gape yellow, and legs like adult or grey-black. **VOICE.** Commonly heard. In New Guinea, song a series of short chirping notes interspersed with soft twittering, or repeated sharp “chit”. Other calls include “mick-mick-mick” or dry “chip” often given in flight; low chirping notes; soft chattering “shee-shee-shee...”; dry “chh chh”, second note slightly higher; repeated faint dry notes or high squeaky notes, all on same pitch; and sharp, shrill monotonous cry, repeated at intervals.

Habitat. In Australia mainly riparian paperbark (*Melaleuca*) thickets or woodlands surrounding ephemeral wetlands, also in adjacent open riparian forest or woodland dominated by *Eucalyptus* or paperbarks, often along watercourses, or gallery rainforest on creek-lines; sometimes in mangroves and in urban gardens and parks. In New Guinea commonly in mangroves, savanna eucalypt woodland, or riparian paperbark thickets, woodlands or forest around swamps or on islands in lakes, including lowland paperbark forest mixed with palms and *Terminalia* at lake edges; occasionally in forest-scrub, coconut plantations, town gardens, roadside vegetation, and recorded also in patches of reeds in floodplain of Middle Fly R. Lowlands, to 600 m.

Food and Feeding. Mainly nectar and insects. Forages in foliage, at flowers and on branches of trees, mostly paperbarks. Nectar taken by probing flowers; insects gleaned from foliage and branches of trees or caught in sally-strike and sally-hover. Conspicuous; flits actively about in vegetation. Usually in twos (probably pairs), less often singly; occasionally in small flocks of up to 18 individuals, especially in flowering trees; in New Guinea in Apr. often in parties of 3–4, possibly family groups. Seen to forage with *Melithreptus gularis*, and in New Guinea often in flowering trees with lorikeets (*Trichoglossus*) and *Myzomela obscura*.

Breeding. In Australia reported in all months except Jun, and eggs recorded mainly Sept–Oct; in New Guinea recorded in all months, mainly Aug–Nov, with eggs and nestlings Sept–Nov, nestlings Apr and fledglings Jan–Feb and Apr. Nests in small groups or colonies (e.g. 21 nests within radius of c. 50 m), also solitary (e.g. mean 42–82 m between nests); clustering possibly related to habitat. Nest built by both sexes, although one in New Guinea built by female alone, a bulky, elongated, pendulous dome, side entrance near top and usually hooded, usually made of strips of paperbark, bound with spider web and cocoons, lined with soft pieces of paperbark, some nests made of grass, bark and leaves and lined with feathers or apparently unlined, external length 13–24 cm, diameter 7–11 cm, internal length 5–11 cm, diameter 4–5 cm, entrance diameter 2.5–6.5 cm; suspended in outer twigs of tree, often above water but can be well away from water, 0.6–16 m (mean 4 m) above ground, 57 nests in Townsville (Queensland) 1–8 m (mean 2.7 m), in New Guinea 1–10 m. Clutch 1–3 eggs, usually 2 (mean 2.09); incubation apparently by female only, period 14–16 days; chicks fed by both sexes, nestling period 12–15 days (but up to at least 17 days reported); fledglings fed by both parents. Nests parasitized by Brush Cuckoo (*Cacomantis variolosus*). At 23 nests with complete clutches in Townsville, eggs hatched in 13, and young fledged from seven (30.4%).

Movements. Apparently partly resident and partly migratory in Australia, although described also as nomadic in Australia and New Guinea, possibly in reference to essentially local movements; suggested that some nomadic movements in Australia misinterpreted as migration. Thought to be migratory in parts of NE Australia, moving or arriving in S in Aug and moving N in Apr–May, which partly supported by reporting rates in atlas surveys; suggested that some Australia breeders may winter in New Guinea, but no records of passage through Torres Strait.

Status and Conservation. Not globally threatened. Generally common in much of New Guinea, although oddly patchy distribution in NW & N parts, where recorded in W Vogelkop, with just isolated records along N coast, but these are apparently not referable to vagrants. Locally common in NE Australia; not recorded around Townsville (E Queensland) until late 1950s or early 1960s, but now well established.

Bibliography. Anon. (1978b), Barnard (1911), Barrett *et al.* (2003), Beehler *et al.* (1986), Bell (1970d), Blakers *et al.* (1984), Bourke & Austin (1947), Campbell (1977), Chemnick *et al.* (1993), Clarke (2004), Coates (1990), Draffan *et al.* (1983), Eastwood (1996a), Finch (1980b, 1983), Fletcher (2000b), Ford (1986), Gannon (1953, 1962), Gregory *et al.* (1996), Griffioen & Clarke (2002), Hicks (1988c), Higgins (1999), Higgins *et al.* (2001), Johnson & Hooper (1973), Keast (1968a), Lavery (1986), MacGillivray (1910b, 1914, 1918), Maher (1986, 1988, 1996), McLean (1995), Miller (1932), North (1906), Officer (1971), Oliver & Hopkins (1989), Pavey (1991), Rand (1942a), Schodde & Mason (1999), Storr (1953, 1973, 1984), Tarr (1948), Tubb (1945), Wieneke (1996).

69. Bar-breasted Honeyeater

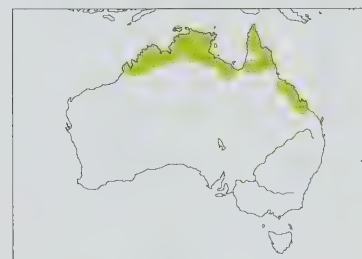
Ramsayornis fasciatus

French: Méliphage fascié **German:** Wellenbrust-Honigfresser **Spanish:** Mielero Pechibarrado
Other common names: Fasciated/White-breasted Honeyeater

Taxonomy. *Glyciphila fasciata* Gould, 1843, Port Essington, Northern Territory, Australia.

Suggestions that populations from E Australia are intermediate between present species and *R. modestus* are not supported by any studies. No significant regional variation in plumage and size; proposed races *apsleyi* (from Melville I) and *broomei* (from Napier Broome Bay, in Kimberley Division) considered insufficiently differentiated. Monotypic.

Distribution. N Western Australia (Kimberley Division), Melville I and Top End of Northern Territory E to S Gulf of Carpentaria and N & E Queensland (Cape York Peninsula S to Atherton, and S on E coast to Rockhampton).



Descriptive notes. 13–14.5 cm; 12.5 g. Small rather plump honeyeater with short tail. Has top of head black, boldly scalloped white, narrow white supercilium (often finely mottled dark brown in front of and behind eye); side of head, chin and throat white, narrow blackish loreal stripe and black-brown malar stripe; upperparts grey-brown, darker on wing and tail, with diffuse blackish streaking on mantle, back and scapulars, narrow pale buff fringes on rectrices, fine white to buff fringes on median and greater secondary coverts, and fine buff fringes on tertials and edges of remiges (diffuse panel on folded wing); underbody

white, bold blackish broken barring on breast merging to black-brown spots on fore-flanks and dark brown streaks on rest of flanks; undertail dark grey, underwing creamy buff with dark grey trailing edge and tip; iris deep red-brown; bill dark brownish-grey, dirty pink on basal half, gape black or dirty pink; legs dirty pink or pink-brown. Sexes alike in plumage, male slightly larger than female. Juvenile is like adult, but top of head light grey-brown with diffuse darker mottling, malar stripe duller and less obvious, breast streaked (not barred) dark brown, iris pale brown to grey, and gape yellow. **VOICE.** Rather quiet. Song a metallic, pleasant chatter. Main call a soft mewing “shrr, shrr” or “zzzzzz”, varying in frequency and intensity, given as contact; other calls include sharp, shrill rapidly repeated piping in alarm, soft purr, and sharp squawks.

Habitat. Seasonally inundated riparian paperbark (*Melaleuca*) forest and woodland bordering swamps or other wetlands; less often, open *Eucalyptus* forest and woodland, especially around or near wetlands. Sometimes in monsoon forest or vine thickets, such as semi-evergreen mesophyll vine forest; occasionally in gardens or on golfcourses; very occasionally in mangroves, thickets of *Acacia shirleyi*, or tropical heathland.

Food and Feeding. Mainly nectar and invertebrates (mostly insects, also spiders). Forages at all levels, among foliage of crowns, in vines and shrubs, occasionally on ground; often in paperbarks. Nectar obtained by probing flowers; invertebrates by gleaning and sallying, including sally-hovering, sally-striking in air and flutter-chasing; once seen to hover in front of spider web to pluck spider out. Takes nectar from wide range of flowering trees or shrubs (including *Melaleuca*, *Eucalyptus*, *Syzygium*, *Xanthostemon*, *Banksia*, *Grevillea*). Usually singly, in twos or in small flocks of up to ten individuals, once in flock of 30 or more; often with other meliphagid species when in flowering shrubs or trees. Defends feeding territories.

Breeding. Season broadly late spring to winter, with eggs recorded Nov–Jul and nestlings Feb–May, Jul and Sept; in Top End breeds almost exclusively in wet season, mainly Mar–Apr, when water levels in billabongs highest. Appears sometimes to nest in loose groups. Nest built by both sexes, bulky and domed, side entrance typically with landing, usually of strips of paperbark, bound with spider web, and lined with finer pieces of bark, but some made of dried grass, leaves or twigs and one lined with feathers, long pieces of bark may hang from sides and base, one nest 15.2 cm long, 10.2 cm wide, with entrance diameter 3.8 cm; suspended in foliage at end of slender branch of small tree or shrub (almost always paperbark), often low over water but can be well away from water, 0.3–7 m (mean 1.7 m) above ground. Clutch 1–3 eggs, usually 2 (mean 2.04); no information available on duration of incubation and nestling periods; it is probable that both sexes incubate; both feed nestlings and fledglings. Nests frequently parasitized by Brush Cuckoo (*Cacomantis variolosus*).

Movements. Probably largely resident. No seasonal movements observed. Vagrants recorded S of main range.

Status and Conservation. Not globally threatened. Locally fairly common. No estimates of global population; recorded densities of 0.5–0.16 birds/ha.

Bibliography. Aumann (1991), Barrett *et al.* (2003), Blakers *et al.* (1984), Boekel (1976), Braithwaite *et al.* (1984), Bravery (1970), Brooker *et al.* (1990), Campbell (1900), Chan (1998), Colston (1974), Crawford (1972), Deignan (1964), Ford (1986), Ford *et al.* (1980), Franklin & Noske (1998, 2000a), Frith & Hitchcock (1974), Gannon (1962), Griffioen & Clarke (2002), Higgins (1999), Higgins *et al.* (2001), Hill (1911), Johnstone & Burbidge (1991), Johnstone *et al.* (1977), Keast (1968a, 1985a), Lavery & Hopkins (1963), Le Souëf (1903), Longmore

On following pages: 70. Rufous-banded Honeyeater (*Conopophila albogularis*); 71. Rufous-throated Honeyeater (*Conopophila rufogularis*); 72. Grey Honeyeater (*Conopophila whitei*); 73. Olive Straightbill (*Timeliopsis fulvigularis*); 74. Tawny Straightbill (*Timeliopsis griseigularis*); 75. Long-billed Honeyeater (*Meliphaga megarhynchos*); 76. Bougainville Honeyeater (*Stresemannia bougainvillei*); 77. Barred Honeyeater (*Glyciphila undulata*); 78. Vanuatu Honeyeater (*Glyciphila notabilis*); 79. Lesser Streaked Honeyeater (*Myza celebensis*); 80. Greater Streaked Honeyeater (*Myza sarasinorum*); 81. Spangled Honeyeater (*Melipotes ater*); 82. Arfak Honeyeater (*Melipotes gymnops*); 83. Common Smoky Honeyeater (*Melipotes fumigatus*); 84. Watted Smoky Honeyeater (*Melipotes carolae*); 85. MacGregor's Honeyeater (*Macgregoria pulchra*).

(1978, 1991a), McLean (1995), Noske (1998), North (1906), Schodde (1976), Schodde & Mason (1999), Schodde & Tidemann (1986), Slater (1959), Smith *et al.* (1978), Storr (1977, 1984), Woinarski (1993), Woinarski & Fisher (1995a), Woinarski *et al.* (1988).

Genus *CONOPOPHILA* Reichenbach, 1852

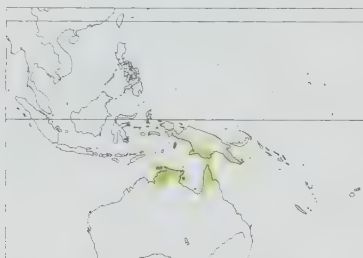
70. Rufous-banded Honeyeater

Conopophila albogularis

French: Méléphage à gorge blanche **German:** Rostband-Honigfresser **Spanish:** Mielero Pechirrufo
Other common names: Rufous-breasted/Red-breasted/White-throated Honeyeater

Taxonomy. *Entomophila* ? *albogularis* Gould, 1843, Port Essington, Northern Territory, Australia. May form a superspecies with *C. rufogularis*. Populations of New Guinea and Torres Strait proposed as race *mimikae* (described from Mimika R, in SW New Guinea), but appear not to differ in plumage or size from Australian populations. Monotypic.

Distribution. Patchily in lowland New Guinea, at Sorong (W Vogelkop), along Sepik R, Markham R and upper Musa R (in N), and (in S) from Triton Bay E to Trans-Fly and Fly R, and at scattered sites in SE lowlands from Kerema E to Milne Bay; Aru Is; islands in Torres Strait; and N Australia from Melville I and Top End of Northern Territory (S to 15° S, E in coastal and subcoastal areas to Gove Peninsula), Groote Eylandt, and E to N Queensland (Cape York Peninsula).



ish-white with brownish-grey trailing edge and tip; iris brown to brownish-grey; bill black-brown, blue-grey base of lower mandible, blue-grey or pale grey gape; legs blue-grey to dark grey. Sexes alike in plumage, male slightly larger than female. Juvenile is like adult, but with top and side of head browner (much as upperbody), no dark streaking on cap, merging into (not sharply demarcated from) off-white chin and throat, and with obvious narrow off-white eyering, underbody off-white, breastband reduced to faint pale brown wash at side (sometimes also on flanks), some also have pale buff centre of breast, bill grey-black with pinkish or orange base of lower mandible and gape. **Voice.** Song complicated and melodious; in New Guinea, one or two wheezy upslurs followed by clearer series of 5–8 notes in seesawing pattern, “szzweei, szzweei, whi-tsui-swei-tsui-swei-swtot-see-sot”, one 10-note song lasted 3–5 seconds. Most common call a repeated rising “zzheep”, or upslurred, wheezy “szzweei”, or clearer “sweei”. Other calls include, in New Guinea, a nasal chipping “nyah-zit” or “nyah-nyah” in flight, coarse squawking “kwee-kwee-kwee...” and nasal “zwee”; in Australia occasional cheeps, chattering and melodious twitter. In New Guinea, two birds often call together, one slightly after the other and both finishing abruptly.

Habitat. Open riparian paperbark (*Melaleuca*) woodlands surrounding wetlands; patches of monsoon vine forest (e.g. dry semi-deciduous monsoon vine thickets); and open and closed mangrove forests and woodlands on coasts (mainly where adjacent to other preferred habitats), but not normally within extensive mangrove forest. Sometimes in open forest or woodland of *Eucalyptus* or *Eucalyptus* and *Lophostemon* near wetlands with open grassy or shrubby sclerophyllous understorey; tends to avoid eucalypt forests and savanna in Australia, but more commonly in such habitats in New Guinea. Common in some cities, urban areas and towns and villages, in suburban parks and gardens and street trees, and in roadside vegetation. Unusually, one in scrub in swampy paddock on Sogeri Plateau, in SE New Guinea. Coastal lowlands and offshore islands; above 600 m on Sogeri Plateau.

Food and Feeding. Predominantly arthropods (mainly insects, also spiders), also nectar (e.g. of *Eucalyptus*, *Melaleuca*), occasionally arils attaching seeds to seedpods; seen also to take nectar from extra-floral nectaries on phyllodes of *Acacia umbellata*. Forages mostly in outer foliage of tree crowns, less often in lower canopy and shrub layer; fairly regularly on ground; seen to forage on aquatic vegetation in swamps (including reeds and water-lilies). Insects gleaned (e.g. from foliage, twigs and *Acacia* seedpods), caught also by sally-striking at foliage, sally-pouncing on to grass, sally-striking in air, probing and flutter-chasing; nectar taken by probing flowers. Arils sometimes plucked from seedpods of *Acacia auriculiformis*, rubbed against branch to remove seeds, then eaten. Usually forages singly or in twos (mostly pairs in territories), though occasionally in small flocks of 10–30 individuals; often in mixed-species feeding flocks, particularly with *C. rufogularis*.

Breeding. In New Guinea breeds through much of year, with peaks middle to late dry season and later in wet season; on Boigu I, in Torres Strait, eggs mid-Jan; in Australia breeding activity in all months, mainly Aug–May and concentrated Sept–Feb, in Darwin (Northern Territory) large peak in Sept–Oct (late dry season) and second, smaller peak in Jan–Mar (late wet season), pair may raise up to five broods. Both sexes collect material and build nest, a deep cup or purse made of fine strips of bark, grass, tips of palm fronds and other plant material, and spider web, lined with fine grass and bark fibre, external diameter 4–4 cm at rim and 5–7 cm at widest part, internal diameter 3–2 cm at rim, depth 5–7 cm; suspended by rim in thin horizontal fork of leafy branch, usually in centre or outer foliage of shrub or small tree, often over water, in New Guinea sometimes in clump of reeds; 195 nests Darwin 1–6–11 m (mean 5 m) above ground, elsewhere 0–5–10 m. Clutch 1–4 eggs, usually 2 (mean 2.16); incubation probably starts with or just before completion of clutch, by female only, period 14–17 days (once estimated fewer than 13 days in New Guinea); chicks brooded probably usually by female alone (but both members of pair seen to brood at one New Guinea nest), fed by both sexes, nestling period 13–15 days, in New Guinea suggested as 10–13 days; fledglings fed by both parents, remain with them for at least 30 days after fledging; adults sometimes start nest for subsequent attempt before young fledge. For 50 eggs in 23 nests, 0.95 young fledged per nest; twelve pairs in Darwin produced mean of 5.82 young per pair per season.

Movements. Resident, with some local erratic or nomadic movements, possibly by young birds. In ringing study in Darwin, adults appeared sedentary, but young possibly non-territorial floaters for months or years.

Status and Conservation. Not globally threatened. Common to very common in New Guinea; in Australia, recorded densities in Northern Territory of 12 birds/ha in Darwin and 0.3 birds/ha along S Alligator R. Colonized suburbs of Darwin in 1980s, well established by 1985, and presently ubiquitous and abundant. Distribution in New Guinea very patchy.

Bibliography. Barrett *et al.* (2003), Beehler *et al.* (1986), Blakers *et al.* (1984), Boeskel (1976), Braithwaite *et al.* (1984), Bristowe *et al.* (1971), Brooker *et al.* (1990), Campbell (1900), Clarke (2004), Coates (1990), Colston (1974), Crawford (1972), Deignan (1964), Draffan *et al.* (1983), Finch (1980b, 1983, 1985), Ford (1982), Franklin & Noske (2000a), Frith & Hitchcock (1974), Gannon (1962), Garnett & Bredl (1985), Gregory *et al.* (1996), Griffioen & Clarke (2002), Higgins *et al.* (2001), Immelmann (1961), Keast (1968a, 1985a), Mayr & Rand (1937), North (1906), Noske (1990, 1996, 1998), Officer (1971, 1976), Peachey (1985), Peckover & Filewood (1976), Pizzey (1980), Rand (1942a), Schodde & Mason (1999), Storr (1977, 1984), Thompson (1983), Verbeek *et al.* (1993), Watson *et al.* (1962), Woinarski (1993), Woinarski *et al.* (1988).

71. Rufous-throated Honeyeater

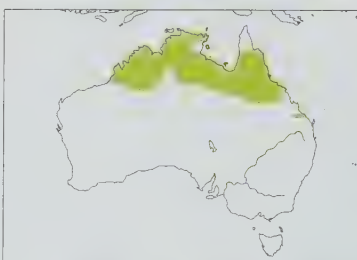
Conopophila rufogularis

French: Méléphage à gorge rousse **German:** Rostkehl-Honigfresser **Spanish:** Mielero Golirrufo
Other common names: Red-throated Honeyeater

Taxonomy. *Entomophila* ? *rufogularis* Gould, 1843, northern coast of Australia = Derby, King Sound, Western Australia.

May form a superspecies with *C. albogularis*. Slight clinal variation in tone of plumage, W and inland populations slightly paler and browner above and below. E populations (N Queensland) sometimes treated as a geographical race, *queenslandica* (described from Inkerman), but appear little different from birds in W of range. Monotypic.

Distribution. N Western Australia (Kimberley, including some offshore islands, e.g. Koolan and Cockatoo) E across Top End of Northern Territory (also Wessel Is, S to Tanami Desert and Barkly Tableland) and S of Gulf of Carpentaria (including Groote Eylandt and Wellesley Is) to N & E Queensland (S Cape York Peninsula, and E coast from about Gladstone S to Burnett R).



Descriptive notes. 11–14 cm; male 8.5–13.9 g, female 8.2–13 g. Small, plump honeyeater with short tail. Male is pale grey-brown above, slightly paler and greyer on top of head and neck, and off-white below; diffuse, fine dark streaking or mottling on top of head, off-white malar area, rufous-brown chin and centre of throat, and pale grey-brown wash on breast and along flanks; upperwing and uppertail slightly darker than upperbody, tertials with narrow pale fringes, greater secondary coverts with narrow dull-yellow fringes, rectrices and remiges with fine yellow edges (conspicuous yellow sides of tail, prominent yellow panel

on folded wing); undertail light grey; underwing brownish-grey, slightly paler on coverts and bases of remiges; iris olive-grey to dark brown; bill blackish, blue-grey base of lower mandible, sometimes off-white gape; legs dark grey or black. Female is like male but slightly smaller, with throat patch paler rufous-brown and less uniform (noticeable when partners compared directly). Juvenile is like adult but with conspicuous thin whitish eyering, no dark streaking on top of head, and off-white chin and throat lacking rufous patch, bill greyish with yellow or pinkish cutting edges and basal half of lower mandible, and gape initially swollen and yellow; immature as adult but most have chin and throat off-white or with scattered rufous-brown mottling, a few indistinguishable from adult female. **Voice.** Most vocalizations undescribed. Commonly utters chattering notes when foraging or nest-building; other calls include sharp, scratchy or peevish “zit-zit”, as contact or alarm, and rasping note. Single-phrase song otherwise undescribed; also light song (incompletely described), first notes given while in flight, the rest after alighting. Sometimes duets.

Habitat. Mainly open, grassy savanna woodlands, typically dominated by *Eucalyptus* and with scattered shrubs in understorey and ground cover of grasses such as spear-grass (*Stipa*), *Themeda*, *Sorghum* or spinifex (*Triodia*), e.g. open forest of Darwin woollybutt (*Eucalyptus miniata*) and Darwin stringybark (*Eucalyptus tetradonta*); or in riparian paperbark (*Melaleuca*) or *Eucalyptus*–*Melaleuca* woodlands, typically with shrubby understorey of *Acacia*, *Callistemon* and *Pandanus*, e.g. tall closed paperbark swamp-forest dominated by *Melaleuca leucadendra*, *Melaleuca cajuputi* and *Melaleuca symphyocarpa*. Sometimes in *Acacia* thickets, usually mixed with eucalypts and rainforest species, or in patches of rainforest or stunted monsoon forest; rarely, in mangroves. Sometimes in urban parks and gardens. Often in riparian vegetation in semi-arid environments.

Food and Feeding. Invertebrates (mostly insects, some spiders), also nectar (including from *Eucalyptus*, *Syzygium*, *Xanthostemon*, *Melaleuca*) and fruit (*Ficus*). Forages at all levels of vegetation; among foliage and flowers of trees and shrubs, also in air and, uniquely among honeyeaters, much on ground, including among long grass; at one site, often forages among emergent aquatic annuals. Insects mainly gleaned from foliage and branches, caught also by sally-striking in air or at foliage and branches (sometimes within a few centimetres of surface of water); also sally-hovers to take insects from foliage or close to ground, sally-pounces from low perch, flutter-chases and occasionally probes for prey. Obtains nectar by probing flowers. Active, acrobatic, conspicuous. Singly, in twos (often pairs) or in small flocks of up to 30 individuals; often in mixed-species flocks or in association with other honeyeaters in flowering trees or shrubs; mixed flock of 20 birds of present species and *Lichenostomus flavescens* once seen while feeding at swarm of termites (Isoptera).

Breeding. Season at least Jul–Mar; eggs recorded Jul, late Sept and Nov–Mar and fledglings early Jul. Nest probably built only by female (although also said that both sexes collect material and build), a neat, fragile pouch or purse made of grass, pieces of bark and twigs, loosely woven with spider web, lined with grass or rootlets, external diameter 5.8–7.8 cm, depth 5.2–7.6 cm, internal diameter 2.5–3.9 cm, depth 4.5–6.4 cm; suspended by one side from fork usually at leafy end of branch of shrub or tree, 1.2–10 m (mean 3.2 m) above ground. Clutch 2 or 3 eggs, mean 2.8; incubation probably by female alone, although some claims that both sexes incubate, period 13–15 days; chicks fed by female alone for first two days, thereafter by both sexes (female does most), nestling period 12 days; both parents feed fledglings. Nests parasitized by Brush Cuckoo (*Cacomantis variolosus*).

Movements. No clear patterns; variously considered sedentary, migratory and nomadic (even at same sites). Any movements undertaken probably related to availability of nectar, arrival and de-

parture in an area often coinciding with flowering of food trees or the end of flowering. Probably resident or partly resident throughout much of range, numbers fluctuating with movement of part of local population or possible influxes from elsewhere. Around Mt Isa (NW Queensland), where well studied, considered to be a breeding visitor, arriving Aug, with local dispersal to breed in Jan–Mar; mainly leaves Apr–May, but said also to move locally around Mt Isa when not breeding. These observations supported by bird-atlas reporting rates at Mt Isa (53.6% in summer and 20.3% in winter). At Mt Isa, said to arrive suddenly, moving rapidly in large flocks along watercourses, but to leave more gradually and in smaller numbers.

Status and Conservation. Not globally threatened. Locally common; less common in E, and rare in SE of range. Recorded densities of 0.08–0.40 birds/ha and, at various sites in N Northern Territory, mean of 0.35 birds/ha in wet season and 0.09 birds/ha in dry season. In Northern Territory, largely absent from N coast and much of E Arnhem Land.

Bibliography. Abbott (1982), Aumann (1991), Barrett *et al.* (2003), Blakers *et al.* (1984), Boeckel (1980b), Brooker *et al.* (1990), Campbell (1900), Carruthers (1970), Collins (1995), Colston (1974), Cooney *et al.* (2006), Ford, J.R. (1978a), Franklin & Noske (2000a), Frith & Davies (1961), Gannon (1962), Garnett & Bredl (1985), Griffioen & Clarke (2002), Higgins (1999), Higgins *et al.* (2001), Hill (1911), Horton (1975), Immelmann (1961), Johnstone (1983), Johnstone & Burbidge (1991), Johnstone & Storr (2004), Johnstone, Dell *et al.* (1977), Johnstone, Smith & Fuller (1981), Keast (1968a), Lavery (1986), Liddy (1962), McKean (1985), North (1906), Pizzey & Knight (1997), Sage (1994), Schodde (1976), Schodde & Mason (1999), Sedgwick (1947), Storr (1973, 1984), Storr *et al.* (1975), Woinarski & Fisher (1995a, 1995b), Woinarski & Tidemann (1991), Woinarski *et al.* (1988).

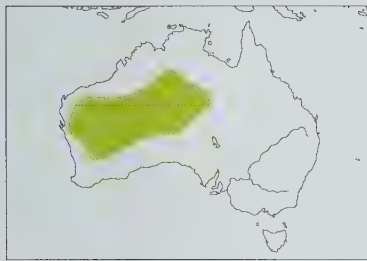
72. Grey Honeyeater
Conopophila whitei

French: Méléphage de White **German:** Grauhonigfresser **Spanish:** Mielero de White
Other common names: Alfred/Inconspicuous/White's Honeyeater

Taxonomy. *Lacustroica whitei* North, 1910, Lake Way, east Murchison Drainage, Western Australia.

Often placed in a monotypic genus, *Lacustroica*. Monotypic.

Distribution. Arid and semi-arid inland Australia: widely scattered records from W Western Australia E to C & S Northern Territory (S of 17° S) and, rarely, N South Australia.



Descriptive notes. 10–13 cm; male 7–10.3 g, female 9.4–11 g. Small, slim honeyeater with short tail. Plumage is nondescript brownish-grey above and white below, with partial thin pale grey eyering (broken in front of and behind eye), brownish-grey wash across breast and anterior flanks; uppertail dark grey-brown, finely edged white; upperwing blackish-brown, leading secondary coverts paler brownish-grey, greater secondary coverts and tertials with diffuse brownish-grey fringes, primaries with thin off-white edges and secondaries with thin olive-yellow edges (diffuse narrow olive strip on folded wing); undertail

dark grey with conspicuous broad white tips on outer few rectrices; underwing white, merging to dark grey trailing edge and tip, with some brown mottling along leading edge; iris dark brown to red-brown; bill grey, with pink-brown or blue-grey base of lower mandible (bill also described as wholly black), gape greyish or dull orange; legs dark grey or grey-black. Sexes alike in plumage; male slightly larger than female in tail length but not in other measures or in weight. Juvenile is like adult but browner above (slightly greyer top of head), with pale yellow wash on ear-coverts, malar area, chin and side of throat, merging to white on centre of throat, prominent narrow pale yellow to off-white partial eyering, breast washed creamy yellow and only faintly tinged brown, undertail-coverts washed pale yellow, most of remiges thinly edged pale olive-yellow (more extensive olive wash on wing), newly fledged young has pale orange, orange-yellow or yellow swollen gape. Voice. Most common call a loud and somewhat harsh, disyllabic “cre-seek”, second note higher than first, often rapidly repeated plaintive “troo-whyee, troo-whyee” or “tsee-you-whyee”; also a high silvery contact call. Song a rapid, high-pitched, sibilant and musical reel, in flight and when perched.

Habitat. Low acacia woodlands and shrublands, usually dominated by mulga (*Acacia aneura*), *Acacia tetragonophylla* and *Acacia citrinoviridis*, with scattered low shrubs and often lining stony or sandy creekbeds; possibly prefers mature stands. Also on sandhills with canegrass (*Zygochloa paradoxa*), scattered beefwood (*Grevillea striata*), red mulga (*Acacia cyperophylla*) and eucalypts. Sometimes in gardens of towns or homesteads, and recorded breeding in such.

Food and Feeding. Mostly insectivorous, seen to eat lerp and associated insects; also nectar and mistletoe (Loranthaceae) fruit. Forages mainly in foliage of trees and shrubs, often *Acacia*. Insects obtained mainly by gleaning from among foliage; seen also to sally-hover over crowns of plants to take insects from outer foliage. Obtains nectar from *Eremophila* by puncturing side of tubular flowers. Quiet and unobtrusive, but not shy. Singly, in twos (at least sometimes pairs) and in family groups; forages also in small flocks of up to eight individuals. Often with acanthizids, especially Yellow-rumped Thornbill (*Acanthiza chrysorrhoa*) and Western Gerygone (*Gerygone fusca*). Sometimes pauses for short periods with bill open and wings outstretched.

Breeding. Breeds in cooler months of inland, from late autumn to mid-spring, but few records; eggs mid-May, second half Aug and mid-Nov, nestlings late Oct and fledglings late Aug to late Oct. Nest built by both sexes, a thin cup made of grass, leaves, plant fibres and horsehair, bound together and attached to tree with spider web (one held together with sticky seed-coats), one nest loosely lined and covered on outside with woolly seeds, two others had many small white woolly lerp on outside, external diameter 5–7 cm; suspended c. 1 m to c. 2.5 m up at end of horizontal branch (sometimes forked) of narrow-leaved tree, often *Acacia*. Clutch 1 or 2 eggs; incubation said to be by both sexes; both feed nestlings and fledglings; no information on duration of incubation and nestling periods.

Movements. No information. Regularly reported at some sites, but sightings and occurrence unpredictable; described as resident or as nomadic and moving through much of C Australia, with no evidence for either.

Status and Conservation. Not globally threatened. Little known; uncommon to rare. Listed as “rare” in South Australia and “endangered” in Western Australia. At one site in Western Australia, five pairs recorded within radius of 1 km (c. 0.3 birds/ha). Most reliably reported at a few sites in inland Western Australia and at Kunoth Well (near Alice Springs), in Northern Territory. Breeding recorded at several widely scattered locations, but very few records. May be adversely affected by burning of vegetation and grazing by domestic and feral stock, which result in lack of regeneration of mulga habitats.

Bibliography. Barrett *et al.* (2003), Blakers *et al.* (1984), Colston (1974), Cooney *et al.* (2006), Cowles (1967), Curry & Menkhurst (1979), Ford (1974), Garnett (1993), Higgins *et al.* (2001), Johnstone & Storr (2004), Keast (1968a), Mathews (1966), Moriarty (1972), Parker (1969), Paton, J.B. (1981), Roberts (1980, 1981), Schodde & Mason (1999), Slater (1974), Stanger *et al.* (1998), Start & Fuller (1995), Storr (1977), Wells & Wells (1977), Whitlock (1910, 1924).

Genus *TIMELIOPSIS* Salvadori, 1876

73. Olive Straightbill
Timeliopsis fulvigula

French: Méléphage olivâtre **German:** Buschhonigfresser **Spanish:** Mielero Oliváceo
Other common names: Olive Straight-billed/Mountain Straight-billed Honeyeater, Mountain Straightbill

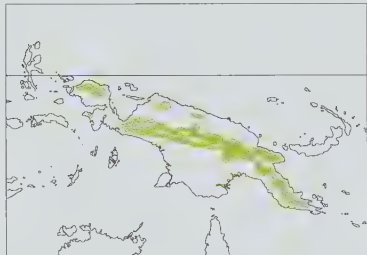
Taxonomy. *Euthyrhynchus fulvigula* Schlegel, 1871, Arfak Mountains, north-west New Guinea. Race *fuscicapilla* poorly differentiated, and possibly better merged with *meyeri*. Birds from Mt Goliath (in Orange Range) described as race *montana*, but very similar to SE New Guinea population of *meyeri* and synonymized with latter. Three subspecies recognized.

Subspecies and Distribution.

T. f. fulvigula (Schlegel, 1871) – mountains of Vogelkop and Onin Peninsula (Fakfak Mts), in NW New Guinea.

T. f. meyeri (Salvadori, 1896) – Central Ranges from Weyland Mts E, including Foja Mts and North Coastal Range (Bewani Mts), to SE New Guinea (including Mt Bosavi).

T. f. fuscicapilla Mayr, 1931 – mountains of Huon Peninsula, in NE New Guinea.



Descriptive notes. 13–15 cm; two males 20 g, two females 16–19 g (*meyeri*); two males 16–19 g (nominate); one male 22 g (*fuscicapilla*). Nominate race is largely dark olive to dark greyish-olive, slightly paler below, with varying brownish tinge on top of head and stronger greyish tone on lores, supercilium and ear-coverts (ill-defined greyish face), more brownish-olive remiges and rectrices, remiges with olive-yellow edges (conspicuous panel on folded wing), browner chin to breast; iris bright orange to red-brown; bill blackish-grey to black, sometimes paler grey base of lower mandible; legs grey-brown. Sexes alike in plumage.

age, male slightly larger than female. Juvenile is like adult but greyer below, iris dark grey to dark brown (specimens described with dark brown bill and yellow gape are probably juvenile or immature, but confirmation needed). Races differ only subtly in tone of plumage: *meyeri* is somewhat paler, less greenish, above than nominate, with buffish-grey chin and upper throat; *fuscicapilla* is very like previous, perhaps slightly darker. Voice. Call, frequently as contact during foraging, a plaintive or scolding, upwardly inflected series of “sreed-sreed-sreed...” or loud “screee screee”, latter given also in flight.

Habitat. Mid-montane forest and forest edge, mainly at c. 1100–2450 m, but to 2700 m in Snow Mts, and some specimens from 770 m inland of Hall Sound, in SE. In Eastern Highlands, recorded at 1760–2440 m, and to 2650 m in Mt Gahavisuka Provincial Park (near Goroka).

Food and Feeding. Insects recorded as eaten. Forages in understorey, including low dense vegetation at forest edge and dense thickets in damp areas within forest. Forages mainly by gleaning from foliage and probing curled leaves. Shy, skulking. Usually singly, in twos (possibly pairs) or often in small, noisy family parties of up to four individuals; occasionally in mixed flocks.

Breeding. Nest with egg in late Jan and female with egg in oviduct in late Jul, indicating breeding in wet and dry seasons. Nest an open cup, externally of dry blades of grass and internally of fine roots and other fibres, lined with feathers (including own). No other information.

Movements. No information; probably resident. Two ringed together in late Sept retrapped with a third individuals in early Dec.

Status and Conservation. Not globally threatened. Poorly known; generally considered scarce to rare. Locally fairly common at Biaru, near Wau; not abundant at Tari Gap.

Bibliography. Beechler (1978a), Beechler *et al.* (1986), Coates (1990), Coates & Peckover (2001), Coles (1995), Diamond (1972a), Frith & Frith (1992), Gibbs (1994), Gilliard & LeCroy (1961, 1970), Hartert (1930), Hicks & Burrows (1989), Mayr & Rand (1937), Rand (1942b), Rand & Gilliard (1967), Ripley (1964), Stein (1936).

74. Tawny Straightbill
Timeliopsis griseigula

French: Méléphage chamois **German:** Geradschnabel-Honigfresser **Spanish:** Mielero Habano
Other common names: Tawny Straight-billed/Grey-throated Straight-billed/Lowland Straight-billed/Babbler Honeyeater, Grey-throated/Lowland Straightbill

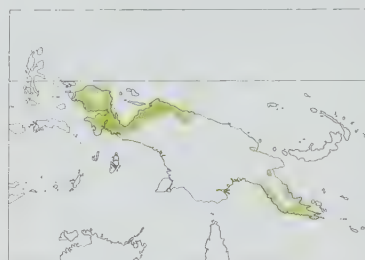
Taxonomy. *Euthyrhynchus griseigula* Schlegel, 1871, Sorong, Vogelkop Peninsula, New Guinea. Racial identity of apparently isolated populations of Gogol R, on NE coast (Madang Province), and R Waut (Morobe Province), on NW coast of SE peninsula, not certain; tentatively placed in, respectively, nominate and *fulviventr*. Two subspecies recognized.

Subspecies and Distribution.

T. g. griseigula (Schlegel, 1871) – NW & N New Guinea, from Vogelkop and Bomberai Peninsula (including Kumawa Mts) E to Humboldt Bay and extending to foothills of S Weyland Mts, also isolated population in R Gogol area (Madang Province).

T. g. fulviventr (E. P. Ramsay, 1882) – SE New Guinea on lower R Waut (Morobe Province) and E from R Kumusi and, on S coast, from E Gulf Province.

Descriptive notes. 18 cm; male 37–43 g and one female 34 g (nominate), 32 g (*fulviventr*). Nominate race is olive-brown above, with rufous tinge on uppertail-coverts, remiges and tail; off-white to buffy edges of remiges (paler panel on folded wing); underbody paler rufous, slightly darker posteriorly, underwing buff-brown with dark trailing edge and tip; iris red, red-orange, orange or red-brown; bill creamy to buff, with very base of culmen and lower mandible dark brown; legs pink. Sexes alike in plumage, male slightly larger than female. Juvenile is much as adult, but



Habitat. Lowland and foothill primary rainforest, also forest edge and tall secondary growth; sea-level to foothills, up to 800 m.

Food and Feeding. Arthropods (insects), fruit, nectar and flowers. Forages from understorey to upper canopy, often in lower and middle strata; of 41 observations of foraging in lowland rainforest at R Brown, most in understorey (38%, including 20% below 1 m), remainder in subcanopy 8–25 m above ground (22%), in upper canopy at 30–35 m (26%) and in lower canopy at 25–30 m (14%). Obtains food mainly by gleaning from foliage of trees, shrubs and vines, branches, palm fronds, debris and flowers; also probes dead curled leaves with bill. Active. When moving up vines, switches body from side to side with each upward movement; often hangs upside-down, flaring tail as it does, to probe or glean from leaves. Usually singly or in family parties of up to four individuals. Often in mixed flocks in which either Rusty Pitohui (*Pitohui ferrugineus*) alone or Rusty Pitohui and New Guinea Babbler are nuclear species, when foraging with latter behaves as integral part of flock; one seen in a mixed-species foraging flock repeatedly examining leaf petioles; at R Brown, foraged significantly closer to ground when in mixed-species flocks than when alone, and appeared to forage among debris and leaf litter disturbed by babblers.

Breeding. Poorly known. Appears to breed in dry season to early wet season (at least), and suggested as finishing late Jul to early Aug; juvenile male in early Aug, dependent fledglings and unspecified breeding noted early Nov, and breeding female mid-Dec. No other information.

Movements. Probably resident; resident in lowland forest near Brown R.

Status and Conservation. Not globally threatened. Patchily distributed throughout range. Generally uncommon; can be locally common, e.g. at Lohiki, in Gulf Province. Estimated density 0.1 bird/ha at Brown R. Presence of apparently isolated populations in NE may indicate that the species is more continuously distributed along N coast.

Bibliography. Anon. (1978c), Beehler, Pratt & Zimmerman (1986), Beehler, Sengo *et al.* (1995), Bell (1982a, 1982b, 1982c, 1983a, 1984a, 1984b), Coates (1990), Coates & Peckover (2001), Diamond (1972a, 1985, 1987), Finch (1980b, 1983), Mayr & Rand (1937), Rand & Gilliard (1967), Ripley (1964).

Genus *MELILESTES* Salvadori, 1876

75. Long-billed Honeyeater

Melilestes mearnsianus

French: Méliophage à long bec **German:** Langschnabel-Honigfresser **Spanish:** Mielero Piquilargo

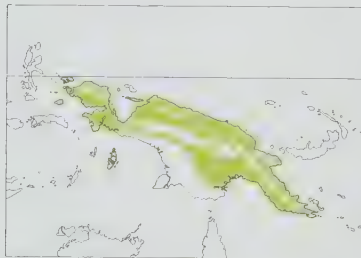
Taxonomy. *Ptilotis mearnsianus* G. R. Gray, 1858, Aru Islands.

Race *stresemanni* possibly better merged with *vagans*, as birds on Batanta I appear intermediate between the two. Proposed race *brunneus* (from Siwi, in Arfak Mts) is synonymized with nominate. Three subspecies currently recognized.

Subspecies and Distribution.

M. m. vagans (Bernstein, 1864) – Waigeo and Batanta, in West Papuan Is.

M. m. mearnsianus (G. R. Gray, 1858) – West Papuan Is (Salawati and Misool), NW, S & E New Guinea (Vogelkop E to Weyland Mts and to Astrolabe Bay, Huon Peninsula and Milne Bay); Aru Is. *M. m. stresemanni* E. J. O. Hartert, 1930 – Yapen I and N New Guinea (Geelvink Bay E to Astrolabe Bay).



Descriptive notes. 20–23 cm; male 43–49.5 g and female 36.3–47.5 g (nominate), male 47–57 g and female 36–48 g (*stresemanni*). Drab honeyeater with very long and rather heavy bill strongly decurved over distal third. Nominate race has head and neck grey-brown, fine indistinct blackish streaking on top of head, faint and diffusely darker submoustachial stripe extending onto anterior ear-coverts (sometimes impression of pale orbital ring); chin and throat slightly paler, greyish-brown with yellow-olive tinge and diffuse paler mottling; upperparts dark brown to dark olive-brown, slightly browner (lacking olive) on wing-coverts,

remiges and uppertail; fine and faint buff-olive outer edges on remiges (most obvious on secondaries); breast, belly and anterior flanks as chin and throat, light greyish-brown with yellow-olive tinge (sometimes diffuse paler mottling on breast), merging to dull olive-brown rear flanks, vent and undertail-coverts; underwing brownish-grey, dirty orange-buff to buff lining and bases of remiges; undertail dark brownish-grey; iris bright orange to bright orange-red; bill black-brown to black, sometimes paler cutting edge on lower mandible; legs slaty blue-grey to black, soles yellow. Sexes alike in plumage, male larger than female; female possibly slightly paler than males, but confirmation needed. Juvenile is very different from adult, with much shorter, almost straight bill, which is also browner, conspicuous bright yellow eyering and yellowish gape, plumage dull olive-brown above, top and side of head diffusely barred or mottled darker, browner tail and wing with olive-brown outer edges of feathers (concealed rich buff inner edges of remiges), brown-streaked yellowish-buff below (streaking heaviest on breast and belly), rich buff underwing-coverts, legs horn to dark grey, iris probably dark (as immature). Race *stresemanni* has greyer, less olive, underbody and darker and browner upperparts than nominate; *vagans* differs from previous in cleaner grey and slightly more heavily streaked chin and throat, darker underbody, thicker bill (bill thicker also than that of nominate), possibly also has small area of bare skin around eye (confirmation

needed). Voice. Usual call a repeated whistled trisyllabic “whit whit whit” or “whit tt whit” (similar to a call of *Xanthotis flaviventris*); other calls include explosive “tick” in flight, and downslurred nasal mewing “chur-r-r” or metallic and plaintive “nyahn” or “nnr!”; single “ceez” as flight contact call, only infrequently heard.

Habitat. Dense vegetation in primary rainforest (but not monsoon forest), forest edge, tall riparian forest (around L Kutubu) and secondary growth, and other disturbed habitats, including 25-year-old and thinned plantation of *Araucaria cunninghamii*; occasionally in towns and gardens (including records of nesting). In Eastern Highlands, mainly in forest and secondary growth. Lowlands to lower mountains, from sea-level mainly to 1500 m, rarely to 2120 m; more common at lower altitudes. At Karimui, females predominate at lower altitudes, males at higher elevations.

Food and Feeding. Small arthropods (insects and spiders), small lizards (Scincidae), nectar, occasionally fruit (usually small, including raspberries); nestlings seen to be fed with small lizards. Forages at all heights, mainly in lower and middle storeys (to c. 10–15 m above ground), less often in canopy (to 35 m), in outer foliage at forest edge, or in secondary growth; males may spend less time in lower levels of vegetation. Of 65 observations in lowland rainforest at Brown R, 86% in understorey to 8 m above ground (49% 0–1 m above ground, 26% 1–2 m), rest in subcanopy at 8–25 m (8%), lower canopy at 25–30 m (5%) and upper canopy at 30–35 m (1%). Seen to forage on ground on flowers of the root parasite *Mitrasacme yamamotoi*. Gleans from foliage, bark, vines and rotten wood, and probes crevices in bark and curled leaves; often works its way up tree trunks in manner of Australasian treecreeper (Climacteridae), gleaning and probing close to trunk and branches, and seen to slide bill beneath bark when searching for food; sometimes hangs upside-down to forage on foliage. At Brown R (88 observations of 21 birds), all foraging by gleaning, 14% on trunks, 11% on branches, 19% on foliage, 5% on fruit, 32% on nectar, and 19% on rotten wood. As well as eating small fruits, probes and extracts pulp from holes made in larger fruits by parrots (Psittacidae); at Crater Mt seen to probe pulp of opened figs of *Ficus dammaropsis*. Infrequent visitor to canopy flowers, though forages at flowers on trunks more often. At Crater Mt, foraged at flowers of *Schefflera*, *Fagraea*, *Sloanea*, *Mucuna*, *Decasina hohlungii*, *Hibiscus*, *Musa* and *Syzygium*; elsewhere, seen to take nectar from large pink or red flowers at middle to canopy levels, from small canopy flowers of *Rhus taiensis*, and flowers of *Homesteadia* ginger close to ground. When feeding at flowers, base of bill and forehead can become dusted or caked with pollen. Shy, inconspicuous; rather slow-moving or leisurely when foraging. Usually seen singly, less often in twos (at least sometimes pairs); pairs thought to be territorial, with much fighting noticed. At Baiyer R, occasionally foraged with other honeyeaters.

Breeding. Season appears bimodal, from middle dry season to early wet season and, again, towards end of wet season (no breeding at height of wet season); at Baiyer River Sanctuary, one pair raised two broods between Oct and mid-Jan (first clutch laid 13th Oct, second 17th Dec), and had another clutch when observations recommenced in following early May; breeding recorded in S New Guinea in Jun–Dec and in Apr; adult feeding juvenile in mid-Sept at Crater Mt. Nest a fairly large, deep and thick-walled cup, exterior mainly of green moss and rootlets, at least sometimes with dead leaves and debris at base, interior of thin vines, vine tendrils and possibly rootlets, often lined with pinnales from large ferns, external diameter 19 cm, depth 11–14 cm; internal diameter 7–10 cm, depth 5.5–7 cm; one nest supported 1.2 m above ground between trunk and multiple leaf bases of a *Pandanus*, another 2 m up in dead foliage in sapling at forest edge, and at Baiyer River Sanctuary nest c. 2.5 m up in roofing material on underside of thatched roof in well-used building; site may be reused for subsequent nestings. Clutch 2 eggs; at two Baiyer R nests, incubation period 16 days and 18–19 days and nestling period 15 days and 14–15 days (nestling period at third nest 17 days). Longevity in ringing studies up to at least 7 years 3 months.

Movements. Resident.

Status and Conservation. Not globally threatened. Generally common, although lack of conspicuousness gives impression of rarity; considered abundant at Crater Mountain Wildlife Management Area; common to uncommon at Baiyer R, and fairly common at Karimui. Estimated density in lowland rainforest at Brown R 1.8 birds/ha.

Bibliography. Bailey (1992), Beehler (1978a, 1980b, 1994), Beehler *et al.* (1986), Bell (1969, 1970c, 1982a, 1982b, 1982c, 1982e, 1984a, 1984b), Bishop (1977), Brown & Hopkins (1996), Clapp (1979a, 1980a), Coates (1990), Coates & Peckover (2001), Diamond (1972a), Finch (1980b, 1983), Fletcher (2000b), Gilliard & LeCroy (1961, 1966, 1967a, 1970), Greenway (1966), Gregory (1995b), Gyldenstolpe (1955a), Hartert (1930), Lamothe (1979), Mack & Wright (1996), Mackay (1981), Murray (1988b), Rand (1942a), Rand & Gilliard (1967), Richards & Suryadi (2002), Ripley (1964), Schodde & Hitchcock (1968), Symes & Marsden (2005), Wahlberg (1993).

Genus *STRESEMANNIA* Meise, 1950

76. Bougainville Honeyeater

Stresemannia bougainvillei

French: Méliophage de Bougainville

Spanish: Mielero de Bougainville

German: Bougainvillehonigfresser

Taxonomy. *Lichmera bougainvillei* Mayr, 1932, Bougainville Island.

Relationships uncertain. Has in the past been placed variously in *Lichmera*, *Meliphaga*, *Melilestes* and the now defunct genus *Vosea*. Retained in current monotypic genus pending resolution of its relationships. Monotypic.

Distribution. Bougainville I, in N Solomons.



Descriptive notes. 17–18 cm. Male has head, neck and upperbody drab olive-grey, merging to slightly paler grey on chin and throat, and with fine and diffuse dark olive-brown mottling on forehead and crown; upperwing and uppertail dark olive-brown to dark olive-grey, faintly paler olive outer edges of rectrices and remiges (greenish wash or panel on folded wing); underbody pale olive-grey, with buff tinge on flanks, vent and undertail-coverts; underwing buffy grey, dark grey-brown trailing edge and tip; iris brown to reddish-brown; bill black to dark slate-grey; legs bluish-grey to leaden grey. Female is slightly smaller than

male; suggested that plumage perhaps greyer and less strongly toned olive ventrally, and top of head tending to appear more mottled, but confirmation needed. Juvenile is greyer than adult, lack-

ing brown tones, and with diffuse greyish mottling on underbody, bill paler, dark grey, and gape prominent and yellow. **VOICE.** Vocalizations include short series of 4–5 mellow whistled notes, the first rising and falling and subsequent notes alternately rising and falling (likened to calls of *Ptiloprora guisei*); dry and raspy “chht chht”. **Habitat.** Primary montane forest, including cloudforest; described as numerous in mixed bamboo and tree-fern. From c. 700 m to above 1950 m. **Food and Feeding.** Insects and fruit; probably also nectar, but not seen to congregate in flowering trees. Forages in canopy, by gleaning from inner canopy of trees; also close to ground in forest. Quiet, shy, but reasonably active. Usually in twos (probably pairs). Two individuals once seen to fly up at each other, before returning to same perches and then disappearing into vegetation, possibly a territorial interaction. **Breeding.** One nest described: a substantial cup, interior of neatly woven rootlets and other vegetable fibres, exterior covered with green moss and small ferns (appearing fresh and green), external depth c. 13 cm, internal diameter 6 cm and depth 8–9.5 cm, built in small leafy tree 3 m tall; contained 1 egg. No further relevant information, although egg described. **Movements.** Resident. **Status and Conservation.** Not globally threatened. Restricted-range species: present in Solomon Group EBA. Poorly known. Described as reasonably common or generally scarce. **Bibliography.** Coates (1990), Diamond (1975a), Doughty *et al.* (1999), Finch (1985), Hadden (1981, 2004), Mayr (1932, 1945b, 1955, 1971), Mayr & Diamond (2001), Stattersfield *et al.* (1998).

Genus *GLYCIFOHIA* Mathews, 1929

77. Barred Honeyeater

Glycifohia undulata

French: Méliphage barré **German:** Sperberhonigfresser **Spanish:** Mielero Barrado
Other common names: New Caledonian Honeyeater

Taxonomy. *Certhia undulata* Sparrman, 1787, no locality = New Caledonia. Genus sometimes subsumed in *Phylidonyris* or in *Guadalcanaria*. Monotypic. **Distribution.** New Caledonia.



Descriptive notes. 16–20 cm; one female 16 g. Distinctively marked honeyeater with long, slender and fairly strongly decurved bill. Top of head, hindneck and side of neck are dark olive-brown, fine whitish scalloping at side of crown grading to bolder white scalloping on neck; lores, patch around eye and narrow stripe above and behind eye dusky black, contrasting with finely black-speckled silvery grey-white ear-coverts; broad off-white malar stripe extends to side of neck, becoming finely scalloped black rather variably, sometimes only posteriorly, and meeting (or almost meeting) largely clear whitish band (diffusely scaled slightly darker) curving across lower throat; isolated brownish-black chin and upper throat, broken up towards lower throat by sparse whitish barring; upperparts brownish-grey to dark brown, diffusely streaked and scaled paler olive-grey or brown on mantle, back and scapulars, upperwing-coverts with fine pale margins (reduced or lost with wear), remiges with yellow-olive edges (conspicuous on folded wing), uppertail dark brown; underbody off-white to very pale grey with broken blackish-brown barring, this bold on anterior flanks and breast (where merging with barring of side of neck), paler and less heavy on lower underbody, and faint or sometimes absent in centre of belly and vent; undertail pale brownish-grey, underwing pale buff-white with silvery brownish-grey trailing edge and tip; with wear plumage becomes browner and pattern duller; iris dark brown to red-brown; bill black; legs blue-grey to dark grey. Sexes alike in plumage, male larger than female. Juvenile is duller and slightly paler than adult, with only faint barring below. **VOICE.** Flute-like whistle, “phew”, sometimes of 2–3 or more syllables, often preceded by long descending trill.

Habitat. Primary rainforest, tall secondary growth and maquis (scrubland) vegetation; also in gardens and niaouli (*Melaleuca leucadendra*) savanna woodland when foodplants flowering. More common in hill and montane vegetation.

Food and Feeding. Nectar (including of *Geissois* and *Grevillea*), small insects, some fruit. Acrobatic, hanging and clambering about flowers and branches. Seen singly or in small parties, congregating in flowering trees. Pugnacious, fighting with conspecifics or other species.

Breeding. Breeds Aug–Jan. Nest cup-shaped, made of dead grasses and ferns, with soft woolly lining (probably of sedge inflorescences), or lined with feathers, some covered externally with fern or moss, external diameter 9 cm, depth 6 cm, internal diameter 6.5 cm, depth 3.5 cm; well concealed 0.3–1.6 m (mean 1.2 m) above ground, one within small *Xanthostemon auranticum* shrub, attached to grasses and a branch of the shrub. Clutch 1 egg; both parents incubate eggs and rear young; no information on duration of incubation and nesting periods.

Movements. Nothing known; probably sedentary, with some local movements. **Status and Conservation.** Not globally threatened. Restricted-range species: present in New Caledonia EBA. Described as not uncommon or as common in all humid habitats in New Caledonia. First nest not described until 1976. **Bibliography.** Anon. (2007q), Doughty *et al.* (1999), Hannecart & Létocart (1980), Layard & Layard (1882), Mayr (1945b), Ross (1988), Stattersfield *et al.* (1998), Stokes (1978, 1980).

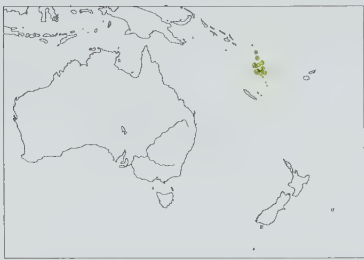
78. Vanuatu Honeyeater

Glycifohia notabilis

French: Méliphage des Nouvelles-Hébrides **Spanish:** Mielero Ventriblanco
German: Weißbauch-Honigfresser
Other common names: Vanuatu Mountain/New Hebrides/White-bellied/White-breasted Honeyeater

Taxonomy. *Glyciphila notabilis* Sharpe, 1899, Vanua Lava, Banks Islands, Vanuatu. Genus sometimes subsumed in *Phylidonyris* or in *Guadalcanaria*. Races weakly differentiated. Two subspecies recognized.

Subspecies and Distribution. *G. n. notabilis* (Sharpe, 1899) – Banks Is (Uréparapara and Vanua Lava), Espiritu Santo and Ambae, in N & C Vanuatu. *G. n. supercilialis* (Mayr, 1932) – C Vanuatu (Maewo, Pentecost, Malakula, Ambrym, Paama and Epi).



Descriptive notes. 18–21.5 cm; one male 29.7 g, two females 23.3 g, 26.4 g. Nominate race has top and side of head black, fine white speckling on forehead and varying onto crown, grading to bolder white barring towards side of crown and merging into prominent black-speckled white supercilium that extends well behind eye to upper side of neck; also flecked and speckled with white on malar area, ear-coverts and brownish side of neck, leaving weakly defined blackish eyestripe (pale flecking on rear ear-coverts sometimes forms silvery patch); hindneck and upperbody rich brown to rufous-brown, tail brown to olive-brown; upperwing brown to olive-brown, coverts with fine rufous-brown fringes, remiges with fine rich brown to rufous-brown outer edges (folded wing appears largely rich rufous-brown); chin, throat and underbody off-white, with sparse, fine and long brownish or dusky streaking on breast, belly and flanks, pale brownish mottling or wash on vent and undertail-coverts; undertail grey-brown, underwing pale rufous-brown with greyish-brown trailing edge and tip; iris dark brown; bill black; legs blue-grey. Sexes alike in plumage, female smaller than male. Juvenile is duller than adult, supercilium creamy white, upperbody darker with fine pale streaking, margins of wing-coverts broader and paler, buff-cinnamon or olive-cinnamon, pale yellow wash on belly, sometimes also on chin, throat and ear-coverts, lacks distinct dark streaking below but some diffuse dusky streaks on lower throat and upper breast. Race *superciliaris* differs from nominate most obviously in more marked white supercilium, much whiter and more prominent malar stripe and lower ear-coverts (less broken up by blackish speckling), better-defined black eyestripe, less speckling and barring on crown, also slightly browner upperbody (subtle). **VOICE.** Highly vocal, with range of ringing calls. Main call one of the most characteristic sounds of highlands and one of first calls of dawn chorus: a loud, powerful, ringing flute-like “tyau” or “tyjau”. Other calls include loud, prolonged “toowyt”; harsh “tchea” in alarm; moderately loud somewhat plaintive “teewee”. Song, occasionally from exposed perch, a rich and varied series of pleasant flute-like notes and whistles, e.g. “teewee-twytwytee” or “teewee-teeeeee”. Possibly mimics other birds.

Habitat. Hill and montane primary forest and tall secondary growth, occasionally lowland forests and mangroves; usually in extensive tracts of forest. Sea-level to at least 1250 m, primarily in highlands above 450–850 m. **Food and Feeding.** Nectar, pollen, insects, spiders, probably fruit. Forages from canopy down to understorey; searches among foliage and flowers, gleaning and probing for arthropods and nectar; also makes short sallies for flying insects. Rapidly probes flower before moving to next, then flying to another plant. Conspicuous, highly active and noisy; seen singly, in twos (probably pairs) and in small parties of up to 15 individuals. **Breeding.** Very poorly known. Said to breed Sept–Jan, with unspecified evidence of breeding Oct–Nov. Nest cup-shaped; clutch 2 pale eggs. No other information. **Movements.** Resident, probably with some local movements. Described as moving from high altitude to sea-level on Espiritu Santo, but no further details. **Status and Conservation.** Not globally threatened. Restricted-range species: present in Vanuatu and Temotu EBA. Widespread and common. **Bibliography.** Bregulla (1992), Diamond & Marshall (1976, 1977b), Doughty *et al.* (1999), Kratter *et al.* (2006), Marshall & Harrison (1941), Mayr (1932), Medway & Marshall (1975), Stattersfield *et al.* (1998).

Genus *MYZA* A. B. Meyer & Wiglesworth, 1895

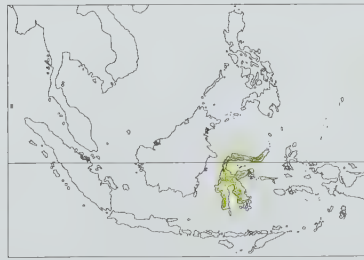
79. Lesser Streaked Honeyeater

Myza celebensis

French: Méliphage des Célèbes **German:** Celebeshonigfresser **Spanish:** Mielero Chico de Célebes
Other common names: Celebes/Dark-eared/Lesser Sulawesi Myza, Brown(!)/Celebes/Dark-eared/Lesser Sulawesi Honeyeater, Brown Honeysucker

Taxonomy. *Arachnothera* ? *celebensis* A. B. Meyer and Wiglesworth, 1894, Bone Mountains, Gorontalo, north Sulawesi. Relationships of genus uncertain, suggested as possibly closest to *Ptiloprora* and *Melidectes*; ear-lier, was placed close to *Lichmera*. Proposed race *parvirostris* (from Mt Tanke, in Mengkoka Mts, SE Sulawesi) subsumed within nominate. Two subspecies recognized.

Subspecies and Distribution. *M. c. celebensis* (A. B. Meyer & Wiglesworth, 1894) – N, C & SE Sulawesi. *M. c. meridionalis* (A. B. Meyer & Wiglesworth, 1896) – S Sulawesi.



Descriptive notes. 17 cm; three males 19.5–22.5 g. Nominate race has top of head and neck grey to tawny-olive, finely streaked dark olive-brown, merging to largely dark olive-brown supercilium; dark olive-brown line beneath eye curving up behind eye to meet rear supercilium, and enclosing bold whitish orbital ring, which is narrow or broken at front; lores pale grey, finely speckled darker (brown); malar area, ear-coverts and side of neck dark olive-brown, finely speckled or mottled light grey-brown, merging to yellowish-grey on chin and throat, which evenly streaked or mottled dark olive-brown; upperbody brownish-grey, streaked and mottled dark olive-brown to blackish; upperwing dark olive-brown, pale olive to yellow-olive outer edges of remiges (diffusely olive panel on outer edge of folded wing); breast yellowish-grey, evenly streaked or mottled dark olive-brown, merging to dark olive-brown on rest of underparts, scaled and streaked paler yellowish-grey except on centre of belly; undertail dark

brown to dark olive-brown, underwing dark olive-brown with pale buff lining; iris dark brown; bill glossy black, sometimes tiny pale brown tip; legs dark brown to grey-brown or green-grey, soles yellow to yellow-orange. Sexes alike in plumage, male much larger than female. Juvenile undescribed. Race *meridionalis* is slightly smaller than nominate, also slightly darker and greyer above, and darker with finer and weaker streaking below. **VOICE.** Main call a sharp, harsh "treet" or harsh "kik". Song a slurred series of twittering squeaks or harsh twittering.

Habitat. Occupies montane rainforest, mainly in primary forest, including moss forest. More often on lower slopes than on ridges; from c. 900 m up to 2500 m. Replaced at higher altitudes by *M. sarasinorum*.

Food and Feeding. No details of diet. Forages mainly in lower stages, less often in canopy, but feeds in crowns of flowering trees, including in flowering mistletoes (of genus *Loranthus*); forages at flowers, and by gleaning from branches, vines and other hard surfaces. Singly or in twos (probably pairs); sometimes in or at edges of mixed-species flocks of insectivores.

Breeding. No information.

Movements. No information; probably sedentary.

Status and Conservation. Not globally threatened. Restricted-range species; present in Sulawesi EBA. Widespread and common. Continuing threats to habitat, through logging and clearing, potentially of concern.

Bibliography. Coates & Bishop (1997), Riley, J. (2000), Riley, J. & Mole (2001), Riley, J.I. (1924), Rozendaal & Dekker (1989), Salomonsen (1966a), Stattersfield *et al.* (1998), Stresemann & Heinrich (1940b), Watling (1983), White & Bruce (1986).

80. Greater Streaked Honeyeater

Myza sarasinorum

French: Méléphage à points **German:** Sarasinhonigfresser **Spanish:** Mielero Grande de Célebes
Other common names: Greater Sulawesi/White-eared/Meyer's/Mengkoka/Spot-headed Honeyeater, White-eared/Sarasin's Myza, Spot-headed Honeysucker

Taxonomy. *Myza sarasinorum* A. B. Meyer & Wiglesworth, 1895, Matinan Mountains, north Sulawesi.

Relationships of genus uncertain, suggested as possibly closest to *Ptiloprora* and *Melidectes*; earlier, was placed close to *Lichmera*. Three subspecies recognized.

Subspecies and Distribution.

M. s. sarasinorum A. B. Meyer & Wiglesworth, 1895 – N Sulawesi.

M. s. chionogenys Stresemann, 1931 – NC & SC Sulawesi.

M. s. pholidota Stresemann, 1932 – SE Sulawesi.

Descriptive notes. 20 cm. Nominative race has top and side of head and neck blackish with fine slate-grey streaking, fine blackish supercilium and lores, and large bare violet ear-patch extending from beneath eye and expanding behind eye onto upper side of neck; chin and throat blackish, diffusely streaked or mottled greyish; upperbody dark brownish-black, heavily streaked grey, upperside brownish-black with reddish-brown feather edges; underbody dark reddish-brown, fine blackish streaking on breast and belly; iris brown; bill and legs black. Sexes alike in plumage, male much larger than female. Juvenile undescribed.

Race *chionogenys* differs from nominate in having whitish ear-patch, olive-green streaking on upperbody and bolder black streaking below; *pholidota* is more like nominate, but differs in more brownish-grey underbody with bolder blackish streaking. **VOICE.** Main call a characteristic sound of high montane rainforest, a chiming monosyllabic "zunk" or, less often, a double "zunk-zunk", with second note lower-pitched. Song a series of high-pitched squeaks (like those of *M. celebensis*); also series of short, sharp "kep" notes, repeated for long periods at rate of 2–4 per second (hoarse "kik...kik" probably the same); call of 3–5 high-pitched wheezy notes and lasting less than 1 second, given at long and irregular intervals during foraging; and occasionally a sharp "zip".

Habitat. Upper montane rainforest and elfin moss forest, on ridgetops, from 1700 m to 2800 m, mainly above 2000 m. Replaced at lower altitudes by *M. celebensis*.

Food and Feeding. Diet includes nectar; doubtless also insects. Usually forages above middle storey, in upper stages and canopy, occasionally descends to lower levels to exploit flowering shrubs: seen to forage in mistletoes (of genus *Loranthus*) in canopy. Active and aggressive, with somewhat jerky movements; rapidly hops or flies from one inflorescence to another and disappears into foliage. In Lore Lindu National Park, occasionally recorded in mixed-species foraging flocks.

Breeding. Female with egg in oviduct in early Jul. No other information.

Movements. No information; probably sedentary.

Status and Conservation. Not globally threatened. Restricted-range species; present in Sulawesi EBA. Common or abundant, and widespread on much of Sulawesi (not in S). Threats to forest habitats potentially of concern.

Bibliography. van den Berg & Bosman (1986), Coates & Bishop (1997), Ekstrom *et al.* (1998), Stattersfield *et al.* (1998), Stresemann & Heinrich (1940b), Watling (1983), White & Bruce (1986).

Genus MELIPOTES P. L. Sclater, 1874

81. Spangled Honeyeater

Melipotes ater

French: Méléphage pailleté **German:** Huonhonigfresser **Spanish:** Mielero Moteado
Other common names: Black/Huon Honeyeater, Huon Melipotes

Taxonomy. *Melipotes ater* Rothschild & E. J. O. Hartert, 1911, Rawlinson Mountains, Huon Peninsula, north-east New Guinea.

Genus closely related to *Macgregoria*. Forms a superspecies with *M. gymnops*, *M. fumigatus* and *M. carolae*. Monotypic.

Distribution. Mountains of Huon Peninsula, in NE New Guinea.



chevron-shaped or crescent-shaped to small and triangular or rounded (variation possibly associated with wear); iris dark brown to red-brown; bill black or grey-black; legs blue-grey. Sexes alike in plumage, male probably larger than female. Juvenile undescribed. **VOICE.** Typically quiet, but noisier than congeners. Calls include repeated deep "chut chut".

Habitat. Occupies montane forests and also tall secondary growth; recorded from c. 1200 m up to 3300 m.

Food and Feeding. Poorly known. Predominantly frugivorous. Mainly in canopy or subcanopy, foraging for fruit. Conspicuous. Usually singly or in twos (probably pairs); more sociable or less aggressive than congeners.

Breeding. No information.

Movements. No information; almost certainly sedentary.

Status and Conservation. Not globally threatened. Restricted-range species; present in Adelbert and Huon Ranges EBA. Poorly known; considered generally common. Described as common above Satop in Nov 1992.

Bibliography. Beehler (1978a), Beehler, Pratt & Zimmerman (1986), Beehler, Prawiradilaga *et al.* (2007), Coates (1990), Coates & Peckover (2001), Eastwood & Gregory (1995), Richards & Rowland (1995).

82. Arfak Honeyeater

Melipotes gymnops

French: Méléphage à ventre tacheté

German: Fleckenbauch-Honigfresser

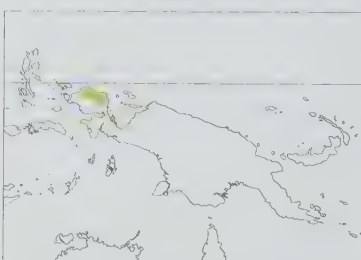
Spanish: Mielero de las Arfak

Other common names: Arfak/Western Melipotes, Bare-eyed/Western Smoky/Large/Spot-bellied Honeyeater

Taxonomy. *Melipotes gymnops* P. L. Sclater, 1874, Hatam, Arfak Mountains, Vogelkop, north-west New Guinea.

Genus closely related to *Macgregoria*. Forms a superspecies with *M. ater*, *M. fumigatus* and *M. carolae*. Status and affinities of populations of this genus in Fakfak Mts (Onin Peninsula) not known: three sightings in 1981 of honeyeaters that looked more like *M. fumigatus* (closest known populations in Kumawa Mts, to SE) than like present species (range to N), and one seen in 1992 had ventral plumage more like that of present species but facial patch somewhat like that of *M. ater* (thus unlike those seen in 1981); further research required. Monotypic.

Distribution. Tamrau Mts, Arfak Mts and Wandammen Mts, in NW New Guinea.



Descriptive notes. 21.5–22 cm; male 58–61.5 g, female 48–58 g. Head, neck, breast, upper belly and flanks are sooty black to grey-black, with large circumorbital patch of bright yellow skin (facial patch flushes bright red when bird agitated, and may be partly red and yellow at times), and distinctive short cream to buff-white streaks on side of upper breast, lower breast, belly and flanks, merging into pale ochre on centre of lower belly, vent and undertail-coverts; blackish colour of head and neck merges into dark grey-brown to brownish-grey on upperparts; tertiaries and upperside-coverts probably have paler tips or fringes, at least when fresh; uppertail grey-black with fine paler outer edges, undertail light brownish-grey; iris dark brown to red-brown; bill black, grey-black or blackish-brown; legs grey-black to brownish-tinged or dark blue-grey. Sexes alike in plumage, male on average slightly larger than female. Juvenile undescribed. **VOICE.** Call "wee wee wee...", while perched or in flight.

Habitat. Montane forest, forest edge and native agricultural gardens; 1200–2700 m, but said also to reach 3680 m.

Food and Feeding. Predominantly frugivorous, but insects also taken; seeds found in one stomach. Forages at all levels, mostly in canopy; also in shrubs and trees in agricultural gardens. Active, noisy and conspicuous. Usually solitary; also in small flocks at food sources.

Breeding. No information.

Movements. No information; almost certainly sedentary.

Status and Conservation. Not globally threatened. Restricted-range species; present in West Papuan Highlands EBA. Poorly known; considered generally common or abundant.

Bibliography. Beehler, Pratt & Zimmerman (1986), Beehler, Prawiradilaga *et al.* (2007), Coates (1990), Coates & Peckover (2001), Diamond (1985), Gibbs (1994), Gyldenstolpe (1955b), Hartert (1930), Hoogerwerf (1971), Hornbuckle (2001), Rand (1936b).

83. Common Smoky Honeyeater

Melipotes fumigatus

French: Méléphage enfumé **German:** Aschbrust-Honigfresser **Spanish:** Mielero Ahumado

Other common names: Common/Smoky Honeyeater, Smoky Bare-eyed/Yellow-faced Honeyeater, Eastern Smoky Honeyeater, Common/Eastern Melipote(s)

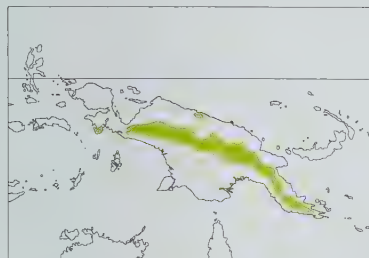
Taxonomy. *Melipotes fumigatus* A. B. Meyer, 1886, Hufeisengebirge (south-east Owen Stanley Range), south-east New Guinea.

Genus closely related to *Macgregoria*. Forms a superspecies with *M. ater*, *M. gymnops* and *M. carolae*. Status and affinities of populations of this genus in Fakfak Mts (Onin Peninsula) not known: three sightings in 1981 of honeyeaters that looked more like present species (closest known

populations in Kumawa Mts, to SE) than like *M. gymnops* (range to N), and one seen in 1992 had ventral plumage more like that of *M. gymnops* but facial patch somewhat like that of *M. ater* (thus unlike those seen in 1981); further research required. Also, earlier published statements that present species abundant in Foja Mts above 1200 m presumably refer to newly described *M. carolae*. Race *goliathi* intergrades with nominate in Herzog Mts. Three subspecies recognized.

Subspecies and Distribution.

M. f. kumawa Diamond, 1985 – Kumawa Mts, in NW New Guinea (S Bomberai Peninsula).
M. f. goliathi Rothschild & E. J. O. Hartert, 1911 – Central Ranges from Weyland Mts and Nassau Mts E to Bismarck–Kubor Mts (including Mt Bosavi) and W Herzog Mts, also Cyclops Mts and C North Coastal Range (Bewani Mts).
M. f. fumigatus A. B. Meyer, 1886 – E Herzog Mts and mountains of SE New Guinea.



wing-coverts and olive-brown to grey-olive edges of feathers of alula and remiges; underbody dark grey-brown to dark olive-brown (contrasting with paler throat), with very faint and fine rufous-brown shaft streaks across upper breast, diffuse pale grey to light grey-brown feather edges forming pale mottling, and light grey-brown thighs; undertail dark grey-brown; underwing pink-buff to buff on coverts, with pale grey-brown bases of remiges and olive-brown trailing edge and tip; iris dark brown to red-brown; bill black, rarely cream tip of upper mandible; legs slate-grey to dark blue-grey or brownish-grey. Sexes alike in plumage, male slightly larger than female. Juvenile is said to be like adult but browner (not so black) above, duller and more uniformly grey below, palest on chin and throat but largely lacking paler mottling, and legs greenish-brown to dusky olive-green. Race *goliathi* differs from nominate in darker, more blue-grey, underparts and more blackish upperparts, also much larger size (increasing clinally with altitude); *kumawa* differs from others in blackish chin and throat contrasting little with rest of head, bold black-and-white crescent-shaped scaling (not diffuse mottling) on lower breast and belly, clear white (not diffusely grey) tips on upperwing-coverts, larger and whiter pale area on underwing, also appears larger than nominate and similar in size to previous (but few data). VOICE. Generally silent; occasionally a thin “sit sit sit” or weak sibilant “swit swit swit...” repeated monotonously; said also to give a series of 6 rather slow and soft, high-pitched notes, upslurred at end; “see” sometimes given in flight; and chipping notes. One adult, near nest with young, gave plaintive squeaking “wheet-wheet-wheet...” unceasingly, possibly as distraction or alarm in response to presence of observer.

Habitat. Mid-montane and montane primary forest, including high-altitude stunted moss forest, forest edge, secondary growth (particularly dense secondary growth in natural clearings), and disturbed and modified habitats, including gardens. From 750 m (Ok Tedi area) to 4200 m (Snow Mts), but rarely below 1100 m and mainly 1400–3400 m (timber-line over most of species’ range); to c. 2800 m in SE. Across altitudinal gradient on Mt Karimui, only immatures at 1100–1370 m and mainly females at 2160–2490 m, with breeding males not found below 1830 m.

Food and Feeding. Predominantly frugivorous, but insects and some floral parts also taken; not known to eat nectar, and one observed while pecking at flowers was found to have only insects (attracted to flowers) in stomach. Takes mainly small fruits 2–8 mm in diameter (including of *Sericolea pullei*), which swallowed whole; also eats pulp of larger fruits by pecking. Mainly in canopy to middle stages and shrubs at edge of forest, but occurs at all levels. Various rather slow-moving and highly active. Forages mainly by gleaning, occasionally hanging with head downwards; occasionally sally-strikes at insects. Conspicuous, often perches in open. Usually seen singly, less often in twos (probably pairs), rarely in small parties of 5–6 individuals; at least once seen in mixed-species flock, and said often to be seen with *Melidectes belfordi*. Often aggressive, sometimes chases conspecifics, and drives other species, including Superb Bird-of-paradise (*Lophorina superba*), from feeding sites; conversely, seen to be chased from a tree by Ribbon-tailed Astropia (*Astrapia mayeri*).

Breeding. Season at least late dry season, with eggs late Sept and early Oct, and nestlings and fledglings late Aug to late Oct, and unseen nestling heard in Dec; birds in breeding condition Aug–Nov. Nest a large and rather bulky, loose pensile cup of long, thin mosses, a few leaves and other plant material, sparingly bound together and to nesting plant with long fungal fibres, one with large pieces of rotten *Pandanus* leaves attached to exterior and few green fern fronds on inside, lined with coarse dead leaves and ferns or rootlets, one nest had external diameter 14 cm, depth 14 cm, internal diameter 7 cm, depth 6 cm; usually suspended by rim from horizontal fork 4.5–12 m above ground near end of branch of small tree. No information on clutch size and on incubation and nestling periods; at one nest, young fed with fruit by one adult while other called in distraction or alarm (apparently at presence of observer).

Movements. Almost certainly largely sedentary or resident, possibly with some local movements, e.g. a few at 1200 m at Crater Mt thought to be transients from higher altitudes, and sporadic records down to 750 m in Ok Tedi area possibly related to shortages of food at higher altitudes.

Status and Conservation. Not globally threatened. Considered generally common to abundant, and ubiquitous in Central Ranges.

Bibliography. Beehler (1978a), Beehler, Pratt & Zimmerman (1986), Beehler, Prawiradilaga *et al.* (2007), Bell (1969), Coates (1990), Coates & Peckover (2001), Diamond (1972a, 1985), Filewood (1969), Frith & Frith (1992), Gilliard & LeCroy (1961, 1968), Gregory (1995b), Gyldenstolpe (1955a), Hartert (1930), Heron (1977a), Hopkins (1992), Mack & Wright (1996), Mayr & Gilliard (1954), Mayr & Rand (1937), Melville (1979), Murray (1988b), Rand (1942b), Ripley (1964), Schönwetter & Meise (1981), Sims (1956), Tolhurst (1991), Watson *et al.* (1962), Weston (1977).

84. Wattled Smoky Honeyeater

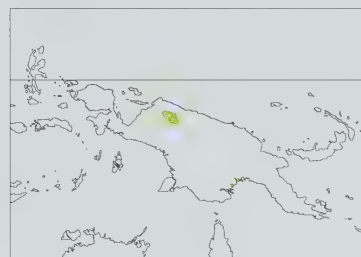
Melipotes carolae

French: Méléphage de Carol **German:** Carolahonigfresser **Spanish:** Mielero de Carlota
Other common names: Farfak Honeyeater

Taxonomy. *Melipotes carolae* Beehler *et al.*, 2007, Bog Camp (2°34′S, 138°34′E), 1650 m, Sarmi District, Papua Province, north-west New Guinea.

Genus closely related to *Macgregoria*; the fleshy wattle of this species provides a morphological link between the two. Forms a superspecies with *M. ater*, *M. gymnops* and *M. fumigatus*. Monotypic.

Distribution. Foja Mts, in NW New Guinea.



upperparts, largely black-brown, with (when fresh) very fine paler greyish outer edges and tips on median and greater coverts and tertials and pale greyish or olive-greyish outer edges on rest of remiges (outer edges of remiges fade with wear); uppertail grey-black with fine paler outer edges; chin and upper throat dark grey, slightly paler than rest of underbody, which mostly dark blue-grey, with light grey scaling or mottling across breast and upper belly and much broader pale fringing on lower belly, vent and flanks (which appear light grey with some darker blue-grey mottling); undertail-coverts light brown-grey; undertail light brownish-grey; iris dark brown to red-brown; bill and legs black. Sexes alike in plumage, male larger than female. Juvenile undescribed. VOICE. No information; not heard to vocalize during 15 observations from late Nov to early Dec.

Habitat. Interior and edge of closed, humid tropical submontane forest. Type locality a sphagnum bog c. 500 m in diameter surrounded by mossy forest of moderate stature (20–25 m) dominated by gymnosperms (e.g. *Dacrydium*, *Dacrycarpus*) and montane angiosperms (e.g. *Nothofagus*, *Lithocarpus*). Known only from above 1150 m.

Food and Feeding. Predominantly frugivorous: seen repeatedly to forage in middle and upper levels of vegetation, especially at plants producing small fruits. Not wary.

Breeding. No evidence of reproductive behaviour during late Nov and early Dec, when two individuals had non-enlarged gonads. In Oct 1979 or Jan–Feb 1981, a *Melipotes* nest found in Foja Mts was described as a bundle of debris 20 cm in diameter and woven around trunk of sapling at height of 9 m; was attributed to *M. fumigatus*, but present species seems to be only member of genus in Foja Mts.

Movements. No information; probably sedentary.

Status and Conservation. Not assessed. Appears not to be globally threatened. Although not yet listed, this is a restricted-range species, confined to North Papuan Mountains EBA. First observed in Nov 2005, and formally described as recently as 2007. Common within tiny known global range. Habitats of this species apparently not at risk: entire Foja Mts massif is apparently without roads, with few or no trails, and no villages except on lowland fringes; further, local people do not enter the uplands, partly because they are not easily accessible but also because the summits are considered sacred.

Bibliography. Beehler *et al.* (2007), Diamond (1985).

Genus MACGREGORIA De Vis, 1897

85. MacGregor’s Honeyeater

Macgregoria pulchra

French: Méléphage de MacGregor **Spanish:** Mielero de MacGregor
German: MacGregor-Honigfresser

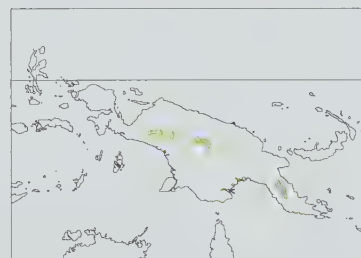
Other common names: Macgregor’s Bird/Lappetface, M(ac)Gregor’s/Orange-wattled Bird-of-paradise, Ochre-winged Honeyeater

Taxonomy. *Macgregoria pulchra* De Vis, 1897, Mount Scratchley, south-east New Guinea. Formerly considered a bird-of-paradise (Paradisaeidae), but molecular analyses indicate that it is a honeyeater, closely related to *Melipotes*. Two subspecies recognized.

Subspecies and Distribution.

M. p. caroliniae Junge, 1939 – discontinuously in Snow Mts and Oranje Mts (Mt Carstenz, Carstenz Meadow, Kemabu Plateau, Mt Wilhelm, L. Habbema) and Star Mts (Mt Capella, Dokfuma Meadow), in W & C New Guinea.

M. p. pulchra De Vis, 1897 – disjunctly on highest peaks of C Owen Stanley Range (Mt Strong–Chapman, Mt Albert Edward, Mt Scratchley, Mt Victoria, Mt Batchelor), in SE New Guinea.



slightly with black remiges; large, conspicuous fleshy orange-yellow wattle in hemicircle around eye, broken at front and with small notch in upper edge (colour of wattle may change; what was thought to be same bird had wattle brilliant orange on one day and duller yellow-orange on next day); iris reddish-brown to red; bill glossy black; legs blue-grey. Sexes alike in plumage, male larger than female and with wattle slightly larger. Juvenile is duller and browner than adult, with iris dark brown (not reddish). Race *caroliniae* has smaller wing and tail than nominate, but weighs significantly more. VOICE. Vocalizes often; sexes maintain contact while foraging by countercalling, apparently having sex-specific calls. Commonest vocalization a rapidly repeated, high-pitched double “jeet” whistle, used as contact and alarm (strange “nyeh nyeh nyeh” possibly this call); a “pscer”

note often given as greeting when one bird returns to roost or perch where other waiting, call repeated many times (associated with wing-flicking and tail-cocking); also a “schweet schweet” call at rate of more than 1 call/second. Other calls include low sharp “click” or double “click”, repeated several times; low plaintive “quee”; soft sharp “chick-chick-chick-chick” or “chick-chick, chick-chick” during aerial chases; weak “psheer”, repeated 2–5 times; and quiet “cheu”, repeated several times. Quiet nasal, slurred “chiff” heard from pair-members together. When a pair was disturbed, larger bird (probable male) uttered loud “krah!” and smaller one (probable female) a “jeet” note; when two individuals were uttering “schweet” notes, a third bird, separated from them, called with “fwooiip”. Wingbeat noise conspicuous whirring, whining or rustling or low loud hollow sound; during glides, outstretched wings (widely spread tips of primaries) make continuous “zing-g-g-g” sound, though glides can also be silent.

Habitat. Subalpine woodland and forest, including patches within alpine grassland, dominated by two gymnosperms, the podocarp *Dacrycarpus compactus* (an important foodplant) and *Libocedrus papuanus*; in at least one site, *Dacrycarpus* was the single dominant tree species forming canopy. Distribution apparently limited by distribution of *Dacrycarpus*. Occupies both forest interior and ecotones between forest and grassland or other habitats; recorded also in subalpine shrubland and forest at edge of Carstenz Meadow. From 2700 m to 4000 m, most commonly 3200–3500 m.

Food and Feeding. Appears highly specialized, but not well known. Primarily frugivorous; almost certainly takes arthropods, and possibly forages at flowers. Preferred food fleshy resin-rich fruit (7–8 mm in diameter) of *Dacrycarpus compactus*, which periodically superabundant, but fruiting of this species unpredictable and not always annual (fruiting cycle appears to be very long, with periods of more than a year with no ripe fruit in local populations of the plant); when *Dacrycarpus* unavailable, range of other fruits taken include *Eurya brassii*, *Cladomyza acrosclera*, *Styphelia suaveolens*, *Coprosma divergens*, *Astelia alpina*, *Rapanea* (including *R. involucreata*), *Symplocos cochinchinensis*. Reported not to take *Dacrycarpus compactus* fruits when available, but it is suggested that this was because the fruit was unripe (once they appear, fruits take about a year to ripen). Forages mainly in canopy, but also at all levels of forest, including on ground, and on small prostrate or cushioning shrubs, in low shrubs and in subcanopy trees; observed to forage among moss and other epiphytes and in foliage. Suggested as probably using open-bill probing (“Zirkeln”), inserting closed bill into a substrate such as moss or soft wood, then opening bill to allow better access to food. Confiding and conspicuous; more wary when on ground. Active, but described also as somewhat sluggish; seen to hop actively about perches while flicking tail and wings; can remain in small area for several hours at a time. Most often in twos (probably pairs), also recorded singly, in threes (possibly adults and offspring) or fours, or in small parties. At Dokfuma (Star Mts), one pair thought to have range c. 1 km long and several hundred metres wide, and may have been territorial, once chasing a third individual from area; in other studies, however, no intraspecific territorial behaviour observed, despite fact that birds appeared to occupy discrete areas. Seen to chase a parrot (Psittacidae) from a food tree.

Breeding. Breeding apparently about Jul to Feb, with eggs possibly mid-Jul to mid-Aug; cycle seems mostly tied to unpredictable fruiting of main foodplant (*Dacrycarpus compactus*), but breeding

recorded also when virtually no such fruit available. Appears to maintain permanent pair-bond, partners remaining together all year. Only three nests described, each an open, bulky cup, exterior mainly of moss, plant stems, lichens, and few sticks, lined with slender stems and small leaves (lining thick at top of walls, thinner at base), cup of one also contained many leaves and phyllodes, for two nests external diameter 24 cm and c. 31.5 cm, depth 19 cm (both), internal diameter 13 cm and 13.5 cm, depth 9 cm (both); placed high in tree, two nests 11 m and 15 m above ground, one in multiple upright forks in emergent tree in moss forest, other supported in upright small branches growing from small lateral branch; once rebuilt within 50 m of old nest, and suggested that may build at or near sites used in previous years. Single known clutch, of 1 egg; incubation of egg and brooding of young apparently by female only, brooding evidently ceased when nestling 11–12 days old; at one nest both sexes fed chick, though male did more, at least during brooding period; no information on duration of incubation and nestling periods, but chick development appears slow (nestling has well-developed wattle like that of adults). Remains of one found in stomach of Eastern Marsh-harrier (*Circus spilonotus*).

Movements. Possibly largely sedentary, but considered also partial or local nomad or migrant. Movements (and breeding) tied to unpredictable fruiting of main foodplant, and species can be absent from areas when fruit not available; left one site during long period when *Dacrycarpus compactus* not fruiting, and has been absent from area around L Omha (SE New Guinea) for periods of as long as one year.

Status and Conservation. VULNERABLE. CITES II. Restricted-range species: present in Central Papuan Mountains EBA. Common above 3000 m in Star Mts, where Ketengban people protect it for cultural reasons; rare on Mt Albert Edward (in Wharton Ranges), where only one record since 1933. May be in slow but ongoing decline. Patterns of movements, combined with dependence for food and possible breeding on unpredictable fruiting of *Dacrycarpus compactus*, may mean that populations fluctuate periodically and dramatically. Occupied range estimated at less than 1000 km², even though overall distribution extends from W Papua E to SE New Guinea; occurs in patchy and geographically restricted habitat, probably with little or no interchange between isolated populations. Absent from large areas of apparently suitable habitat in Central Highlands, suggesting past extirpation in these areas, possibly in part through hunting pressure. Hunted as game in parts of range, particularly as it is large, confiding and conspicuous (and site-faithful), and therefore easy to kill; threat from hunting is exacerbated by the species’ small fragmented population. Hunters visiting upper fringes of montane forest to hunt wallabies (Macropodinae) in alpine grasslands build a hide beneath favoured fruiting tree (usually *Dacrycarpus compactus*) and kill one to several honeyeaters as they come to roost or forage. Although much of its range is remote and inaccessible to hunters, new roads are creating access to its habitats; subalpine habitats are also under threat from global warming. Protected by law throughout range.

Bibliography. Anon. (1994c, 2007a), Barker & Croft (1977), Beehler (1981, 1983, 1985, 1991a, 1991b), Beehler *et al.* (2007), Butchart & Stattersfield (2004), Clapp (1986b), Cracraft & Feinstein (2000), Frith & Beehler (1998), Gregory & Johnston (1993), Hicks & Burrows (1992), Mayr (1962), Rand (1940b), Safford & Smart (1996), Schodde *et al.* (1975), Stattersfield & Capper (2000), Stattersfield *et al.* (1998).

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PLATE 45

Family MELIPHAGIDAE (HONEYEATERS) SPECIES ACCOUNTS

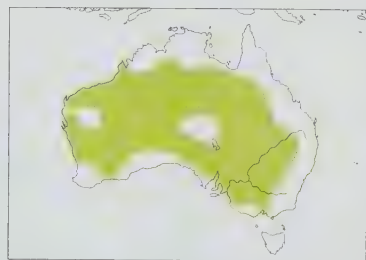
Genus *SUGOMEL* Mathews, 1922

86. Black Honeyeater

Sugomel nigra

French: Myzomèle cravaté **German:** Trauerhonigfresser **Spanish:** Mielero Blanquinegro
Other common names: Gray's Honeyeater, Charcoal Bird

Taxonomy. *Myzomela nigra* Gould, 1838, interior of New South Wales, Australia. Genus sometimes subsumed in *Certhionyx*; species formerly placed in *Myzomela*. Genus name is neuter, because ends in a neuter Latin noun. Monotypic.
Distribution. Australia from W coast E, largely S of c. 19° S, to W slopes of Great Divide; typically absent from larger desert regions (e.g. Simpson Desert), Nullarbor Plain, and moister coastal and subcoastal areas of SW, S & SE.



Descriptive notes. 10–13 cm; male 9.5–11 g, female 8.5–12 g. Male is strikingly pied, with head, neck and upperparts mostly black and underbody mostly white, black of throat and upper breast continuing as V on lower breast and as narrow scruffy black stripe down centre of belly; upperwing-coverts and remiges black-brown, remiges with fine grey edges in fresh plumage; undertail black, underwing blackish-brown; iris black-brown; bill and gape black; legs black to grey-black. Female is slightly smaller than male, plumage very different: mainly dark grey-brown above and white below, with small diffuse whitish patch above and behind eye, whitish malar area finely mottled grey-brown and extending as white stripe along side of

throat, and whitish chin and throat densely mottled dark grey-brown; breast variable, from streaked with dark grey-brown at side to heavily mottled dark grey-brown in centre and grading to dark grey-brown patch at side; uppertail and most of upperwing slightly darker than upperbody, blackish-brown, larger secondary coverts with off-white to pale grey-brown fringes, remiges with fine pale grey edges, undertail black-brown, underwing dark brown; bill black, creamy cutting edge on base of lower mandible and creamy gape, rest of bare parts as male. Juvenile is very like female, but throat and upper breast more uniform grey-brown, secondary coverts and tertials of upperwing have clear pinkish-buff fringes when fresh (more scaly appearance of folded wing), remiges and rectrices finely edged pinkish-buff, and gape yellow. Voice. During breeding, male gives two-note whistle, "pee-pee", in display-flight, also distinctive high-pitched plaintive "peeee" repeated for long periods from perch. Other calls include metallic "chick chick", by both sexes after hatching of eggs; harsh scolding notes; "chirrup" sometimes interspersed among whistles; weak squeaking by female during distraction display.

Habitat. Arid and semi-arid low, open woodlands and shrublands, often dominated by *Acacia*, especially mulga (*Acacia aneura*), or by mallee eucalypts, and typically with shrubby understorey of emu-bush (*Eremophila*) or, less often, *Grevillea*, paperbarks (*Melaleuca*) or *Acacia*; also low open sclerophyllous woodlands dominated by eucalypts, including bloodwoods (*Corymbia*) or Darwin woollybutt (*Eucalyptus miniata*), or woodland dominated by cypress-pine (*Callitris*) or casuarina, or mixed *Eucalyptus*–*Callitris*–*Melaleuca* woodland. Sometimes in spinifex (*Triodia*) savanna, especially where flowering shrubs present, or in chenopod shrublands.

Food and Feeding. Nectar (particularly of emu-bush, but also wide range of other plants) and small insects. Forages in shrubs, in crowns of trees, mostly eucalypts, and in mistletoe (*Loranthaceae*). Obtains nectar by probing flowers, sometimes sally-hovering to do so. Insects caught mostly by sally-striking in air (up to 15 m from perch), birds often searching while perched on top of shrubs; also gleaned from bark. Observed to eat charcoal and ash at extinguished fires; groups of up to ten seen at sources of ash or charcoal. Usually singly, in twos (probably pairs) and in small parties; sometimes in large flocks at food sources, e.g. 110 individuals in two small clumps of *Eremophila longifolia* within c. 100 m². Often with other species in and around flowering plants.

Breeding. Jul–Dec, mostly Aug–Nov, possibly starting and finishing slightly earlier in W Australia; also Mar in Queensland; apparently single-brooded. Often in loose groups or colonies. Both members of pair appear to choose nesting site, but only female carries material and builds, accompanied by male (male may carry material during selection process); nest a shallow open cup (can become flattened as young grow) of fine twigs, grass and other plant material, lightly bound with

spider web, lined with soft grass and rootlets and, less often, plant fibre, bark and other soft materials, construction starts with foundation of spider web around fork of branch, on to which twigs placed and secured with more web, external diameter 5–8 cm, depth 3.8–6.4 cm, internal diameter 3.8–4.5 cm, depth 2–2.5 cm; usually attached to horizontal fork of low shrub or tree, sometimes in angled or near-vertical fork or growth and often quite exposed (occasionally on fallen timber), usually close to ground at 0.3–1 m (mean of 45 nests 0.67 m), but reported extremes of 15 cm and 2.5 m. Clutch usually 2 eggs, rarely 1 or 3, mean 1.91; incubation mainly or solely by female, sometimes shared more equally by both sexes, 14–16 days, once 13 days for 1-egg clutch; chicks brooded and fed by both sexes, female doing more of brooding, male may do more feeding, nestling period 15–16 days; fledglings seen with both parents, but one brood fed only by male. Nests parasitized by Horsfield's Bronze-cuckoo (*Chrysococcyx basalis*).

Movements. Generally considered migratory, with seasonal trends in numbers in a given area; suggestion that range expands into S inland in spring, and contracts to N inland in late summer, extent of expansion varying annually and dependent on overall population of species, with tendency for movement through much of C Australia. Tends to be recorded in S & E of range more often in spring–summer than in autumn–winter; appearance or numbers at many sites, however, unpredictable and species frequently described as nomadic (although many such claims based merely on sporadic occurrences at locations, particularly at periphery of range). Broad-scale analysis of data in E Australia found strong evidence of movements, but with no clear pattern. Occurrence at edge of normal range often irregular, and irruptions widely recorded. Widely scattered records outside main range, e.g. in N Western Australia (N Kimberley Division), Top End of Northern Territory and E coast. Movements often related to flowering of foodplants, especially emu-bush and mistletoe; possibly some movements made in response to seasonal conditions, including drought. Numbers at any site may also reflect annual changes in size of total population. Said possibly to move in groups, and flock of at least 1000 in Feb at one site possibly gathering before N movement.

Status and Conservation. Not globally threatened. Widely but sparsely distributed, and locally common. Recorded densities of 0.07–1.08 birds/ha. May be adversely affected by loss of *Eremophila* through grazing and through control measures where this considered a weed by pastoralists.

Bibliography. Barrett *et al.* (2003), Black & Badman (1986), Blakers *et al.* (1984), Bourne (1987), Brooker *et al.* (1979), Burbidge & Fuller (2007), Campbell (1900), Carpenter (1985), Close & Jaensch (1984), Coate (1985, 1987), Coate *et al.* (1998), Cody (1991b), Colston (1974), Cox (1987), Davies *et al.* (1988), Emison *et al.* (1987), Ford, H.A. (1978), Ford, J.R. (1974), Ford, J.R. & Parker (1974), Gannon (1953, 1962, 1966), Gibson (1986), Griffioen & Clarke (2002), Halse (1978), Higgins (1999), Higgins *et al.* (2001), Hobbs (1958, 1967), Hutchins (1988), Johnstone & Storr (2004), Johnstone *et al.* (1981), Keast (1968a), Lepschi (1989), Milne (1938), Morris *et al.* (1981), Mules (1932), North (1906), Paton *et al.* (1994), Pescott (1985), Robinson *et al.* (1992), Schodde & Mason (1999), Storr (1984), Storr *et al.* (1952), Waterhouse (1941), Watson (1994, 1995), Wyndham (1978).

Genus MYZOMELA Vigors & Horsfield, 1827

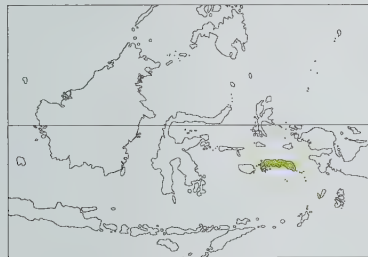
87. Drab Myzomela

Myzomela blasii

French: Myzomèle sobre **German:** Amboinahonigfresser **Spanish:** Mielero Apagado
Other common names: Drab/Amboina/Ambon Honeyeater, Amboina/Ambon/Seram Myzomela

Taxonomy. *Stigmatopis blasii* Salvadori, 1882, Ambon, Moluccas.
Forms a superspecies with *M. albigula*, *M. eques*, *M. cineracea* and *M. obscura*. Monotypic.

Distribution. Seram, Boano and Ambon, in S Moluccas.



Descriptive notes. c. 11.5 cm; 12–17 g. Top and side of head and neck and upperbody greyish-olive, slightly greyer on rump, with diffuse darker loreal stripe and narrow eyering, stripe continuing a short distance behind eye; upperwing and tail subtly darker olive than upperbody, somewhat duller on remiges, fine olive edges on remiges and rectrices; chin and throat whitish-grey with darker feather centres (scaly appearance); underbody pale yellowish-grey; at least some individuals have trace of reddish on forehead and throat; iris brown; bill black; legs grey-blue. Sexes alike, male probably larger but no data. Juvenile undescribed. **VOICE.** Undescribed.

Habitat. Lowland and montane forest; in one study, single records in unlogged forest and in logged forest. From 150 m to 2200 m, mainly 600–700 m.

Food and Feeding. Forages at flowering trees for nectar (particularly of *Eugenia*); presumably also takes small invertebrates. Mainly in canopy; on Seram, seen to forage in crowns of tall flowering trees. Inconspicuous, easily overlooked. In small flocks of 10–20 individuals in flowering trees.

Breeding. No relevant information.

Movements. No information.

Status and Conservation. Not globally threatened. Restricted-range species: present in Seram EBA. Uncommon or common on Seram; scarce or common in Manusela National Park. Only recently recorded from Boano.

Bibliography. Bowler & Taylor (1989a, 1993a, 1993b), Coates & Bishop (1997), Diamond *et al.* (1989), Isherwood *et al.* (1998), Koopman (1957), Marsden (1998), Schönwetter & Meise (1981), Sibley & Monroe (1990), Stresemann (1914a), White & Bruce (1986).

88. White-chinned Myzomela

Myzomela albigula

French: Myzomèle à menton blanc **German:** Weißkinn-Honigfresser **Spanish:** Mielero Barbiblanco
Other common names: White-chinned/White-throated Honeyeater, White-throated Myzomela

Taxonomy. *Myzomela albigula* E. J. O. Hartert, 1898, Rossel Island, Louisiade Archipelago, New Guinea.

Forms a superspecies with *M. blasii*, *M. eques*, *M. cineracea* and *M. obscura*. Two subspecies recognized.

Subspecies and Distribution.

M. a. pallidior E. J. O. Hartert, 1898 – Bonvouloir Is (Hastings I, East I), Conflict Group (including Panasesa), Deboyne Is (including Panapompom) and Kimuta I, in W & C Louisiade Archipelago, off SE New Guinea.

M. a. albigula E. J. O. Hartert, 1898 – Rossel I, in E Louisiade Archipelago.



Descriptive notes. 13–14 cm; male 16.3 g, one female 13 g. Male nominate race is fairly uniform dark brownish-grey above, paler brownish-grey below, with indistinct red wash on centre of forehead and crown, ruby-red streak on chin and centre of throat, and diffuse dusky streaking on breast; iris brown; bill black; legs bluish-grey. Female is like male but smaller, with chin and throat contrastingly pale greyish-white, and red throat stripe less distinct. Juvenile undescribed. Race *pallidior* is much paler, with white throat paler than that of either sex of nominate. **VOICE.** Undescribed.

Habitat. No information; thought to be forest.

Food and Feeding. No information.

Breeding. No information.

Movements. No information.

Status and Conservation. Data-deficient. Restricted-range species: present in Louisiade Archipelago EBA. Very poorly known, but considered not globally threatened; thought to be common. Apparently not present, or no longer present, on Misima and Tagula, despite some statements to the contrary.

Bibliography. Anon. (2007a), Beehler *et al.* (1986), Butchart & Stattersfield (2004), Coates (1990), Diamond *et al.* (1989), Koopman (1957), LeCroy & Peckover (1998), Rand & Gilliard (1967), Stattersfield & Capper (2000), Stattersfield *et al.* (1998).

89. Red-throated Myzomela

Myzomela eques

French: Myzomèle à menton rouge **German:** Dolchstich-Honigfresser **Spanish:** Mielero Barbirrojo
Other common names: Red-throated/Ruby-throated/Red-spot Honeyeater, Ruby-throated/Red-spot(ted)/Red-chinned Myzomela

Taxonomy. *Cinnyris eques* Lesson and Garnot, 1827, Waigeo, West Papuan Islands, off north-west New Guinea.

Forms a superspecies with *M. blasii*, *M. albigula*, *M. cineracea* and *M. obscura*. Often treated as conspecific with *M. cineracea*. Four subspecies recognized.

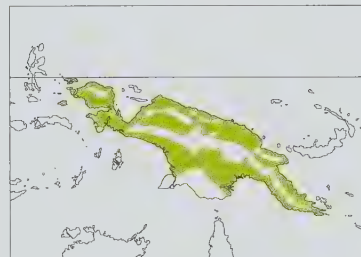
Subspecies and Distribution.

M. e. eques (Lesson & Garnot, 1827) – West Papuan Is (Waigeo, Salawati, Misool) and NW New Guinea (Vogelkop and Onin Peninsula).

M. e. primitiva Stresemann & Paludan, 1932 – N New Guinea from Geelvink Bay E to Astrolabe Bay.

M. e. nymani Rothschild & E. J. O. Hartert, 1903 – S & E New Guinea (E from Vogelkop–Mimika R on S coast and from Huon Gulf on N coast).

M. e. karimuiensis Diamond, 1967 – Karimui, in Eastern Highlands (E New Guinea).



Descriptive notes. 14 cm; mean 13.8 g (nominate), male average 15.8 g and female 12.4 g (*nymani*). Male nominate race is wholly blackish-brown, slightly paler below, with glossy red to scarlet patch on chin and throat, faint red spot on forehead; underwing light grey-brown with diffusely darker trailing edge and tip; iris light brown to golden-brown; bill black; legs dark grey. Female is like male but smaller, somewhat paler and duller, dark brown to dark grey-brown, slightly warmer brown on rump and uppertail-coverts, and often lacks red frontal spot; remiges have faintly paler brown outer edges. Juvenile undescribed; immatures similar to female but slightly paler and greyer, wholly dusky brownish-grey, slightly paler below, with varying faint or non-existent red wash on forehead and cheeks, and poorly defined gular stripe. Race *primitiva* is darker than nominate, with smaller red throat patch; *nymani* male is more grey-toned than others, with more extensive red throat patch covering whole chin and throat; *karimuiensis* considerably darker than others, with deeper red throat patch, also slightly longer tail. **VOICE.** High-pitched “chip” typical of genus, given occasionally; heard to give a series of musical chirps that developed into sibilant twitter when two birds chasing each other and displaying.

Habitat. Primary rainforest, forest edge and tall secondary forest and regrowth; at Lakekamu, found in lowland alluvial rainforest and edge. Sea-level to 500–600 m, but recorded locally to 1200 m.

Food and Feeding. Primarily nectar, from wide range of flowering plants, including Myrtaceae and figs (*Ficus*); also insects, and reported as eating figs growing from tree trunks. Forages mainly in outer canopy of tall flowering trees, also in vines and epiphytes (seen to visit inflorescences of canopy epiphyte *Schefflera*); mostly in upper canopy (to 24–46 m above ground), less often in lower canopy, subcanopy, middle storey and, occasionally, substage layers. Of nine observations of foraging at Karimui, six in upper canopy and rest in lower canopy. Often forages on flowering sago (*Metroxylon*). Main techniques gleaning and probing. Less active than congeners. Often in gatherings of up to 20–30 birds in flowering trees, frequently with other honeyeaters, including congeners such as *M. nigrita*, *M. adolphinae* and *M. cruentata*, and parrots such as Red-flanked Lorikeets (*Charmosyna placensis*); less often singly or in twos (probably pairs). Readily associates with mixed-species flocks.

Breeding. Nest with young in late Mar; breeding in E of range thought to end late Jul to early Aug, and breeding in W several months later. Nest an untidy and rather scanty cup made of strips of strong black arboreal lichen, suspended from fork of leafy branchlet; one was 3 m above ground near top of sapling, c. 15 cm from trunk, and well concealed by foliage. No other relevant information.

Movements. Resident, possibly territorial, but appears to disperse locally to exploit flowering trees.

Status and Conservation. Not globally threatened. Generally uncommon in lowland forest in E Sepik District and at Crater Mt (in Chimbu Province); considered common elsewhere. At Brown R

density less than 1 bird/ha. In all foraging groups most individuals appear to be males, suggesting either skewed sex ratio or sexual difference in foraging behaviour.

Bibliography. Anon. (1978a), Bailey (1992), Beehler *et al.* (1995), Bell (1982a, 1982c, 1984b), Brown & Hopkins (1996), Coates (1990), Diamond (1967, 1972a), Diamond *et al.* (1989), Finch (1978, 1980b, 1983), Gilliard & LeCroy (1966), Gregory (1995b), Hartert (1930), Hicks (1992), Koopman (1957), Murray (1988b), Ogilvie-Grant (1915), Pearson, D.L. (1975), Rand (1942a, 1942b), Rand & Gilliard (1967), Richards & Suryadi (2002), Ripley (1964), Rowland (1995), Schönwetter & Meise (1981), Stein (1936), Terborgh & Diamond (1970), Tolhurst (1991), Weston (1976b).

90. Ashy Myzomela

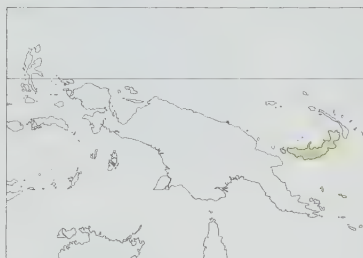
Myzomela cineracea

French: Myzomèle cendré **German:** Schlichthongfresser **Spanish:** Mielero Cenizo
Other common names: Ashy/Bismarck/Cinereous Honeyeater, Grey/Bismarck/Umboi/Selater's Myzomela

Taxonomy. *Myzomela cineracea* P. L. Selater, 1879, New Britain.

Forms a superspecies with *M. blasii*, *M. albigula*, *M. eques* and *M. obscura*. Often treated as conspecific with *M. eques*. Birds from Umbui, slightly larger (and male possibly slightly paler above) than those of New Britain, described as race *rooki*, but differences considered too slight to warrant recognition of geographical races. Monotypic.

Distribution. Umbui and New Britain, in Bismarck Archipelago.



Descriptive notes. 14.5–16 cm; male average 15.6 g, female 12.2 g. Male is dark brown to dark greyish-brown above, slightly darker, black-brown, on tail, and with faint fine paler brown fringes on some upperwing-coverts (most noticeable on greater), and fine olive to brown edges on most remiges; some have diffusely darker, dusky forehead, lores or eyering; rosy patch on chin and throat; below paler, pale grey-brown, becoming even paler on vent and undertail-coverts; undertail brownish-grey, underwing white with diffuse silvery brownish-grey trailing edge and tip; iris brown to reddish-brown; bill black; legs grey to blue-grey. Female is smaller than

male, with small rose-pink patch on chin and centre of throat. Birds looking much as adult but with orange gape and brown head are possibly juveniles, but confirmation needed; immature apparently like female, with rosy patch on chin and throat. **Voice.** Calls infrequent, quiet and unobtrusive. Regular series of single or double notes often at dawn, "chip-chip-chip" or "chip-chop, chip-chop"; rapid harsh chattering "chee-chee-chee...", rising and falling in pitch; thin whistled "hoet, hoet".

Habitat. Most lowland habitats that provide cover, including primary rainforest, forest edge, secondary forest and regrowth, and other modified habitats such as gardens and coconut plantations. Sea-level to 1200 m or more.

Food and Feeding. Diet includes nectar and insects. Forages from canopy to understorey, mainly in canopy and substages, in flowering trees, coconut palms and low shrubs. Usually seen singly; sometimes associates with other species, including other honeyeaters, in flowering trees; on Mt Uali (c. 900 m), seen to forage with congeners *M. cruentata* and *M. erythromelas*.

Breeding. Season appears to be second half of dry season and middle of wet season; eggs late Jul, early Oct and early Jan to late Feb. Nest a thin-walled bowl or cup made of fine stems, roots and fibres from leaf sheaths, internal diameter 4 cm, depth 3–7 cm, suspended from fork of shrub or small tree. Clutch usually 2 eggs. No other relevant information.

Movements. No information; probably resident, with local movements.

Status and Conservation. Not assessed. Probably not globally threatened. Restricted-range species: present in New Britain and New Ireland EBA. Widespread in lowlands and foothills; considered moderately common to abundant.

Bibliography. Bishop & Jones (2001), Coates (1990), Coates & Peckover (2001), Diamond *et al.* (1989), Dutton (2007a), Eastwood (1995b), Eastwood & Gregory (1995), Eastwood *et al.* (1997), Finch & McKean (1987), Fletcher (2000a), Gilliard & LeCroy (1967b), Hartert (1930), Koopman (1957), LeCroy & Peckover (1983), Mayr (1955), Mayr & Diamond (2001), Orenstein (1976), Schönwetter & Meise (1981), Stattersfield *et al.* (1998), Storey & Eastwood (1991).

91. Dusky Myzomela

Myzomela obscura

French: Myzomèle ombré **German:** Rußhönigfresser **Spanish:** Mielero Sombrio
Other common names: Dusky/Moluccan Honeyeater, Moluccan Myzomela; Red-brown Honeyeater/Myzomela (*rubrobrunnea*)

Taxonomy. *Myzomela obscura* Gould, 1843, Port Essington, Northern Territory, Australia.

Forms a superspecies with *M. blasii*, *M. albigula*, *M. eques* and *M. cineracea*. Races fall into two groups, nominate, *harterti*, *fumata*, *rubrobrunnea* and *aruensis* comprising "nominate group" and other three the "simplex group". Birds on Pulu Adi (SW New Guinea) of uncertain racial identity; provisionally included in *fumata*. Proposed race *munna* from NE Australia (Cape York, in N Queensland) is synonymized with *harterti*. Eight subspecies recognized.

Subspecies and Distribution.

M. o. mortuana E. J. O. Hartert, 1903 – Morotai, off N Halmahera.

M. o. simplex G. R. Gray, 1861 – Halmahera, Ternate, Tidore, Kasiruta, Bacan and Damar (N Moluccas).

M. o. rubrotincta Salvadori, 1878 – Obi and Bisa, in N Moluccas.

M. o. fumata (Bonaparte, 1850) – New Guinea from S Vogelkop (S from Sorong) E along S coast, including Pulu Adi (off Triton Bay), to Trans-Fly and Milne Bay and, in SE, on N coast E from near Popondetta; also islands of N Torres Strait (probably Boigu and Sabai).

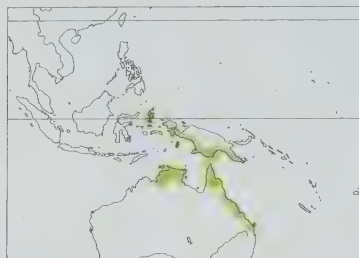
M. o. rubrobrunnea A. B. Meyer, 1874 – Biak I, in Geelvink Bay (NW New Guinea).

M. o. aruensis Kinnear, 1924 – Aru Is.

M. o. harterti Mathews, 1911 – islands of C & S Torres Strait, and NE Australia (coastal and subcoastal Queensland from Cape York Peninsula S to Moreton Bay).

M. o. obscura Gould, 1843 – Tiwi Is (Bathurst I, Melville I) and N Northern Territory (Arnhem Land), in N Australia.

Descriptive notes. 13–15 cm; male 11.8–15.1 g and female 10–12.3 g (nominate), male 11.8–17.5 g, female 9–12.5 g and sexes combined 9.5–15 g (*harterti*), two birds 12 g (*fumata*). Nominant race dark grey-brown above, slightly darker on lores, and merging to paler and greyer-tinged brown on side of head, chin and throat, breast and upper belly, and to slightly paler and greyer on rest of underbody; in close view, most have indistinct dull dusky stripe in centre of throat, and some have very faint and diffuse maroon wash on forehead and forecrown (and sometimes very faintly over more of face, chin



and throat); upperwing and uppertail slightly darker than upperbody, secondary wing-coverts with faint light brown fringes and, in fresh plumage, remiges with fine pale grey edges (become duller with wear); undertail and underwing dark grey-brown, slightly paler on underwing-coverts and with thin pale edges on basal inner webs of remiges; iris dark brown to grey-brown; bill black, gape varies (possibly seasonally) from black to pale yellow; legs slate-grey, blue-grey or brown or black. Sexes alike in plumage, male slightly larger than female. Juvenile is very like adult, but rump and uppertail-coverts slightly paler and warmer brown than rest of upperbody,

secondary coverts have broader and paler tips giving more patterned appearance to folded wing (sometimes forming subtle wingbar), secondaries thinly edged dull olive, bill blackish with obvious paler yellowish base of lower mandible, and gape yellow and swollen. Races differ little, mainly in tone of plumage and prominence of dusky centre of throat: *harterti* is darker and less grey than nominate, dusky patch or stripe on throat more distinct; *fumata* is like nominate but darker, with fainter or no dusky marking on throat, also reported as variable, birds of mangroves being darker than others (study needed); *aruensis* is darker and browner again than previous, especially below; *simplex* has reddish or rufous edges on remiges and rectrices, and some pinkish-brown fringes on breast feathers; *rubrobrunnea* is darker than nominate, with brownish-red wash in plumage and reddish throat stripe; *mortuana* is also dark, with strong red tinge on breast; *rubrotincta* has red wash on back, wings and tail, and pink wash on abdomen. **Voice.** In Australia, usual call a short mournful whistle or single note, often repeated; on Obi, a thin high "sut-sit, sut-sit, sut-sit". Song described as squeaking warble, or jumble of squeaky, high-pitched notes, "tip-tip-eeee-chip", third note longer and descending. Other calls include soft trilling chatter; scolding notes; quiet "tick, tick"; and upslurred squeaky "seet" or "sweet". Continuous twittering during mutual chasing in small flocks; said to give excited "see, see" notes during chases.

Habitat. In Australia, mainly dense coastal or lowland rainforests and monsoon forests, also in such habitats at higher altitudes; often in rainforests with *Ficus* in canopy, and sometimes emergent eucalypts or paperbarks, and with thick middle storey of various tree species and generally sparse ground cover. Also riparian forests, especially of weeping paperbarks (*Melaleuca leucadendra*), often mixed with eucalypts; open eucalypt or open to closed paperbark woodlands and forests, especially when in flower, and often with tall or dense understorey of sclerophyllous shrubs; ecotone between monsoon forest and open eucalypt forest; and mangroves. Sometimes in towns, and parks and gardens, and locally in coconut plantations; rarely, in heathland. In New Guinea, mangrove forest, monsoon woodland (in Trans-Fly Region), savanna woodland, coastal scrub and scrubby savanna, forest edge bordering grassland, secondary growth, open areas, and in villages and town gardens (e.g. in Port Moresby). In Wallacea, mainly in primary forest and tall secondary forest, including edges. In Wallacea sea-level to at least 450 m on Halmahera, 1200 m on Bacan and at least 800 m on Obi; in New Guinea mainly coastal, from sea-level to c. 100 m, commonly to 600 m or more on Sogerit Plateau. In Australia sea-level to tablelands, e.g. at 750–800 m on Atherton Tableland (N Queensland). In W Torres Strait, found only on those islands where *Lichmera indistincta* absent.

Food and Feeding. Little known outside Australia. Mainly nectar, some arthropods (insects, spiders). Nectar taken from wide variety of plants over year; near Darwin, fed at flowers that provided best sources of nectar. Spends much time in eucalypts, and in New Guinea attracted to flowering sago palms (*Metroxylon*). Arboreal, usually foraging among flowers and foliage in upper and middle canopy, but also at lower levels, down to near ground. In NE Queensland, tended to feed slightly higher in wet season than in dry season; and in Northern Territory, when feeding on nectar in Kakadu National Park, some indication that foraging height varied seasonally. Forages much among foliage (e.g. more than 60% of feeding observations in Northern Territory and NE Queensland), particularly outer foliage; also on branches of trees, branches and trunks of shrubs, dead leaves and vines, and in air. Probes flowers for nectar; gleans and probes for insects among twigs and leaves and from bark and branches; obtains insects also by flutter-chasing, and by sallying, sally-striking and sally-hovering, and once seen to glean from spider web. Active, often hanging upside-down. Usually singly or in pairs, sometimes in small parties (e.g. of up to six individuals) or congregates in flowering trees; sometimes forages in mixed-species flocks, often with other meliphagids. Chases Black Sunbirds (*Leptocoma sericea*).

Breeding. Poorly known. In Australia breeding recorded in most months, with eggs May, Jul, Sept and Nov and nestlings and fledglings Mar–Dec; in New Guinea Jun, Sept and Apr, with nestlings mid-Sept, fledglings Sept (and nestlings or fledglings mid-Apr), and "breeding" specimens Jan, Mar–Apr and Oct–Dec (most Nov–Dec). Nest a small, frail, thin-walled cup made of grass, thin strips of paperbark, rootlets, plant tendrils and plant down, with spider web (mostly around rim), lined with fine grass or long hair, external diameter 6–7 cm, depth 4–5 cm, internal diameter 3–4 cm, depth 3–8 cm; suspended by rim from branch of tree 0.3–1.5 m (mean 4–5 m) up, usually near end of branch and among dense foliage, one was suspended between three vertical branches of small tree, nests recorded in paperbark, eucalypt, occasionally mangrove, sometimes in ornamental or fruit tree in garden. Usual clutch 2 eggs; no information on incubation and nestling periods; adults continue to feed young after fledging.

Movements. Not well known. Primarily resident in most of range. Some dispersive or local ("nomadic") movements apparent in Australia, including on some islands in Torres Strait (Booby, Badu and Saibai), and considered occasional visitor to some areas, such as Darwin (Northern Territory) and Blackall and Conondale Ranges (SE Queensland); around Rockhampton (Queensland), movements may be more seasonally regular. In New Guinea also occasional visitor at some sites, indicating probable local movements or dispersal.

Status and Conservation. Not globally threatened. Moderately common in Wallacea; fairly common in New Guinea; locally common in Australia. Reports from Misool (West Papuan Is) and, in Australia, from Groote Eylandt and near Borroloola (Northern Territory) and in New South Wales considered doubtful. In Australia, recorded densities 0.06–0.64 birds/ha. Abundance in Kakadu National Park (Northern Territory) negatively correlated with damage caused by water buffalo (*Bubalus bubalis*), although buffalo now in reduced numbers and no longer a threat. In Lamb Range (NE Queensland), significantly more abundant in regrowth rainforest 20–30 years old than in mature rainforest. On Halmahera, the people of Jailolo consider present species to be young of *Melittograis gilolensis* (the two often forage together).

Bibliography. Anon. (1978a, 1978b), Austin (1950), Barnard (1926), Barrett *et al.* (2003), Beehler *et al.* (1986), Bell (1970a), Bellchambers *et al.* (1994), Bishop (1992), Blakers *et al.* (1984), Boekel (1976), Boles & Longmore (1989), Braithwaite *et al.* (1984), Brooker *et al.* (1990), Brown & Hopkins (1996), Campbell (1900), Campbell & Barnard (1917), Clarke (2004), Coates (1990), Coates & Bishop (1997), Colston (1974), Cooney *et al.* (2006), Crawford (1972), Crome (1978), Diamond *et al.* (1989), Draffan *et al.* (1983), Durrant & MacRae (1994), Finch (1980b, 1983), Ford, J.R. (1978a, 1982), Forshaw & Muller (1978), Franklin & Noske (1999, 2000a), Frith & Hitchcock (1974), Garnett & Bredl (1985), Garnett & Cox (1983, 1988), Griffin (1974, 1995), Griffiths & Clarke (2002), Gyldenstolpe (1955b), Hicks (1990a), Higgins *et al.* (2001), Holland (1972), Johnson & Hooper (1973), Keast (1968a, 1985a), Kikkawa (1982), Kikkawa *et al.* (1981), Koopman (1957), Lambert & Young (1989), Laurence

et al. (1996), Lavery *et al.* (1968), Linsley (1995), Longmore (1978, 1991a), MacGillivray (1914, 1918), Marshall (1934a), Mayr & Rand (1937), McKean (1985), McLean (1995), Mees (1982), Mordue (1981), North (1906), Noske (1996), Officer (1967, 1971, 1976), Ogilvie-Grant (1915), Poulsen & Lambert (2000), Rand (1942a), Rand & Gilliard (1967), Ripley (1959b), Schodde & Mason (1999), Schodde & Tidemann (1986), Schönwetter & Meise (1981), Sedgwick (1947), Storr (1953, 1977, 1984), Tarr (1948), Watson *et al.* (1962), White, C.M.N. & Bruce (1986), White, S.R. (1946), Wieneke (1988, 1992), Woinarski (1993), Woinarski, Fisher *et al.* (2001), Woinarski, Press & Russell-Smith (1989), Woinarski, Tidemann & Kerin (1988).

92. Red Myzomela

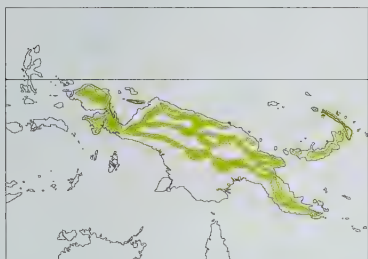
Myzomela cruentata

French: Myzomèle vermillon **German:** Bluthonigfresser **Spanish:** Mielero Rojo
Other common names: Red Honeyeater, Red-tinted Myzomela/Honeyeater

Taxonomy. *Myzomela cruentata* A. B. Meyer, 1874, Arfak Mountains, north-west New Guinea. Races fall into two groups: "n nominate group" (with *coccinea*) of New Guinea and New Britain, and "*erythrina* group" (remaining four races) of New Ireland and satellite islands. Six subspecies recognized.

Subspecies and Distribution.

M. c. cruentata A. B. Meyer, 1874 – New Guinea, including Yapen I (in Geelvink Bay).
M. c. coccinea E. P. Ramsay, 1877 – New Britain and Duke of York Is, in Bismarck Archipelago.
M. c. lavongai Salomonsen, 1966 – New Hanover.
M. c. erythrina E. P. Ramsay, 1877 – New Ireland.
M. c. vinacea Salomonsen, 1966 – Djaul I, off NW New Ireland.
M. c. cantans Mayr, 1955 – Tabar I (in Tabar Group), off NE New Ireland.



Descriptive notes. 11–13 cm; male average 8.6 g, female average 7.9 g. Male nominate race appears almost entirely bright, glossy crimson, brightest on rump and uppertail-coverts, duller on back; uppertail dark brown with strong crimson suffusion, crimson edges of rectrices; upperwing dark brown, coverts with broad crimson tips and fringes, tertials with strong crimson suffusion, remaining remiges with crimson outer edges (folded wing appears dusky red); undertail brown; underwing light grey-brown, coverts paler and (on at least some) mottled off-white; some individuals have faint crimson-brown mottling above and

below, but not certain whether this is an immature character or the result of wear; iris rufous-brown to blackish-brown; bill black to brownish-black, gape yellow; legs dusky grey to blackish-brown, soles yellowish. Female is smaller than male, drab brown to olive-brown, slightly paler and greyer below, especially in middle of belly and vent, with diffuse red wash on forehead, chin and throat, and on rump, uppertail-coverts and uppertail; bare parts as for male. Juvenile is very similar to female, but wing shorter and gape swollen; immature male like adult female, but red wash more extensive (reaching varying to hindworn, nape and back), also varying washed red below, especially on chin and throat and centre of breast, and retains juveniles remiges and rectrices. Races differ in intensity of red of male (complicated by effects of wear), in "*erythrina* group" also in plumage of female (very similar to respective adult male) and juvenile: *coccinea* is very like nominate but a little smaller, with slightly longer bill, male slightly paler and duller red, female with slightly more extensive and deeper rose-red on forehead, throat and rump to uppertail-coverts; *erythrina* is slightly larger than nominate, male much duller and darker red, with almost blackish crown, female like male but duller red above and slightly paler below, juvenile has red wash on upperparts, chin and throat and (on most) paler red wash on breast and belly (young male slightly brighter red on throat, contrasting more with breast, than young female); *lavongai* male is larger than previous, with brighter and glossier red upperparts (more like nominate), female undescribed, juvenile like that of previous but with buff-grey breast and abdomen; *cantans* male is similar in size to previous and larger than *erythrina*, but upperparts darker and duller red than both, female undescribed, juvenile much darker than *erythrina*, dark red above, bright red chin and throat, strongly contrasting red-washed dark grey-brown underparts; *vinacea* is much larger than other races, male plumage as that of *lavongai*, female almost identical to *erythrina* but possibly slightly darker and duller below, juvenile very different from that of all other races, dark plum-red, slightly paler below, chin and throat contrasting only slightly with underbody. **Voice.** Typically quiet. Main call a high-pitched "tseet" at rate of c. 1 per 5–10 seconds, or (New Guinea) a high-pitched insect-like "tzip" or "tick" repeated frequently at intervals of several seconds; other calls include repeated high "sit" during mutual chasing.

Habitat. Primary rainforest and forest edge and tall secondary growth (regrowth forest); recorded also in savanna eucalypt woodland at Varirata National Park (New Guinea); common in gardens, plantations and secondary forest on New Hanover. Altitudinal range varies among islands, and on New Britain and New Ireland associated with presence of congeners. In New Guinea mainly in hills between c. 750 m and 1600 m, but visits foothills and occasionally adjacent lowlands (down to at least 400 m); several recorded at 1200 m and 1500 m in Fakfak Mts, and recorded in lower belt of mid-mountain forest at 1370–1460 m in Telefomin region; in Vanapa–Veimauri region (in SE), fairly common above 210 m but scarce at lower levels and only occasionally on lowland plains. On New Britain, where *M. erythromelas* occupies lowlands, present species found only in mountains above 900–1100 m and up to at least 1720 m; on New Ireland *M. pulchella* occupies mountains, with present species (which thought to be the more recent invader) restricted to lowlands and hills from sea-level to 900–1000 m, mainly below range of congener (in recent surveys, however, present species recorded regularly at 1175 m but *M. pulchella* on only one day at this altitude). New Britain also supports larger *M. cineracea*, which co-exists with both congeners there owing to differing ecology.

Food and Feeding. Nectar; also small arthropods, mainly insects. Seen to visit inflorescences of *Poikilospermum*, *Albizia* and the canopy epiphyte *Schefflera*; in New Guinea visits sago palms (*Metroxylon*), and on New Ireland forages in flowering coconut palms. Mainly in canopy of forest, and most often in flowering trees. In Whiteman Range (SW New Britain), foraged through abundant clusters of red flowers in canopy of forest on summit ridge, probing to base of flowers from all angles, sometimes reaching down or hanging to do so; one foraged in one small area for c. 5 minutes. Where no flowering present, seen to search foliage rapidly for arthropods. Forages mainly by probing and gleaning. In Nakanai Mts (EC New Britain), usually seen while sally-hovering to take nectar from flowers, but also probed large cushions of moss hanging from tree branches. Described as quiet and inconspicuous; in Bismarcks usually seen singly or in small parties, foraging quietly at flowers in crowns of tall forest trees. Also congregates with conspecifics, other meliphagids and other species; at Mt Uali (New Britain) foraged with *M. cineracea* and *M. erythromelas*.

Breeding. Breeding birds in Feb–Apr. No other information.

Movements. Probably largely sedentary, but some local movements or dispersal. Descends to foothills and lowlands to feed on flowering trees. Resident S New Ireland. In E New Guinea, possibly resident at Crater Mt but suggested that it may leave area during periods of low nectar availability (perhaps Dec–Mar); considered feeding visitor or vagrant in lowland and foothill forest around Port Moresby. **Status and Conservation.** Not globally threatened. Generally scarce to moderately common, locally common. Described as abundant (at least 100 pairs/km²) in some places.

Bibliography. Beehler (1978a, 1980b), Beehler & Alonso (2001), Beehler, Pratt & Zimmerman (1986), Beehler, Sengo *et al.* (1995), Bell (1969, 1982a, 1984b), Berggy (1978), Bishop & Jones (2001), Brown & Hopkins (1996), Clapp (1987a), Coates (1990), Diamond (1972a), Diamond *et al.* (1989), Eastwood (1995b, 1996b), Finch (1980b, 1983), Finch & McKean (1987), Fletcher (2000b), Gibbs (1994), Gilliard & LeCroy (1961, 1967a, 1967b), Gregory (1995b), Hartert (1930), Jones & Lambley (1987), Koopman (1957), Leavesley & Leavesley (2000b), LeCroy & Peckover (1983), Mack & Wright (1996), Mackay (1980), Mayr (1955), Mayr & Diamond (2001), Mayr & Rand (1937), Murray (1988b), Ogilvie-Grant (1915), Rand (1942b), Rand & Gilliard (1967), Rothschild *et al.* (1932b), Salomonsen (1966b), Sclater (1879), Terborgh & Diamond (1970), Weston (1976b).

93. Black Myzomela

Myzomela nigrita

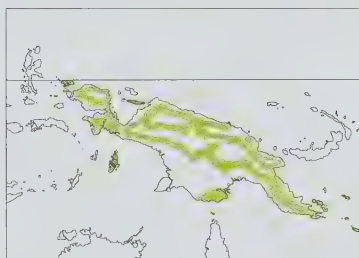
French: Myzomèle noir **German:** Mohrenhonigfresser **Spanish:** Mielero Negro
Other common names: (Papuan) Black(ened)/Carbon Honeyeater, Blackish/Carbon/Papuan Black/White-sided Myzomela

Taxonomy. *Myzomela nigrita* G. R. Gray, 1858, Aru Islands.

In past, treated as conspecific with *M. pammelaena* and *M. tristrami*. Six subspecies recognized.

Subspecies and Distribution.

M. n. steini Stresemann & Paludan, 1932 – Waigeo I, in West Papuan Is.
M. n. pluto W. A. Forbes, 1879 – Meos Num I, in Geelvink Bay.
M. n. meyeri Salvadori, 1881 – Yapen I and W, N & E New Guinea.
M. n. nigrita G. R. Gray, 1858 – Aru Is and SC New Guinea (Eilanden R E to Fly R).
M. n. forbesi E. P. Ramsay, 1880 – D'Entrecasteaux Archipelago (Goodenough I, Fergusson I, Dobu I), off SE New Guinea.
M. n. louisiadensis E. J. O. Hartert, 1898 – Louisiade Archipelago (Woodlark I, Misima I, Tagula I), E of D'Entrecasteaux.



Descriptive notes. 10–12 cm; male 8.3–10.8 g (all races except *steini* and *pluto* combined), two males 9 g and 10.5 g (nominate), male 9–11 g and three females 8.3–9 g (*meyer*). Male nominate race is wholly glossy black, except for white axillaries and largely white underwing with silvery grey-brown trailing edge and tip; iris brown to light brown; bill black, thin yellowish gape on at least some (possibly immatures); legs dark grey, sometimes tinged yellow, soles yellow. Female is smaller than male, plumage olive-brown to grey-brown, paler below, with reddish to rosy wash on forehead, lores, anterior cheek, and chin and upper throat. Juvenile undescribed;

immature male appears to vary, some with head, neck and upper breast black with few scattered olive-brown flecks (particularly on hindneck), merging to largely black body strongly mottled with light olive-brown (particularly on scapulars and underbody), and with brown-tinged black upperwing and tail, others entirely black except for small area of rose-red on chin, some like adult female (and doubtfully distinguishable in field), yet others apparently dark brown to grey-black with dull red to rufous forehead (possibly also chin and throat), study needed; immature female doubtfully separable from adult in field. Races differ in plumage tone and pattern and in size: *meyer* is larger than nominate (male wing 57–64 mm, nominate 55–58.5 mm), male plumage as nominate, female dimorphic, either like male but duller black or like female of nominate; *forbesi* is larger than previous, male less glossy than nominate and with conspicuous red patch on hindworn to nape, female like nominate but red of forehead extends to crown; *pluto* is much larger than others (wing 63.5–68.6 mm), male plumage like nominate, female resembles female of *meyer*; *steini* male is like adult female; insufficient data available on *louisiadensis*. **Voice.** Main call a dry, high-pitched "sit" or "zeet", given often, and incessantly by flocks in flowering trees; also a rather formless series of "sit" and "see" (called "song"). Vocalizations of race *meyer* described as twittering and sibilant.

Habitat. Hill and lower montane primary forest, forest edge and tall secondary growth; also in eucalypt savanna woodland in Trans-Fly, and monsoon forest in parts of range. Throughout range mainly in foothills and lower mountains, between c. 500 m and 1000 m, but recorded also in lowlands in Trans-Fly region (e.g. near sea-level on Oriomo R) and Aru Is, and visitor to lowlands elsewhere; occurs locally up to 1250 m, e.g. at Mafulu. On Goodenough I occupies lowlands, and not recorded above 620 m.

Food and Feeding. Nectar and small arthropods (insects), occasionally berries. Specialist of upper part of crowns of flowering trees. Of 77 observations in flowering trees in Karimui area, 94% in upper half of canopy and only 6% in lower half. Sometimes descends to lower levels at forest edge. Visits flowering trees in savanna; also visits flowering sago palms (*Metroxylon*), e.g. at lowland sites at Brown R. Seen to probe inflorescences of *Albizia*, *Astronia*, *Syzgium* and *Poikilospermum*. Often gathers in small parties in flowering trees, where frequently associates with other meliphagids and other bird species, especially parrots such as Red-flanked Lorikeet (*Charmosyna placensis*), Black Berrypecker (*Melanochoris nigra*) and Dwarf Longbill (*Oedistoma iliolophus*); at Mafulu, feeds with congeners in *Albizia* trees.

Breeding. Female with possible nesting material seen chased by a male in late Jul (middle dry season), six "breeding" specimens in Mar–Apr. No other information.

Movements. Mainly resident, but moves locally. Moves from foothills to lowlands to exploit flowering trees, e.g. suggested that it may regularly visit lowland forest at Brown R to forage; occurs in small numbers in Vanapa–Veimauri lowlands when trees in flower, but often absent when no flowering.

Status and Conservation. Not globally threatened. Locally common throughout range. Black-plumaged birds seen far more than brown-plumaged individuals, indicating a possible bias in sex ratio or differences in ecology or behaviour between sexes.

Bibliography. Anon. (1978a), Beehler (1978a), Beehler, Pratt & Zimmerman (1986), Beehler, Sengo *et al.* (1995), Bell (1982a, 1984b), Brown & Hopkins (1996), Coates (1990), Coles (1976a), Diamond (1972a, 1976), Diamond *et al.* (1989), Eastwood (1989a), Finch (1978, 1980b, 1983), Gilliard & LeCroy (1967a), Gregory (1995b), Hartert (1930), Hicks (1992), Koopman (1957), LeCroy & Peckover (1998, 1999), Mack & Wright (1996), Mayr & Rand (1937), Melville (1979), Murray (1988b), Ogilvie-Grant (1915), Rand (1942b), Rand & Gilliard (1967), Ripley (1964), Rothschild *et al.* (1932b), Stein (1936), Terborgh & Diamond (1970), Weston (1976b).



PLATE 46

Family MELIPHAGIDAE (HONEYEATERS) SPECIES ACCOUNTS

94. New Ireland Myzomela

Myzomela pulchella

French: Myzomèle de Nouvelle-Irlande

Spanish: Mielero de Nueva Irlanda

German: Neuirland-Honigfresser

Other common names: New Ireland/Olive-yellow Honeyeater, Crimson-fronted/Olive-yellow Myzomela

Taxonomy. *Myzomela pulchella* Salvadori, 1891, New Ireland.

Relationships uncertain. Monotypic.

Distribution. New Ireland, in E Bismarck Archipelago. To date, only recorded from S of island, but presence in C considered probable.



Descriptive notes. 11 cm; 10 g. Forehead, crown, anterior ear-coverts, malar area and chin to uppermost breast are red, forming conspicuous red mask enclosing narrow black loreal stripe that extends in thin ring around eye; upperparts dark grey-brown to dark olive-brown, greater upperwing-coverts and secondaries with fine olive-green outer edges; red below grades to slightly dusky red on upper breast; rest of underbody pale buff to dirty yellowish-white, with diffuse band of dark streaking across lower breast bordering dusky red; iris dark grey to dark brown; bill black, possibly blackish-brown in some; legs blue-grey, soles yellowish. Sexes alike in adult plumage (probably differ in size). Juvenile has olive-brown head, neck and upperbody, including face, with scattered red feathers on head and neck and a small patch of red on chin and throat, olive-grey breast, rest of underbody as adult or more olive-yellow. Voice. Call a buzzy, downslurred "bzrr" or repeated "zzr".

Habitat. Montane forest, mainly above 500 m; generally replaced at lower altitudes by *M. cruentata*. Recorded to 1840 m in Hans Meyer Range. In surveys of S New Ireland, however, recorded below 500 m, with records at 150–200 m on eight of nine days at the site; also commonly at 1800 m (on each of six days), but recorded on only one of seven days at 1175 m (where *M. cruentata* recorded on all seven days).

Food and Feeding. No data on diet. Singles and small groups forage in canopy and congregate in flowering trees; two seen to search through epiphytic growth on branch. No other information available.

Breeding. No information.

Movements. Resident.

Status and Conservation. Not globally threatened. Restricted-range species: present in New Britain and New Ireland EBA. In general, present species is very poorly known. No measures or estimates of abundance are available, but species is considered to be generally common above 500 m.

Bibliography. Beehler (1978b), Beehler & Alonso (2001), Coates (1990), Diamond *et al.* (1989), Dutson (2007a), Finch & McKean (1987), Koopman (1957), Mayr & Diamond (2001), Stattersfield *et al.* (1998).

95. Rotuma Myzomela

Myzomela chermesina

French: Myzomèle de Rotuma German: Karmesinhonigfresser Spanish: Mielero de la Rotuma

Other common names: Rotuma Honeyeater

Taxonomy. *Myzomela chermesina* G. R. Gray, 1846, no locality = Rotuma Island, Fiji.

Forms a superspecies with *M. chloroptera*, *M. wakoloensis*, *M. boiei*, *M. sanguinolenta*, *M. caledonica*, *M. rubratra*, *M. cardinalis* and possibly also *M. erythromelas*. Limits of this superspecies are not certain and require further investigation, especially regarding possible inclusion of *M. erythromelas*; further, *M. erythrocephala*, *M. dammermani*, *M. kuehni* and *M. adolphinae* are closely related to the group, *M. vulnerata* also may be, and possibly *M. rosenbergii* and the *M. lafargei* superspecies should be included. Present species considered a race of *M. cardinalis* by some authors. Monotypic.

Distribution. Rotuma and offshore islets, including Uea, in N Fiji.



Descriptive notes. 13 cm. Adult male is striking: largely black, with broad bright red to scarlet strip down centre of upperbody (centre of mantle and back, and rump and uppertail-coverts), and bright red to scarlet chin, throat, breast, side of belly and anterior flanks; scarlet plumage often patchily mottled black, especially on upperbody and breast, belly and flanks; iris brown; bill black; legs grey-black. Female is like male but duller, with less red: head and upperparts grey-black, and red of upperbody duller throughout and reduced in extent on mantle to back; underparts much duller, blackish-brown chin to upper breast

with weak red wash (sometimes stronger red blotching on upper throat), merging to brownish-grey or brownish-black on lower underbody, with strong red wash on lower breast and upper belly and, on some, weak rufous tinge on vent and undertail-coverts; upperwing-coverts and remiges have narrow greyish-olive edges. Juvenile not fully described, but said to lack red on upperparts, and wing-coverts apparently edged brownish-olive; immature male has dark areas of plumage duller than adult, red on lower throat and upper breast much reduced (sometimes lacking, in which case reddish of upper throat and that of lower breast and anterior flanks separated by blackish band), belly to lower flanks and undertail-coverts pale cinnamon-grey, wing (probably largely retained juvenile plumage) has coverts edged brownish-olive, remiges edged olive, some have dark reddish wash on forehead and forecrown; immature female like adult female, but dark parts of plumage browner, and underside washed cinnamon or dark rufous. Voice. No information available; apparently undescribed.

Habitat. All habitats on Rotuma, including primary and secondary forest, edges, agricultural gardens and plantations.

Food and Feeding. Nectar; also strongly insectivorous. Gleans from outer branches in forest; seen also to hang from seedheads of weeds in open areas. Sallies for aerial insects. Highly active, aggressive and conspicuous.

Breeding. Recently fledged young in mid-May. Nest and eggs said to be like those of *M. jugularis*. No other information.

Movements. Resident.

Status and Conservation. **VULNERABLE.** Restricted-range species: present in Rotuma Secondary Area. Common on Rotuma, where the most abundant bird species. Nearly all native forest on Rotuma has been cleared for agriculture, including plantations, but extensive secondary vegetation exists and appears to provide suitable habitat. Abundance and habitat tolerance of the species should protect it from cyclone damage. Pacific rat (*Rattus exulans*) already present on the island, but introduction of other exotic predators a hypothetical threat.

Bibliography. Anon. (2007o), Butchart & Stattersfield (2004), Clunie (1984, 1985), Koopman (1957), Mayr (1932), Pernetta & Watling (1978), duPont (1976), Pratt *et al.* (1987), Stattersfield & Capper (2000), Stattersfield *et al.* (1998), Watling (2001), Zug *et al.* (1988).

96. Sulawesi Myzomela

Myzomela chloroptera

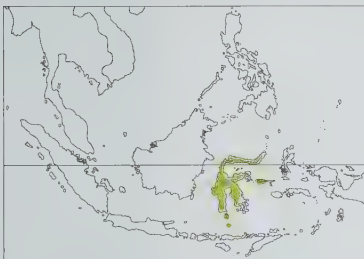
French: Myzomèle des Célèbes **Spanish:** Mielero Rojo de Célebes

German: Sulawesihonigfresser
Other common names: Sulawesi/Celebes Honeyeater, Celebes Myzomela

Taxonomy. *Myzomela chloroptera* Walden, 1872, Menado, north Sulawesi. Forms a superspecies with *M. chermesina*, *M. wakoloensis*, *M. boiei*, *M. sanguinolenta*, *M. caledonica*, *M. rubratra*, *M. cardinalis* and possibly *M. erythromelas*. Limits of this superspecies not certain and require study, especially regarding inclusion of *M. erythromelas*; further, *M. erythrocephala*, *M. dammermani*, *M. kuehni* and *M. adolphinae* are closely related to the group. *M. vulnerata* also may be, and possibly *M. rosenbergii* and the *M. lafargei* superspecies should be included. Present species sometimes treated as conspecific with *M. wakoloensis* and *M. boiei*. Proposed race *charlottae* (from Latimodjong Mts, in C Sulawesi) considered inseparable from nominate. Birds of this species on Taliabu (in Sula Is) provisionally placed in nominate, but possibly represent an as yet undescribed race. Four subspecies currently recognized.

Subspecies and Distribution.

M. c. chloroptera Walden, 1872 – mountains of N & C Sulawesi, and Sula Is (Taliabu).
M. c. juga Riley, 1921 – S Sulawesi.
M. c. eva Meise, 1929 – Salayar and Tanahjampea (S of Sulawesi).
M. c. batjanensis E. J. O. Hartert, 1903 – Bacan, off SW Halmahera.



Descriptive notes. 9–11.5 cm. Male nominate race is distinctive and striking, with head, neck, breast and mantle to uppertail-coverts scarlet-red, forming broad stripe down centre of upperbody boldly contrasting with black scapulars, wing and tail, and with narrow black loreal stripe extending in thin ring around eye and diffusely for short distance behind eye; neat narrow olive-green edges on remiges; flanks, belly, vent and undertail-coverts pale grey-brown to greyish-white, varying olive-yellow wash on centre of belly; pale flank feathers often show narrowly around angle of folded wing (separating black of wing from

red of head and neck); iris dark brown; bill and gape black; legs dark grey. Female drab brown above, more rufous brown on rump, darker sepia-brown tail and wings, thinly but conspicuously edged yellowish-olive on primary-coverts and flight-feathers, other wing-coverts edged buff; forehead, lores, frontal part of ear-coverts, chin and upper throat flame-red (more orange than in males), merging into light brownish grey on rear ear-coverts, neck sides and lower throat, breast and upper belly; lower belly, vent and undertail-coverts whitish-buff. Juvenile very similar to female; immature male as adult female but tertials, like wing-coverts, broadly edged light buff, not yellowish-olive as in adults, scarlet on head, scattered single scarlet feathers also on upperparts to vent, and on breast; immature female undescribed. Race *juga* is slightly larger than nominate, male differs in brownish-black (not black) scapulars, wing and tail, lacks yellowish wash on belly, female also similar to nominate but flame scarlet on forehead more extended and less rufous brown on upperparts; *eva* differs from nominate only in slight yellowish tinge on belly; *batjanensis* has red of plumage darker and, below, confined to throat, with breast olive, lower underbody off-white to greyish-white. Voice. Very vocal; male calls and sings from exposed branches high in canopy. Calls of nominate race include loud clear “peeew”, repeated every 2–2.5 seconds, while moving in canopy (soft “tschiep...tschiep...” repeated at intervals of several seconds probably the same call); sharp disyllabic “treeu treeé”, second syllable higher-pitched, repeated at 10-second intervals from treetops perch; fast, trisyllabic “tuwéédu” lasting 0.5 seconds and repeated every 2–3 seconds during foraging; and fast, rather brief, thin and high-pitched warble, from treetop (possibly same as short, pleasant, twittering phrase).

Habitat. Mainly primary montane forest and tall secondary forest, including moss forest, possibly mangroves. Recorded also in selectively logged forest in N Sulawesi. Mainly in mountains, but extends to lowlands on low-lying islands: 700–2400 m (occasionally down to 200 m) on Sulawesi; above 800 m on Taliabu; mainly 1500–2200 m on Bacan, but possibly down to 800 m; only in lowlands on Tanahjampea.

Food and Feeding. Nectar from flowers; a subadult was once attracted to an insect light-trap at night. Frequents canopy and upper middle storey; often forages in flowering trees, also in flowering mistletoes (of genus *Loranthus*) and parasitic shrubs. Seen singly, in twos (probably pairs), and either occasionally or regularly in small flocks; often in mixed-species flocks on Taliabu, and occasionally reported in mixed flocks of insectivores on Sulawesi.

Breeding. No information.

Movements. Possibly moves locally to exploit resources.

Status and Conservation. Not globally threatened. Common to scarce. Considered scarce to uncommon on Sulawesi, but common in Lore Lindu National Park. Moderately common on Tanahjampea, and very common on Taliabu.

Bibliography. van den Berg & Bosman (1986), Coates & Bishop (1997), Davidson & Stones (1993), Davidson *et al.* (1995), Dutton (1995), Koopman (1957), Riley (1924), Riley & Mole (2001), Rozendaal & Dekker (1989), Sibley & Monroe (1990), Stones *et al.* (1997), Stresemann & Heinrich (1940b), Watling (1983), White & Bruce (1986).

97. Wakolo Myzomela

Myzomela wakoloensis

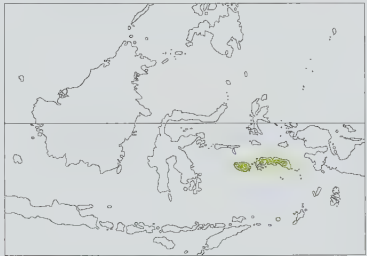
French: Myzomèle de Forbes **German:** Wakolohonigfresser **Spanish:** Mielero del Wakolo
Other common names: Wakolo Honeyeater

Taxonomy. *Myzomela wakoloensis* H. O. Forbes, 1883, Lake Wakolo, Buru, Moluccas.

Forms a superspecies with *M. chermesina*, *M. chloroptera*, *M. boiei*, *M. sanguinolenta*, *M. caledonica*, *M. rubratra*, *M. cardinalis* and possibly *M. erythromelas*. Limits of this superspecies not certain and require study, especially regarding inclusion of *M. erythromelas*; further, *M. erythrocephala*, *M. dammermani*, *M. kuehni* and *M. adolphinae* are closely related to the group. *M. vulnerata* also may be, and possibly *M. rosenbergii* and the *M. lafargei* superspecies should be included. Present species sometimes treated as conspecific with *M. chloroptera* and *M. boiei*; has been treated as a race of *M. sanguinolenta*. Races differ in plumage and, apparently, vocally; possibly represent two separate species. Two subspecies recognized.

Subspecies and Distribution.

M. w. wakoloensis H. O. Forbes, 1883 – Buru, in S Moluccas.
M. w. elisabethae van Oort, 1911 – Seram, in S Moluccas.



Descriptive notes. 9–11.5 cm; 7–9 g (*elisabethae*). Male nominate race is predominantly red above and on much of underbody, with fine black loreal stripe extending in thin ring around eye, contrasting largely black scapulars, wing and tail, wing-coverts with scarlet-red edges (smaller coverts appear largely red); much of belly red, vent and undertail-coverts black with red feather edges (appearing mottled); iris dark brown; bill and gape black, brownish base of lower mandible; legs black-grey, olive-grey or yellow-olive. Female is not well described; brown above, merging to slightly paler greyish-brown on side of head

and underbody, and with varying reddish wash on head. Juvenile and immature undescribed. Race *elisabethae* differs from nominate in having narrower scarlet edges on upperwing-coverts, more black below (much of belly to undertail-coverts), and some may have black on lower back or rump (confirmation needed). Voice. Undescribed; variants of vocalizations on Buru and Seram said to differ, but not well studied.

Habitat. Mainly primary forest and tall secondary forest, possibly also mangroves. Mainly in mountains: lowlands to 1500 m, mainly above 800 m, on Buru; 300–1400 m, mainly above 700–900 m, on Seram.

Food and Feeding. Forages at flowers for nectar; presumably also takes small invertebrates. Usually seen singly or in twos (probably pairs), occasionally in small flocks. Often in mixed-species foraging flocks on Buru; only infrequently so on Seram, but observed there in mixed flocks typically including, among others, three species of white-eye (*Zosteropidae*). Seen to forage also with *Lichmera albaauricularis*.

Breeding. No information.

Movements. Possibly locally nomadic.

Status and Conservation. Not globally threatened. Restricted-range species: present in Buru EBA and Seram EBA. Not well known. Described as moderately common to common on Buru and Seram.

Bibliography. Bowler & Taylor (1989a, 1993a, 1993b), Coates & Bishop (1997), Jepson (1993a), Jones *et al.* (1990), Koopman (1957), Marsden (1998), Poulsen & Lambert (2000), Rheindt & Hutchinson (2007a), Stattersfield *et al.* (1998), Stresemann (1914a), White & Bruce (1986).

98. Banda Myzomela

Myzomela boiei

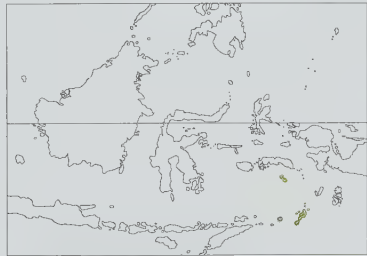
French: Myzomèle de Banda **German:** Inselhonigfresser **Spanish:** Mielero de las Banda
Other common names: Banda/Boie's/Wallacean Honeyeater

Taxonomy. *Nectarinia* (*Myzomela*) *Boiei* S. Müller, 1843, Banda Islands, Moluccas.

Forms a superspecies with *M. chermesina*, *M. chloroptera*, *M. wakoloensis*, *M. sanguinolenta*, *M. caledonica*, *M. rubratra*, *M. cardinalis* and possibly *M. erythromelas*. Limits of this superspecies not certain and require study, especially regarding inclusion of *M. erythromelas*; further, *M. erythrocephala*, *M. dammermani*, *M. kuehni* and *M. adolphinae* are closely related to the group. *M. vulnerata* also may be, and possibly *M. rosenbergii* and the *M. lafargei* superspecies should be included. Present species sometimes treated as conspecific with *M. chloroptera* and *M. wakoloensis*; has also been treated as a race of *M. sanguinolenta*. Two subspecies recognized.

Subspecies and Distribution.

M. b. boiei (S. Müller, 1843) – Banda Is, in S Moluccas.
M. b. annabellae P. L. Sclater, 1883 – Babar and Tanimbar Is (Yamdena, Selaru), in extreme E Lesser Sundas.



Descriptive notes. 9–11.5 cm. Male nominate race is distinctive and striking, with head, neck, upper breast and mantle to uppertail-coverts scarlet-red, forming broad stripe down centre of upperbody boldly contrasting with black scapulars, wing and tail, and with narrow black loreal stripe extending in thin ring around eye; black extends from scapulars to form breast-band across lower breast, separating red of chin, throat and upper breast from greyish-white lower underbody; iris black; bill and gape black; legs brownish. Female is brown above, merging to slightly paler greyish-brown on side of head and underbody, and with vary-

ing reddish wash on head; probably smaller than male. Juvenile and immature undescribed. Race

annabellae male differs from nominate in having narrower black breastband and more olive underbody below it. **VOICE.** Undescribed.

Habitat. Mainly primary closed forest and tall secondary forest, secondary woodland, lightly wooded farmland, selectively logged semi-evergreen forest, cultivation; also mangroves on Yamdena. Only in lowlands in Tanimbar Is.

Food and Feeding. Seen singly, in twos (probably pairs) and, occasionally, in small flocks. No other information.

Breeding. In Banda Is, nests with eggs and with nestlings recorded in Sept, and recently fledged young late Apr. No other information.

Movements. Possibly locally nomadic.

Status and Conservation. Not globally threatened. Restricted-range species: present in Banda Sea Islands EBA. Very poorly known. Described as moderately common in Tanimbar Is.

Bibliography. Bishop & Brickle (1999), Coates & Bishop (1997), Hartert (1901), Johnstone & Sudaryanti (1995), Koopman (1957), Moores *et al.* (1996), Rheindt & Hutchinson (2007a), Stattersfield *et al.* (1998), White & Bruce (1986).

99. Scarlet Myzomela

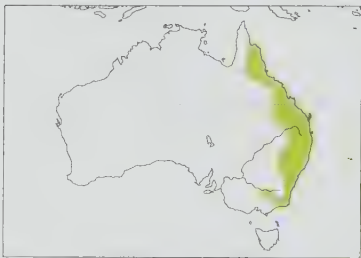
Myzomela sanguinolenta

French: Myzomèle écarlate **German:** Scharlachhonigfresser **Spanish:** Mielero Escarlata
Other common names: Scarlet/Sanguineous/Blood-(red)/Crimson Honeyeater, Sanguineous Myzomela

Taxonomy. *Certhia sanguinolenta* Latham, 1801, Nova Hollandia = region of Port Jackson, New South Wales, Australia.

Species sometimes referred to by name *M. dibapha* (published with current name simultaneously in same book), but priority of present name has now been stabilized. Forms a superspecies with *M. chermesina*, *M. chloroptera*, *M. wakoloensis*, *M. boiei*, *M. caledonica*, *M. rubrata*, *M. cardinalis* and possibly *M. erythromelas*. Limits of this superspecies not certain and require study, especially regarding inclusion of *M. erythromelas*; further, *M. erythrocephala*, *M. dammermani*, *M. kuehni* and *M. adolphinae* are closely related to the group, *M. vulnerata* also may be, and possibly *M. rosenbergii* and the *M. lafargei* superspecies should be included. Present species sometimes treated as conspecific with *M. caledonica*. Monotypic.

Distribution. Coastal and subcoastal E Australia from NE Queensland (Cape Melville) S, inland to Great Divide (as far inland to e.g. Carnarvon Gorge and, in New South Wales, Warrumbungle Ranges and Southern Tablelands), to E Victoria (mainly from near Mallacoota W to Mitchell River National Park).



Descriptive notes. 9–11 cm; male 6.4–13 g, female 5.5–10 g. Male is distinctive, with head and neck to upper breast and broad stripe down centre of upperbody scarlet (some have small patches of black scattered throughout scarlet plumage), black loreal stripe continuing in thin ring around eye, and black scapulars, side of mantle and upperwing; greater secondary wing-coverts with fine off-white fringes, and remiges with thin whitish edges (diffuse pale panel on folded wing; pale margins of feathers much reduced with wear); uppertail dull black; underbody below upper breast largely greyish-white with diffuse red wash, dark grey mottling on side of belly, diffuse dark grey patch at side of breast bordered along upper edge by blackish band; undertail dark grey, underwing white with broad dark grey trailing edge and tip; iris dark brown; bill and gape black, gape sometimes pale yellow; legs dark grey or dark grey-brown. Female is smaller than male, has head, neck and upperbody brown, slightly paler and greyer on side of head and merging to pale grey-brown on chin and throat; usually pink-red wash on chin and throat, often also on malar area and anterior ear-coverts, sometimes a faint red-brown wash on forehead (at times with brighter red patches), and sometimes a few small scarlet-red patches on uppertail-coverts; uppertail blackish-brown, all except central feather pair with narrow straw-yellow fringes; upperwing blackish-brown, marginal secondary coverts brown, median and greater coverts and tertials with narrow light grey-brown or cream fringes, remiges with thin straw-yellow edges (diffuse pale panel on folded wing); underbody light brown-grey, browner on breast and paler creamy or off-white in mid-line; underwing and undertail as male, bare parts as male except for yellow basal half or most of lower mandible, yellow gape. Juvenile is very similar to female, but slightly warmer brown above with contrastingly paler brown rump and uppertail-coverts, slightly broader and richer buff-brown fringes on secondary coverts and tertials, pale edges of remiges slightly brighter yellow, gape initially clearly swollen; immature male similar to adult but retains varying amounts of juvenile plumage, some probably inseparable in field, some roughly intermediate between adult male and female; immature female poorly known, doubtfully separable from adult female. **VOICE.** Song rather loud, melodious, tinkling and bell-like, often consisting of phrases of 6 notes, rising and falling erratically or, sometimes, short tinkling twitters. Calls include brisk “chiew-chiew”, by both sexes as contact; brief chirps by female when bathing and preening, and when greeting male; and sibilant squeak by female.

Habitat. Dry open sclerophyll forests and woodlands, usually dominated by eucalypts, sometimes mixed with cypress-pines (*Callitris*), *Angophora* and acacias, and usually with sparse understorey; frequently in riparian vegetation around wetlands and with flowering shrubs, such as paperbarks (*Melaleuca*) and bottlebrushes (*Callistemon*). Also often in wet sclerophyll forest with understorey of rainforest plants; less often in rainforest or mangroves; very occasionally in other habitats, e.g. heathland, low open *Banksia* forest or brigalow (*Acacia harpophylla*) woodland. Regularly in parks, gardens and urban areas.

Food and Feeding. Mainly nectar; occasionally fruit and insects. Nectar mainly from *Eucalyptus*, *Melaleuca*, *Callistemon*, *Banksia* and *Grevillea*, and mistletoes (Loranthaceae). Insects taken include beetles (Coleoptera), flies (Diptera), aphids (of family Aphididae) and larval Lepidoptera. Arboreal, usually forages among flowers and foliage in upper and outer canopy, e.g. in one study 92% of observations involved probing of flowers. Obtains nectar by flower-probing, sometimes sally-hovering; obtains insects by gleanings from foliage, twigs and branches, and by sally-striking in air. In study on New England Tableland (N New South Wales), foraged mostly more than 10 m above ground, and spent 24% of time in feeding when levels of nectar moderate; while feeding on nectar, made mean of 13 probes per inflorescence and spent 18 seconds at each inflorescence; when catching flying insects, made average of 1.94 sallies per minute. Forages singly, in twos (possibly pairs), and in small parties of up to twelve or so individuals; sometimes in larger numbers at profusely flowering plants. At least at times appear to defend feeding territories against conspecifics. When

foraging together, usually displaces conspecifics, landing on or near perch vacated by target of attack, but sometimes chases others.

Breeding. Jul–Jan, apparently earlier in N (Jul records) and season possibly shorter in S, and fledglings once recorded in late May; one pair successfully raised three broods in a season. Nests as solitary pair. Nest may be built by both sexes, but roles can vary; small and cup-shaped, contents sometimes visible through wall, made of fine strips of bark and grass, loosely bound with spider web, usually lined with fine plant fibre, casuarina needles and occasionally rootlets, sometimes unlined, external diameter 5.1 cm, depth 3.8 cm, internal diameter 3.8 cm, depth 2.5–3.2 cm; suspended by rim from horizontal or dangling branch, or supported in upright fork, usually hidden among foliage, c. 1.2 m to c. 25 m (mostly 3–12 m, average 5.6 m) above ground. Clutch 2 eggs, occasionally 3; incubation probably by female only, period 11–12 days; chicks fed by both parents, nestling period 11–12 days; juveniles fed by both parents for at least 10 days after fledging.

Movements. Partly resident and partly migratory, with some local movement or dispersal. Appears to be resident in subhumid NE Queensland; irregular visitor to Paluma Range, Feb–Apr and Sept–Nov, which fits with patterns of migration farther S. At intermediate latitudes (SE Queensland and NE New South Wales) at least partly resident, and part of population migratory; N migration recorded in Mar–Apr, and S passage recorded in Queensland Aug–Oct, with passage through or influx into NE New South Wales and SE & E Queensland in winter. Largely spring–summer breeding visitor in S of range, including SE New South Wales and Victoria. In study in SE Queensland, 1986–1993, a small part of population migratory, arriving Mar–Apr and leaving in Dec, but many recorded on passage: some remained in area for several months; suggested that birds also moved inland during times of peak rainfall in summer. Movements often said to be associated with flowering of foodplants (such movement often described as nomadic), fluctuations in numbers coinciding with flowering of certain trees and shrubs; in SE Queensland study, however, presence or absence of blossom was not main factor, and abundance of this species was negatively correlated with rainfall. Sometimes seen to move in small flocks. In Victoria vagrant W of 147° E.

Status and Conservation. Not globally threatened. Locally common. Recorded densities include 0.01–0.02 birds/ha near Armidale and 0.6 birds/ha on Hawkesbury R, both in New South Wales. As with many other dichromatic species in this genus, sex ratio appears to be male-biased, e.g. ratio of 1.5:1 for netted birds in SE Queensland (neither sex appearing to be more susceptible to trapping); males, however, also much more conspicuous than females in appearance and behaviour.

Bibliography. Andrew (1993), Barrett *et al.* (2003), Blaber (1995), Blakers *et al.* (1984), Bourke & Austin (1947), Bravery (1970), Campbell (1900), Chaffer (1930), Coates & Bishop (1997), Colemane (1974), Comrie-Smith (1930), Cooney *et al.* (2006), Cooper (1975a), Dow (1973), Emison *et al.* (1987), Ford, Bridges & Noske (1985), Ford, Noske & Bridges (1986), Gannon (1962), Gibson (1977), Gilbert (1935), Gill, H.B. (1970), Gosper (1986), Griffin (1974, 1995), Griffioen & Clarke (2002), Hardy & Farrell (1990), Higgins (2001), Hindwood (1944), Hindwood & McGill (1958), Johnson & Hooper (1973), Keast (1968a, 1985a), Koopman (1957), Lavery (1986), Le Souëf & Macpherson (1920), Leach & Hines (1987), Leishman (1994), Longmore (1978), Lord (1956), Marshall (1934a), McFarland (1984b, 1986b, 1986c, 1994b), Morris (1975a), Morris *et al.* (1981), North (1906), Officer (1971), Passmore (1982), Pizzey & Knight (1997), Pratt (1971), Recher (1975), Rheindt & Hutchinson (2007a), Roberts (1979), Roberts & Ingram (1976), Robertson (1965), Robertson & Woodall (1983), Schodde & Mason (1999), Sibley & Monroe (1990), Slater (1995), Storr (1953, 1984), Wheeler (1959), White & Bruce (1986), Wolstenholme (1922, 1923, 1930).

100. New Caledonian Myzomela

Myzomela caledonica

French: Myzomèle calédonien **German:** Neukaledonien-Honigfresser **Spanish:** Mielero de Nueva Caledonia
Other common names: New Caledonian Honeyeater

Taxonomy. *Myzomela caledonica* W. A. Forbes, 1879, New Caledonia.

Forms a superspecies with *M. chermesina*, *M. chloroptera*, *M. wakoloensis*, *M. boiei*, *M. sanguinolenta*, *M. rubrata*, *M. cardinalis* and possibly *M. erythromelas*. Limits of this superspecies not certain and require study, especially regarding inclusion of *M. erythromelas*; further, *M. erythrocephala*, *M. dammermani*, *M. kuehni* and *M. adolphinae* are closely related to the group, *M. vulnerata* also may be, and possibly *M. rosenbergii* and the *M. lafargei* superspecies should be included. Present species sometimes treated as conspecific with *M. sanguinolenta*. Monotypic.

Distribution. New Caledonia, including I of Pines.



Descriptive notes. 10–12 cm; two males 7.5 and 8.2 g, two females 6.6 g and 6.9 g. Male is strikingly red, black and cream; head, neck and centre of upperbody deep scarlet, with black loreal stripe extending in thin ring around eye, black scapulars and side of mantle and back and scattered black patches exposed throughout scarlet of upperbody (particularly on rump and uppertail-coverts); uppertail dull black; upperwing black, remiges slightly duller and with thin greyish-white to greyish-olive edges (diffuse panel on folded wing, much reduced with wear); red of head extends down to upper breast, dark grey patch at side and merging to

diffuse red wash on lower breast, anterior flanks and side of belly, where increasingly mottled with grey; rest of underbody creamy white; undertail dark grey, underwing white with broad dark grey trailing edge and tip; iris dark brown; bill black; legs dark grey to dark grey-brown or brownish-green, soles yellow. Female is smaller than male, head and neck brownish-grey, slightly paler and greyer at sides and noticeably paler light grey-brown on chin and throat, usually with distinct reddish-brown forehead, anterior ear-coverts, malar area and chin and throat; upperbody brownish-grey, sometimes a few small reddish patches on uppertail-coverts; uppertail blackish-brown, all except central feather pair with narrow straw-yellow fringes, upperwing blackish-brown, brown marginal secondary coverts, fine light brown or cream fringes on median and greater coverts, fine straw-yellow edges of remiges (diffuse pale panel on folded wing); breast, flanks and belly light brown-grey, with olive-grey mottling on breast, merging to paler dirty white on centre of belly, vent and undertail-coverts; underwing and undertail as male; bare parts as male, but basal half (sometimes most) of lower mandible yellow, gape yellow. Juvenile is like female, but upperparts slightly warmer brown (except rump and uppertail-coverts noticeably paler brown), secondary coverts and tertials have slightly broader and richer buff-brown fringes, pale edges of remiges slightly brighter yellow, yellowish gape initially clearly swollen; immature male usually separable by contrasting mixture of adult-like scarlet-and-black plumage and brownish retained juvenile plumage (appearance somewhat between adult male and adult female), some very like adult male and probably inseparable in field. **VOICE.** Male song a series of short hurried phrases, each usually

of 2–10 notes, e.g. a short dry rattle of identical double notes, “tchu-tchu—tchu-tchu— tchu-tchu...”, or “tch-tchwy-tchwy”. Contact call very short sharp high-pitched single “tsip” notes.
Habitat. Humid forest, including stunted forest on high slopes, and niaouli (*Melaleuca leucadendron*) savanna woodland; also forest edge and in modified habitats such as plantations and gardens. Lowlands and middle altitudes.
Food and Feeding. Primarily nectar; also small arthropods (insects). Forages in all types of flowering trees, including niaouli. Confiding and active, climbing among flowers.
Breeding. Breeds Nov–Jan. Nest a tiny and rudimentary cup, made of fine twigs, rootlets and other plant fibres, usually or always unlined, internal diameter 4.5–5 cm, typically attached to branches

by spider web, often high in tree. Clutch 2 eggs; said that parents share incubation and brood-feeding duties; no information on duration of incubation and nestling periods.
Movements. No information; apparently resident.
Status and Conservation. Not globally threatened. Restricted-range species; present in New Caledonia EBA. No estimates of global abundance; variously considered common or rare. Widespread within tiny range.
Bibliography. Delacour (1966), Doughty *et al.* (1999), Dutson (2007a), Hannecart & Létocart (1980), Higgins *et al.* (2001), Koopman (1957), Layard & Layard (1882), Myers (2004), Ross (1988), Stattersfield *et al.* (1998), Stokes (1980), Tristram (1879).



PLATE 47

Family MELIPHAGIDAE (HONEYEATERS)
SPECIES ACCOUNTS

101. Micronesian Myzomela

Myzomela rubrata

French: Myzomèle de Micronésie

Spanish: Mielero de Micronesia

German: Mikronesienhonigfresser

Other common names: Micronesian (Cardinal) Honeyeater; Guam/Safford's Cardinal Honeyeater (*saffordi*)

Taxonomy. *Cinnyris rubrata* Lesson, 1827, Kosrae, east Caroline Islands.

Forms a superspecies with *M. chermesina*, *M. chloroptera*, *M. wakoloensis*, *M. boiei*, *M. sanguinolenta*, *M. caledonica*, *M. cardinalis* and possibly *M. erythromelas*. Limits of this superspecies not certain and require study, especially regarding inclusion of *M. erythrocephala*, *M. dammermani*, *M. kuehni* and *M. adolphinae* are closely related to the group, *M. vulnerata* also may be, and possibly *M. rosenbergii* and the *M. lafargei* superspecies should be included. Present species sometimes treated as conspecific with *M. cardinalis*, but differs in morphology and vocalizations. Birds of this species recorded on Sapwuahfik (Ngatik), near Pohnpei, of uncertain race; provisionally included in *dichromata*. Seven subspecies recognized.

Subspecies and Distribution.

M. r. asuncionis Salomonsen, 1966 – N & C Northern Mariana Is (Maug Is and Asuncion S to Anatahan).

M. r. saffordi Wetmore, 1917 – S Northern Marianas (Saipan, Tinian, Aguijan, Rota; formerly also Guam).

M. r. kobayashii Momiyama, 1922 – nearly all islands of Palau (from Kayangel S to Angaur).

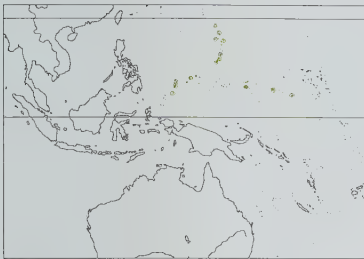
M. r. kurodai Momiyama, 1922 – Yap, in W Caroline Is.

M. r. major Bonaparte, 1854 – Chuuk Is, including Nama, Losap and Mortlock Is (Namoluk, Ettal, Lukunor and Satawan atolls), in C Carolines.

M. r. dichromata Wetmore, 1919 – Pohnpei and nearby Sapwuahfik Atoll (Ngatik), in E Carolines.

M. r. rubrata (Lesson, 1827) – Kosrae, E of Pohnpei.

Descriptive notes. c. 13 cm; male 10.5–18 g, female 10.4–15 g (*saffordi*). Male nominate race is striking, with head and neck to breast and belly and central upperbody (centre of mantle and back, and rump and uppertail-coverts) brilliant deep scarlet to scarlet-red, narrow black loreal stripe continuing in narrow ring around eye and as short diffuse blackish stripe behind eye; black bases of red feathers can show through scarlet plumage as patchy black mottling, particularly on mantle, back and scapulars (can appear largely black), but scarlet of upperbody strikingly conspicuous in flight; rest of mantle and back, scapulars, upperwing and uppertail black, remiges with fine pale olive-grey outer edges; vent and undertail-coverts duller, sooty black, undertail dark grey-black; iris brown to dark brown; bill black; legs greyish-black to dark grey-brown. Female is smaller than male, similarly patterned but duller overall, with hood and central upperbody dull red, rest of upperbody, upperwing and uppertail dark brownish-grey to olive-brown, paler olive-grey outer edges of remiges and rectrices, and lower underbody dark grey to olive-grey; bare parts apparently as for male. Juvenile nominate not fully described, juvenile *saffordi* male brownish-olive to brownish-



on chin, throat and central upperbody, with belly to undertail-coverts washed buff. Races differ mainly in general plumage tone and pattern of female, also in tone of red and extent of black on head of male, and in size: *dichromata* is slightly smaller than nominate but with longer bill, male slightly paler scarlet, with broader black loreal stripe and eyering, female duller than nominate, largely dusky brownish-grey, with red reduced to pale wash on upperbody and chin to breast (red on crown to hindneck and side of head lacking or very faint); *kobayashii* is smaller than previous but with slightly longer tail, male like nominate but with darker scarlet-red coloration, and olive edges on remiges and rectrices, female like previous but red darker, head partly red, belly to undertail-coverts and axillaries buff-grey; outer edges of remiges and rectrices pale olive; *kurodai* is apparently smaller than nominate, from which male differs in less intensely scarlet plumage, female dark olive-brown above, slightly paler on chin to upper breast, ashy white with yellowish tinge on rest of underbody, and with red wash on head to breast and centre of upperbody (brightest on back to rump), and olive edges on remiges and rectrices; *saffordi* is slightly smaller than nominate but with longer bill, male like nominate but paler, more orange-red, and edges of remiges and rectrices olive, female like nominate but paler overall, upperparts dark olive-grey and mottled with scarlet, outer edges of remiges and rectrices greenish-olive, lower underbody buff-grey; *asuncionis* male is like previous but slightly larger, female quite different from previous, dark olive-brown above with dull red forehead, nape and chin, red wash on throat, and red back to upper-tail-coverts (but not hindneck and mantle), and underbody pale greyish-yellow, with reddish wash on breast (continuous with chin and throat); *major* is slightly smaller than nominate but with longer bill, scarlet slightly less intense, female like nominate but underbody more intensely red, and lower underbody black, also tail slightly darker. Voice. Fairly vocal, and vocalizations given throughout day, though most vocal at dawn. On Guam, main call a sharp, wheezy, upslurred whistle, typically followed by a chirp, repeated regularly. Song a long, complex series of chirps, tweets and whistles, usually in paired syllables, given for short time before dawn but sometimes also at dusk; in Palau, said to sing only before dawn. On Guam, where apparently extinct, territorial song was described as high-pitched and reedy, given during breeding season. Other calls include wheezy chirps or soft scratchy or wheezing notes, buzzy notes, whistles, and scolding notes; male may utter brief and quiet staccato notes during apparent courtship-flight. Possibly some geographical variation in vocalizations, some phrases apparently heard on only one island, but samples small and study needed.

Habitat. Forest, forest edge, mangroves, native palm (*Clinostigma*) forests, coastal scrub (including *Pemphis*) and strand vegetation, secondary growth, shrubby or weedy savanna, and other disturbed habitats, including coconut plantations and groves, agroforest, roadsides; also in towns and villages, and gardens in urban areas. In Mortlock Is (Chuuk), encountered in all terrestrial habitats: coconut (*Cocos nucifera*) forest, with breadfruit (*Artocarpus*) a co-dominant in coconut forest in interior of islands, coastal scrub or thicket dominated by *Tournefortia* and *Scaevola* or by *Pemphis*, and human-maintained taro (*Colocasia*) patches. In Palau and Northern Mariana Is, and on islands of Sapwuhfik Atoll, more common at forest edges, forest openings and other disturbed habitats than in undisturbed forest; in Marianas, sometimes visits flowering herbaceous plants in open grassy savanna. On Pakin Atoll (Pohnpei), in coconut forest and *Pemphis* scrub. On Yap, Chuuk, Pohnpei and Kosrae most abundant in mangroves, and on Kosrae highest densities recorded in massive trees of mature *Sonneratia* forest and less abundant in usually smaller *Rhizophora*; densities in mangroves, however, varied markedly among islands, possibly as a result of maturity and richness of stands, floristic composition, and competition with other bird species. In S Northern Marianas (race *saffordi*), density variation from island to island possibly related to habitat, species preferring native forest and diverse secondary vegetation (most abundant on Aguijan and Rota, corresponding to highest densities of myzomelids) over homogenous stands of *Leucaena* (common on Tinian and Saipan, where densities lowest); on Saipan, densities in native forest lower than those in disturbed sites. On uninhabited Sarigan (C Northern Marianas), density found to be significantly higher in native forest than in coconut forest, and highest in native forest on island plateau where many *Erythrina* trees were flowering. Sea-level to highest peaks, primarily in lowlands (the overwhelming altitude within species' range): in E Caroline Is, recorded at about same rates below 200 m as at 200–800 m on Pohnpei, and on Kosrae density at 0–100 m about three times greater than at 400–600 m (probably owing to scarcity of nectar in scrubby montane forests at higher elevations).

Food and Feeding. Nectar; also small invertebrates, mainly insects, including aphids (Aphidoidea) and scale insects (Coccoidea), also spiders (Araneae), and in Palau reported as taking snails (Gastropoda). Estimated ratio of nectar to insects 60:40 in one study. Forages at all levels in shrubs and trees; in forest and coconut groves mainly in upper canopy, whereas in more open habitats (including gardens) tend to forage at all levels. Frequently feeds at flowers of coconut palms and native palms and, where present, lantana (*Lantana camara*); seen also to feed at flowers of bananas, *Elaeocarpus*, *Hibiscus*, *Erythrina*, *Cestrum*, *Morinda*, *Premna*, *Scaevola*, *Vitex*, *Cynometra*, *Pemphis*, *Albizia*, *Cassia*, *Schefflera*, *Cyrtandra*, and mangroves (including *Sonneratia*, *Rhizophora*). Moves among flower clusters and systematically inserts bill into every flower, feeding at as many as 30 flowers per minute; spends up to 30 minutes in searching and foraging at single coconut palms in flower. Perches beside, or sometimes hovers at, flowers to take nectar. Gleans invertebrates from foliage or spider webs, and sometimes takes insects by sallying in air; seen to seize spiders and insects from beneath eaves or canvas awnings of buildings. Active and conspicuous, darting among vegetation. Usually singly or in twos, and more often in pairs in breeding season, though sometimes congregates at sources of abundant nectar, e.g. 15 or more in flowering *Parinarium*. Aggressive and territorial; two or three individuals often seen in aerial chases above or through canopy, and even between small islands, and sometimes grapple in mid-air. Defends feeding territory from other small birds, especially white-eyes (Zosteropidae).

Breeding. Throughout Micronesia breeding appears to occur in all months through year, with little or no seasonal fluctuation: in Northern Marianas breeds throughout year, with no evidence of

seasonality, eggs recorded Jan–Mar and May–Jul and nestlings Apr; thought to breed throughout year in Caroline Is, on Chuuk in nearly all months (eggs Jan–Jun, Sept and Dec), on Pohnpei eggs recorded Jul–Sept and one brood Nov–Dec, on islands of Sapwuhfik Atoll many in pairs May–Jul and active nesting in early Jun, on Ant Atoll fledglings in boreal summer, and on Kosrae eggs recorded late Feb and mid-Mar. Territorial; aggressively defends nest against conspecifics and other species. Nest a light, loosely woven (eggs often visible through base or side) but fairly deep cup made of fine grasses, fern fronds, casuarina needles, rootlets, leaves and leaf fragments, plant stems, shreds of coconut bast, and spider web, lined with lichens or fine grasses, on Chuuk cup often made from dark vine tendrils and what appeared to be aerial rootlets or saprophytes, three nests on Saipan made of vine tendrils and *Casuarina equisetifolia* needles (one with part of *Pandanus* leaf skeleton entwined around base); on Guam external diameter 3.5–8 cm, depth 5–12 cm, internal diameter 2.5–6 cm, depth 2.5–5 cm, three nests on Saipan had mean external diameter 6.6 cm, depth 5.5 cm, internal diameter 4.7 cm, depth 4.1 cm, and for 18 nests on Chuuk mean external diameter 5 cm and depth 2 cm; suspended and possibly sometimes supported, often only weakly attached, usually woven into thin horizontal fork at end of branch (sometimes in crotch or close to trunk), typically in dense foliage of small live tree or shrub (including young coconut), and usually less than 5 m above ground, in Marianas generally 1.2–4.6 m (but seven nests on Saipan 1.5–5.1 m, mean 2.9 m; two on Guam were at 3.1 m and 4.6 m), in Palau one c. 2 m up, in Sapwuhfik Atoll one at c. 5 m, but an unfinished nest in Chuuk was 16 m above ground in dead tree. Clutch usually 2 eggs, less often 1 (and brood of three once reported in Palau); incubation and brooding said to be by both sexes, but on Saipan (race *saffordi*) only female incubated and single observation of female brooding, although both parents usually observed close to nests; on Saipan, incubation period 12 days and nestling period more than 13 days, two young leaving nest prematurely at 13–14 days (one chick was returned to nest by observer, subsequently left nest at 15–16 days). Of seven nests on Saipan, three fledged at least one young.

Movements. Resident; possibly some short local movements associated with flowering events. On Kosrae, seen to fly singly or in small flocks, well above canopy, apparently from roosts in coastal lowlands towards foraging sites at higher elevations in inland forests.

Status and Conservation. Not globally threatened. Restricted-range species: present in Mariana Islands EBA, in Palau EBA, in Yap Islands EBA, and in East Caroline Islands EBA. Common to abundant throughout much of range; less so in Marianas, although still one of the commonest bird species there. Many estimates of total population and densities. In C Northern Marianas, race *asuncionis* the most abundant forest bird on Sarigan, with estimated population of 1821 individuals, at overall density of 11.2 birds/ha (although densities differed significantly between surveys in 1990 and 1997). In S Northern Marianas, *saffordi* common to abundant from Saipan S to Rota, with estimated total population for these four islands 63,120 individuals, island densities ranging from 1.14 to 5.70 birds/ha; densities on Saipan declined between surveys in 1986 and 1997, but not known whether this apparent decline is real and, if it is, what the causes for it are. Race *kobayashii* in Palau considered common on all islands, with total population in 1991 estimated at 59,690 individuals, and densities ranging from 0.4 to 3.37 birds/ha. Yap race *kurodai* common, with population of 109,360 individuals at estimated density of 10.98 birds/ha. Race *major* abundant on all islands surveyed in Chuuk Lagoon, with estimated total population of 165,440 birds at mean density of 20.67 birds/ha; the second most numerous landbird in Mortlock Is, where equally abundant on inhabited and uninhabited islands. In Pohnpei, race *dichromata* one of the most abundant bird species, with estimated total population of 358,070 individuals at mean density of 10.71 birds/ha, although a reduction in encounter rates was evident between 1983 and 1994 (but not known whether or not this represents a real decline); density on Ant Atoll 2.7 birds/ha and on Pakin Atoll (where the most numerous bird species) 3.8 birds/ha; common to very common on islands of Sapwuhfik Atoll, with overall density of 1.8 birds/ha. Nominative race restricted to Kosrae (E of Pohnpei), where one of the most abundant birds, with a total estimated population of 136,360 individuals and a mean density of 14.33 birds/ha; in Kosrae mangroves recorded at 40 birds/ha, one of the highest densities of any forest bird in Micronesia. Ready use by this species of modified habitats suggests little immediate impact of increasing human population and development of forestry and agricultural activities. Introduced brown tree-snake (*Boiga irregularis*), however, a major threat to avifauna of all Micronesian islands and already responsible for extirpation of present species on Guam (where deforestation probably caused earlier declines); Guam population declined rapidly in 1970s, almost extinct in S by 1976, and estimated to number fewer than 150 pairs in 1977; last recorded on Guam in 1986. Small numbers of this snake may have become established on Saipan, where same race as that of Guam (*saffordi*) could be at risk. Further, although this species utilizes a wide range of modified habitats, these may not provide suitable nesting sites. On islands of Sapwuhfik Atoll, hunted for food by people, and less abundant on permanently inhabited Ngatik than on other more sparsely populated islands. Often killed by children with slingshots or air-rifles around human habitation. As one of the few nectarivorous species in Micronesia, and owing to its abundance, it may be an important plant-pollinator. As with some other members of genus, sex ratio appears biased at some sites, but this possibly a result of sexual differences in behaviour and conspicuousness (males typically more conspicuous than females) or in foraging levels.

Bibliography. Baker (1951), Brandt (1962), Buden (1996a, 1996b, 1999, 2000, 2006), Craig (1996), Drahos (2006), Engbring (1983, 1988, 1992), Engbring *et al.* (1986, 1990), Fancy *et al.* (1999), Hartert (1900a), Jenkins (1983), Koopman (1957), Marshall, J.T. (1949), Marshall, M. (1975), Pratt, Bruner & Berrett (1987), Pratt, Engbring *et al.* (1980), Reichel & Glass (1991), Sachtleben *et al.* (2006), Salomonsen (1966a), Schönwetter & Meise (1981), Spennemann (1999), Stattersfield *et al.* (1998), Steadman (1999), Wiles (2003, 2005), Wiles & Conry (1990), Wiles *et al.* (2003), Yamashina (1932).

102. Cardinal Myzomela

Myzomela cardinalis

French: Myzomèle cardinal **German:** Kardinalhonigfresser **Spanish:** Mielero Cardenal
Other common names: Cardinal Honeyeater, Black-bellied Honeysucker; Samoan Cardinal Myzomela (*nigriventris*); Lifou Cardinal Myzomela (*lifuiensis*)

Taxonomy. *Certhia Cardinalis* J. F. Gmelin, 1788, Tanna Island, Vanuatu. Forms a superspecies with *M. chermesina*, *M. chloroptera*, *M. wakoloensis*, *M. boiei*, *M. sanguinolenta*, *M. caledonica*, *M. rubrata* and possibly *M. erythromelas*. Limits of this superspecies not certain and require study, especially regarding inclusion of *M. erythromelas*; further, *M. erythrocephala*, *M. dammermani*, *M. kuehni* and *M. adolphinae* are closely related to the group, *M. vulnerata* also may be, and possibly *M. rosenbergii* and the *M. lafargei* superspecies should be included. Present species sometimes treated as conspecific with *M. chermesina*; formerly treated as conspecific with *M. rubrata*, but differs in morphology and vocalizations. Race *pulcherrima*

apparently a recent invader on San Cristobal (Solomon Is), possibly hybridizing with *M. tristrami* in the past. Eight subspecies recognized.

Subspecies and Distribution.

- M. c. sanfordi* Mayr, 1931 – Rennell, in S Solomon Is.
- M. c. pulcherrima* E. P. Ramsay, 1881 – San Cristobal, Ugi and Three Sisters Is, in SE Solomons.
- M. c. sanctaecrucis* F. Sarasin, 1913 – islands of Santa Cruz Group, including Nepani, Reef Is (Fenualoa, Lonlom), Duff Is, Nendo, Utupua, Vanikoro, and Torres Is (Hiu, Loh).
- M. c. tucoptiae* Mayr, 1937 – Tucopia I (E of Vanikoro), in Santa Cruz Group.
- M. c. tenuis* Mayr, 1937 – Banks Is and N & C Vanuatu (S to Efate).
- M. c. cardinalis* (J. F. Gmelin, 1788) – S Vanuatu (Erromango, Tanna, Aniwa, Futuna, Anatom).
- M. c. lifuensis* E. L. Layard & E. L. C. Layard, 1878 – Loyalty Is (Ouvéa, Lifou, Maré).
- M. c. nigriventris* Peale, 1848 – Samoa (Savai'i, Upolu and offshore islets of Apolima, Manono and Nu'utele) and W American Samoa (Tutuila).



Descriptive notes. 9–12.5 cm; male 16–23 g and female 13 g (*sanfordi*), male 14–18 g and female 11.5–14 g (*pulcherrima*), male 11.5–15 g and female 10–11.7 g (*nigriventris*). Male nominate race is striking, mostly black, somewhat glossy above and sooty black below, with deep red or scarlet hood extending to uppermost breast and enclosing black loreal stripe that extends in thin ring around eye, and deep red to scarlet central upperbody (centre of mantle and back, and rump and uppertail-coverts) typically patchily mottled with black, especially on rump and uppertail-coverts (red of upperbody partly or wholly concealed when bird perched, but strikingly conspicuous in flight); upperswing and uppertail black-brown; undertail dark grey-brown; underwing-coverts dusky black, remiges pale grey-brown with glossy sheen and pale buff-grey bases (pale stripe across centre of underwing); iris brown to dark brown or grey-brown; bill black; legs blackish-grey to dark grey-brown. Female is smaller and duller than male, head and upperbody dull dark olive-brown or dark olive-grey, slightly paler rufous-brown on rump and uppertail-coverts, reduced dull red to red hood not extending to hindneck or breast, usually scattered small diffuse patches of red from centre of mantle to uppertail-coverts (some have reddish centre of mantle and back), uppertail blackish-brown, upperswing dark greyish-brown, median and greater wing-coverts with fine pale brown to buff margins, remiges with fine yellow-brown edges; underbody dirty buff-white to olive-buff, washed dark grey across upper breast, with diffuse dark olive-grey mottling or streaking on breast, flanks and belly petering out towards unmarked centre of belly and and somewhat warmer buff thighs, vent and undertail-coverts; undertail as male, underwing largely off-white with dark grey trailing edge and tip; bare parts much as male, but base of bill brownish, possibly gape sometimes yellowish. Juvenile is like female but slightly paler, with red confined to forehead, forecrown and chin and malar area (and sometimes as faint wash over ear-coverts), small scattered patches of red on upperbody, throat or breast (sometimes lacking), slightly broader and paler buff-brown fringes on upperswing-coverts and tertials, outer edges of remiges slightly brighter yellow-green, base of lower mandible paler (brownish-black or creamy grey), gape initially clearly swollen and yellow; immature male variable, at least some identifiable by contrasting mixture of adult-like scarlet-and-black male plumage and female-like plumage as well as some brownish retained juvenile plumage, some have head and upperparts much as adult but blackish underparts with pale greyish-olive wash over breast merging to more extensive pale greyish-olive mottling over lower underbody, also some brownish juvenile greater primary coverts with buff fringes (visible only in close view) and juvenile remiges (fringes and edges lost with wear), others have incomplete red hood with black of lores extending over eye to nape and hindneck and washing across red of malar area and anterior ear-coverts, and underparts as adult female, some possibly inseparable from adult male in field; immature female not properly known, probably less red on head than adult and less intense red on upperbody and underbody (but red wash extends onto belly), bill apparently at first paler basally (as immature male). Races differ in plumage and size, varying differentially with sex: *tenuis* is much smaller than nominate, especially in bill size (male mean bill length from 16.4 mm in N of range to 17.9 mm in S, nominate 18.8 mm), plumage very similar but immature (both sexes) brighter and tinged more olive, less brown, on upperbody and upperswing; *tucoptiae* is similar to previous, but bill even shorter (15.5 mm), adult male with red below confined to chin and throat (not extending to upper breast); *sanfordi* is similar in size to nominate, male with scarlet more extensive, reaching patchily to side of mantle, back and scapulars (but some with only scattered patches) and, below, continuing from throat over breast, upper belly and along flanks (patchily mottled black), rest of underbody black, sometimes with small scarlet patches or mottling, female like *sanctaecrucis* but largely dark brownish-olive above with red top of head, hindneck, lores, ear-coverts, most of chin to upper breast, faint reddish mottling or patches on mantle to rump (lacking distinct red) and red uppertail-coverts; underbody olive-buff, reddish mottling or wash on lower breast, grey mottling on side of breast and flanks; *sanctaecrucis* is larger than previous, male similar but with scarlet of upperbody more like that of nominate, female brownish-black to dark olive-brown above, slightly paler on head and neck, with strong red wash on forehead and weaker suffusion of dark red on rest of head and neck, scarlet scaling or mottling on mantle and back, wholly scarlet rump and uppertail-coverts, dull yellow-olive margins on wing and tail feathers, dark buff-brown or brown-olive underbody (paler than upperparts), darker and with dull red wash or mottling on breast; *pulcherrima* is smaller than nominate, male like previous (a few adult males have gape brownish or olive-brown, but not known if this occurs in other races), female with head and neck, middle of mantle and back, and rump and uppertail-coverts red, scapulars, side of back, and wing and tail dull black or blackish-brown, brownish fringes on wing-coverts and dull olive outer edges on remiges, underbody largely brownish-grey, anterior flanks blackish or blackish-brown, and breast, upper belly and rest of flanks faintly washed red; *lifuensis* is like nominate but smaller, male with red not extending to upper breast, and red and black sharply demarcated, female lacking red in plumage (other than faint wash on forehead and crown) and with upperparts generally darker olive-grey, chin and throat pale grey; *nigriventris* is like nominate but smaller, with much shorter bill (16–17 mm), male plumage similar, female differs from nominate in having top of head, neck and upperbody brownish-black, with scattered patches of scarlet (as nominate) or with reddish confined to lower back and rump. **VOICE.** Vocal, but not noisy, with variety of short, sharp syllables. Usual call a sharp high-pitched “tzwee” or “tzeer” (Vanuatu) or “zeet” or “tvee” (Samoa), uttered almost constantly during foraging, or sharp “chrrr” or “cheet”, rising in pitch and given singly or up to five times in succession (Rennell); “tzeer” also as threat or alarm; also a short, dry “tk” or “tch”; juvenile heard to utter wheezy descending “cheeet”. Song, usually from high perch, a repeated brief, melodious, tinkling or warbling “tzweety-tzweety-tweet-tweet-tweet”, more lively during breeding season; song described also as slurred whistles but with dawn song louder and consisting of clear whistled phrases, but rich disyllabic whistles described also as separate from song.

Habitat. Primarily forest, but occupies wide range of habitats on all islands on which recorded, occurring wherever flowering plants found, including primary and secondary forest, forest edge and mangroves; commonly in modified habitats, including plantations (especially of coconut palms), isolated trees, gardens and other urban and village habitats. In surveys in Samoa, recorded on Upolu more commonly in coastal fringe vegetation, in lowland forest to 30 m tall and dominated by tava (*Pometia pinnatifida*) and in foothill forest 20–30 m tall and dominated by mamalava (*Planchonella torricelliensis*), less commonly in tall or low montane forest (6–18 m or more tall) dominated by maotea mea (*Dysoxylum huntii*), and not recorded in exotic plantations, also more abundant in partly logged forest than in unmodified forest (often using gaps in canopy in former); on Tutuila more abundant in modified habitats than elsewhere (though still common in undisturbed forests), and in one detailed study most abundant in highly disturbed village habitat (variety of exotic flowers in plantations and gardens provides year-round source of nectar, though apparently competitive interactions with larger *Fouleaia carunculatus* can limit access to some of these plants); on Savai'i, numbers higher in upland cloudforest than lowland tava forest. In Santa Cruz Is, common on Vanikoro in gardens, plantations and secondary forest, occasionally in primary forest. Sea-level and coastal lowlands to mountains, in Solomons mainly along coast on Makira and Ugi, recorded to 455 m on Vanikoro, and recorded to 1250 m in Vanuatu; on Efate (Vanuatu) more common at higher altitudes; in Samoa at all altitudes but decreasing in abundance in montane forest; on Tutuila (American Samoa) recorded from lowlands to mountain tops but more common at higher altitudes (400–600 m), somewhat less common in lowlands and foothills (0–200 m), and lowest densities at intermediate altitudes.

Food and Feeding. Nectar, also pollen, possibly other plant material; also small arthropods, including insects and spiders (Araneae). A small snail (Gastropoda) was fed to a nestling in Samoa. Takes nectar from wide variety of sources, including ornamental hibiscus, ginger, bananas and Indian mulberry (*Morinda*) from gardens; on Tutuila, exotic flowers in plantations and gardens (such as coconut palms and ornamental plants e.g. *Hibiscus*, *Morinda* and *Carica*) provide year-round source of nectar, and native and introduced species of *Erythrina* provide large seasonal supplies of nectar when in flower. Forages at all levels, apparently mainly in middle and upper levels of forest, and said to prefer tall flowering trees. Constantly active, flitting through foliage and between flowers; perches on even finest twigs to reach flowers. Forages by probing and glean-ing; long bill and tongue enable it to reach deep into flowers. Also acrobatic, hanging or sally-hovering to reach flowers. Chases insects through foliage, and sallies from vegetation to catch them in flight; one seen entangled in spider web, and assumed to have been trying to obtain trapped insects. Usually singly or in twos (probably pairs), occasionally in family parties, but gathers in large numbers at sources of abundant food, particularly flowering trees and coconut palms; sometimes associates with other species, and in Solomon Is described as being in mixed-species flocks more often on Rennell (race *sanfordi*) than on San Cristobal or Three Sisters (*pulcherrima*). Ag-gressive towards conspecifics and other small nectarivorous birds, including *M. tristrami*, over which dominant at food, and spends much time in quarrelling and chasing; chases sometimes end in brief fights (lasting for a few seconds), birds jumping or flying at each other, grappling and even tumbling to ground together.

Breeding. In Vanuatu season Sept to Dec/Jan, with some evidence of breeding Jun; in Samoa thought to breed in all months (nestlings found in Jul and Sept, dependent young Jun and late Nov, male with brood patch mid-Mar); in Solomon Is dependent fledgling early Dec, and on Rennell independent juveniles and juveniles in post-juvenile moult common in first half Sept. Most nest-building by female, nest a small delicate open cup, usually of loosely woven grasses, fine grass fibres or fine roots and spider web, sometimes moss attached to exterior, usually suspended by rim from thin fork of branch or from vine, site varies from high in tree to almost on ground but thought to be often high (more than 3 m up), nearly always in dense foliage and well hidden; two nests in Samoa were built 2.5–3 m above ground, and another was 8 m up in crown of coconut palm. Clutch generally 2 eggs, rarely 3, but apparently 3–5 in Samoa and 4–5 in American Samoa; incubation said to be mostly by female, assisted by male, period 12–14 days; both sexes tend chicks, nestling period 12–14 days.

Movements. Resident, some local movement in search of blossom or other food sources. Locally, may be completely absent for long periods, and then numerous again when nectar abundant. Commonly flies between close islands, and occurs transiently on tiny islets; in Solomons, race *pulcherrima* vagrant on Santa Ana (off E San Cristobal).

Status and Conservation. Not globally threatened. Restricted-range species: present in Solomon Group EBA, in Rennell and Bellona EBA, in Vanuatu and Temotu EBA, in New Caledonia EBA, and in Samoan Islands EBA. Widespread and generally common or abundant throughout most of range; not uncommon in Loyalty Is. Estimated population in American Samoa (Tutuila) 9940 individuals, at average density of 91/km² (0.91 birds/ha); earlier estimate of 118,000 birds considered unreliable. Often in urban and agricultural landscapes and common in disturbed habitats throughout much of range, and at some locations where studied this species is more numerous in disturbed sites than in undisturbed ones. Was previously caught and plucked for feather-money in the Santa Cruz Is and possibly elsewhere, but this practice appears to have died out.

Bibliography. Banks (1984), Beichle (2008), Beichle & Baumann (2003), Bellingham & Davis (1988), Bregulla (1992), Buckingham *et al.* (1995), Cain & Galbraith (1956), Clapp & Sibley (1966), Craig (2005), Dhondt (1976), Diamond (1970, 2002), Doughty *et al.* (1999), Dulson (2007a), Evans *et al.* (1992), Freifeld (1999), Freifeld *et al.* (2001), Hadley & Parker (1965), Hannecart & Létocart (1980), Koopman (1957), Kratter *et al.* (2006), Layard & Layard (1878, 1880), Mayr (1931a, 1932, 1937, 1940, 1945b), Mayr & Diamond (2001), Mayr & Hamlin (1931), McCarthy (2006), duPont (1976), Pratt *et al.* (1987), Schönwetter & Meise (1981), Tarburton (2001), Watling (1982a, 2001), Webb *et al.* (1999), Whitmee (1875).

103. Black-bellied Myzomela

Myzomela erythromelas

French: Myzomèle à ventre noir **Spanish:** Mielero Ventrinegro

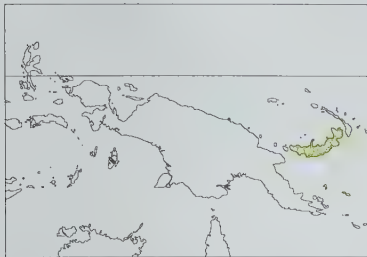
German: Flammenkopf-Honigfresser

Other common names: Black-bellied/New Britain (Red-headed) Honeyeater, New Britain/Splendid Myzomela

Taxonomy. *Myzomela erythromelas* Salvadori, 1881, New Britain. May be part of a superspecies with *M. chermesina*, *M. chloroptera*, *M. wakoloensis*, *M. boiei*, *M. sanguinolenta*, *M. caledonica*, *M. rubratra* and *M. cardinalis*; limits of this superspecies, however, not certain and present species should perhaps be excluded; further study required. Monotypic.

Distribution. New Britain, in Bismarck Archipelago.

Descriptive notes. 9–10 cm; male 7–9 g, female 6.5–7.5 g, mean of 46 unsexed birds 8 g. Tiny short-tailed honeyeater. Male is striking, wholly black, except for scarlet hood marked with narrow black loreal stripe continuous with narrow black eyering; underwing sooty black, silvery grey panel across bases of remiges; iris dark brown; bill black; legs grey to blue-grey, soles yellow. Female is slightly



ings and gardens; in Whiteman Range recorded in lowland and high tropical rainforest. Lowlands and foothills, to c. 900 m. Replaced at higher altitudes by *M. cruentata*.

smaller than male, largely plain olive, a little paler below, with red mask covering forehead, forecrown, anterior ear-coverts, malar area and chin and throat, lores dusky; tail dark brown; bill blackish with paler basal third of lower mandible, gape said to be yellowish, rest of bare parts as for male. Juvenile undescribed; immature said to resemble adult of respective sex, but no further information. VOICE. Calls include rapid “tsi-tsi-tsi...”, fine, thin, squeaky notes, and a seesawing call, all three likened to calls of Black Sunbird (*Leptocoma sericea*).

Habitat. Primary forest, forest edge and secondary growth, and fairly common in clear-

Food and Feeding. Nectar, probably also small arthropods. Forages mainly in outer foliage of crowns of trees, but lower at forest edge and in secondary growth; seen to forage also in flowering vines. Usually in small parties in flowering trees, but sometimes in large congregations; in Whiteman Mts, large numbers foraging with other species in crowns of flowering trees in rainforest; at Mt Uali, seen to forage with *M. cineracea* and *M. cruentata*.

Breeding. Fledged juveniles seen in early Jul. Nest an open cup, one suspended in dense tendrils of vine. No other relevant information.

Movements. No information; probably resident, with local movements to exploit flowering of foodplants, this supported by obvious fluctuations in local numbers.

Status and Conservation. Not globally threatened. Restricted-range species: present in New Britain and New Ireland EBA. Locally common to fairly common. Widespread and common in W New Britain, and abundant in Whiteman Mts.

Bibliography. Ap-Thomas & Ap-Thomas (1977), Bishop & Jones (2001), Coates (1990), Diamond *et al.* (1989), Dutson (2007a), Eastwood (1995b, 1997), Finch & McKean (1987), Fletcher (2000a), Gilliard & LeCroy (1967b), Gregory (2007), Hartert (1926b), Koopman (1957), LeCroy & Peckover (1983), Mayr & Diamond (2001), Schönwetter & Meise (1981), Storer & Eastwood (1991).



PLATE 48

Family MELIPHAGIDAE (HONEYEATERS) SPECIES ACCOUNTS

104. Red-headed Myzomela

Myzomela erythrocephala

French: Myzomèle à tête rouge **German:** Rotkopf-Honigfresser **Spanish:** Miellero Cabecirrojo
Other common names: (Mangrove) Red-headed Honeyeater, Mangrove Red-headed Myzomela

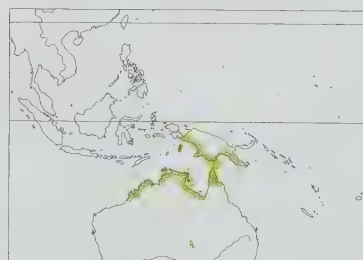
Taxonomy. *Myzomela erythrocephala* Gould, 1840. King Sound, north Western Australia. Forms a superspecies, and sometimes treated as conspecific, with *M. dammermani* and *M. kuehni*; all three closely related to the *M. cardinalis* superspecies. Races intergrade in C & S Torres Strait. Two subspecies recognized.

Subspecies and Distribution.

M. e. infusca W. A. Forbes, 1879 – Aru Is, coastal S New Guinea (Triton Bay E to Domara, E of Cape Rodney) and islands of Torres Strait.

M. e. erythrocephala Gould, 1840 – islands of C & S Torres Strait, and from N Western Australia (near Broome, in S Kimberley Division) E along coast, including offshore islands and islets (such

as Melville I and Sir Edward Pellew Group, in Northern Territory), to N Queensland (Cape York Peninsula S on E coast to Princess Charlotte Bay).



Descriptive notes. 11–13 cm; male 7–11 g, female 6–9.4 g (nominate). Male nominate race has dark red hood marked with narrow black loreal stripe continuous with thin black ring around eye, sooty-brown upperparts, dark red on rump and uppertail-coverts (sometimes extending onto lower back), red of hood and rear upperbody often patchily mottled black; uppertail and upperwing blackish-brown, tertials and median and greater secondary coverts with narrow grey fringes, remiges with thin grey edges (diffuse pale panel on folded wing); sooty-brown band across upper breast grading into light brownish-grey below; undertail dark

grey, underwing dark grey with mostly white lining; iris dark brown; bill black or blackish-brown, sometimes brown or pink-brown basal half of lower mandible, gape black or yellowish; legs dark grey to brown or black, soles yellow. Female is smaller than male, has head, neck and upperbody grey-brown, merging to paler grey-brown on lower throat, and with obvious pink-red forehead, anterior ear-coverts, malar area, chin and upper throat and, sometimes, a few dark pink-red flecks on crown and uppertail-coverts; uppertail and upperwing dark brown, fringes and edges as for male although edges of remiges can be slightly paler (yellow); breast light grey-brown, grading slightly paler on lower underbody, and merging to off-white in centre of belly; bare parts as for male, gape yellowish. Juvenile is very like female, but rump and uppertail-coverts slightly paler and distinctly warmer brown than rest of upperbody, fringes of secondary coverts and tertials broader and light brown, pink-red on face sometimes much fainter (but usually conspicuous, as on female), base of lower mandible yellowish, yellow gape initially swollen, and iris and legs possibly paler; immature male not well known, like adult female but separable by patchy redder feathering on head and neck, and rump and uppertail-coverts, combined with dusky loral stripe and eyering, and some appear to have dark red partial hood. Race *infuscat*a differs from nominate in blacker upperbody and breastband, otherwise darker grey underparts, red of rump always extending to lower back, female darker above and more uniform and darker grey-brown below than nominate, with little pink-red on forehead. **VOICE.** Song a repetitive metallic jingling sound; contact call described as brisk and rather harsh “chiew-chiew-chiew”, which may be same as usual call described as buzzing and harsh “caseep” sounds. Other calls include shrill loud “cheep”, buzzing chirp, rather sharp and harsh chirrup when foraging; in New Guinea, also a harsh “zit”.

Habitat. Mangrove thickets or forests, especially extensive stands typically dominated by combinations of *Rhizophora*, *Bruguiera*, *Avicennia*, *Ceriops*, *Campostemon* or *Aegiceras*. In Australia, also often in vegetation on landward edge of mangroves or nearby along tidal creeks or samphire flats, including stands of paperbarks (*Melaleuca*) or casuarinas on littoral dunes; occasionally in open forest or swamp-woodland dominated by eucalypts and paperbarks (sometimes with thickets of *Pandanus*), patches of monsoon rainforest, rarely in semi-deciduous mixed woodland on coastal dunes and tall grassland and rarely in coconut plantations. Often in or around settlements and towns. Mainly at about sea-level, in coastal and subcoastal zones; in Australia, occasionally on near-coastal tablelands, to c. 800 m.

Food and Feeding. Primarily nectar; also small arthropods (mainly insects, some spiders). Forages mainly at flowers and in outer foliage in canopy of trees, especially flowering mangroves and mistletoes (Loranthaceae), less often in paperbarks or eucalypts up to 3 km from coast; of 291 observations of foraging in Darwin Harbour, 77% in mangroves and rest in other plants, such as vegetation fringing mangroves. Of observed feeding heights in Darwin, 4.4% at or below 1 m above ground, 16.8% at 1.1–2 m, 27.3% at 2.1–4 m, 32.4% at 4.1–8 m, and 19% above 8 m. Active when foraging, darting rapidly from flower to flower, and sallying for flying insects. In Darwin Harbour, 85% of foraging observations involved probing of flowers for nectar, the rest gleaning insects from foliage and twigs (14%), sally-striking in air (less than 1%) and sally-hovering (less than 1%). Usually singly or in twos (probably pairs), sometimes in small parties of up to four, and possibly more, individuals; in Australia, often associates loosely with other species such as *Lichmera indistincta*, fantails (*Rhipidura*) and others. Aggressive, and often chases or fights with conspecifics and *Lichmera indistincta*; males grapple in mid-air, often almost falling to ground before breaking away. In Darwin Harbour, defends feeding territories in flowering *Bruguiera exaristata* for much of dry season (May–Oct), but moves between sources of nectar during wet season (Nov–Apr); when food in short supply (Mar–May), establishes small feeding territories in cadjeput (*Melaleuca cajuputi*).

Breeding. No information for New Guinea. In Australia, breeding recorded Mar, Jun–Oct and possibly Nov, eggs recorded May–Oct; in Darwin Harbour, young fledged when *Ceriops australis* in flower. Nest a small cup made of pieces of bark, leaves, plant fibre, fine rootlets and sometimes seaweed, bound with spider web (which mainly near rim), usually lined with similar but finer material (one nest unlined), external diameter 5–5.8 cm, depth 3–4.3 cm, internal diameter 3.8–4.1 cm, depth 2.5–3.6 cm; suspended by rim from small horizontal fork of branch in foliage of mangroves, usually over water but up to 5 m from it; one in clump of mistletoe in mangroves, mean height above ground or water 1.5–5.4 m (mean 3 m), but in N Western Australia most nests 6–10 m above ground or water. Clutch 2 eggs, rarely 3; no information on duration of incubation and nestling periods; nestlings seen to be fed by female, and both adults seen with fledged young.

Movements. In Australia and at least some islands of Torres Strait generally considered resident, but numbers in an area can fluctuate, indicating at least local movements, possibly related to flowering of food trees. Around Darwin, in N Northern Territory, moves locally in wet season; occasionally occurs S of normal range in Queensland, but historical report from Moreton Bay (SE Queensland) probably involved misidentification. Also described as nomadic or to move locally, e.g. in S Torres Strait, and an irregular visitor to some sites. In New Guinea, in mangroves of Mimika R mouth, common at times but absent at other times.

Status and Conservation. Not globally threatened. Locally common to fairly common. No estimates of overall abundance; recorded at mean densities of 0.04–5.5 birds/ha.

Bibliography. Agnew (1921), Archbold & Rand (1935), Barrett *et al.* (2003), Blakers *et al.* (1984), Bravery (1970), Campbell (1900), Clarke (2004), Coates (1990), Collins (1995), Colston (1974), Cooney *et al.* (2006), Crawford (1972), Draffan *et al.* (1983), Drake (1979), Finch (1983), Ford, J.R. (1982, 1983b), Franklin & Noske (1999, 2000a), Frith & Hitchcock (1974), Garnett & Bredl (1985), Haselgrove (1975), Hicks (1988c), Higgins *et al.* (2001), Hill (1911), Ingram (1976), Johnson & Hooper (1973), Johnstone (1983, 1990), Johnstone & Burbidge (1991), Johnstone & Storr (2004), Keast (1968a), Koopman (1957), MacGillivray (1918), Mayr & Rand (1937), North (1906), Noske (1996), Noske & Franklin (1999), Ogilvie-Grant (1915), Pizzey (1980), Rand & Gilliard (1967), Schodde (1976), Schodde & Mason (1999), Schodde & Tidemann (1986), Schönwetter & Meise (1981), Storr (1977, 1984), Thomson (1935), Tolhurst (1988), Wheeler (1967b), White & Bruce (1986), Woinarski (1993), Woinarski, Fisher *et al.* (2001), Woinarski, Press & Russell-Smith (1989), Woinarski, Tidemann & Kerin (1988), Woodall (1999).

105. Sumba Myzomela

Myzomela dammermani

French: Myzomèle de Sumba **German:** Sumbahonigfresser **Spanish:** Mielero de Sumba
Other common names: Sumba Honeyeater

Taxonomy. *Myzomela erythrocephala dammermani* Siebers, 1928, Sumba, Lesser Sundas. Forms a superspecies, and sometimes treated as conspecific, with *M. erythrocephala* and *M. kuehni*; all three closely related to the *M. cardinalis* superspecies. Monotypic.

Distribution. Sumba and Roti (off SW Timor), in Lesser Sundas.



Descriptive notes. 11 cm. Male is distinctive, with dark red head and neck forming hood, sharply demarcated from blackish mantle, back and scapulars, and with narrow clear-cut black loral stripe extending in thin ring around eye; rump and uppertail-coverts dark red; upperwing blackish, fine ashy-grey margins on coverts and remiges forming diffuse pale panel on folded wing (pale fringes on coverts become much reduced with wear, but pale panel on remiges remains distinct); uppertail blackish; below, dark red hood sharply demarcated from broad blackish band across breast and anterior flanks, this grading into paler grey-black on rest of underbody; undertail dark grey, underwing white with dark grey trailing edge and tip; iris dark brown; bill black; legs dark grey to blackish-brown. Female undescribed, but field observations suggest that sexes differ in much the same way as do those of *M. erythrocephala* (i.e. female grey-brown above, tail and wing darker, some areas of reddish colour on at least head, chin and throat, mostly light grey-brown below). Juvenile and immature undescribed. **VOICE.** Undescribed; considered quiet.

Habitat. Mainly primary forest, especially deciduous forest, and often seen at forest edge; recorded also in evergreen forest with *Acacia*. In study on Sumba, found to have preference for edges of primary forest with above-average proportion of deciduous trees. Claims that it occupies mangroves and adjacent vegetation apparently incorrect. Lowlands to 930 m or more.

Food and Feeding. No details of diet. Seen mainly in middle storey to canopy levels of forest; of 84 observations, 77.4% in canopy (more than 15 m above ground), the rest at middle levels (5–15 m). Seen singly, in twos (probably pairs) and in groups of up to seven individuals.

Breeding. No information.

Movements. Resident; probably at least some local movements to exploit flowering plants.

Status and Conservation. Not globally threatened. Restricted-range species: present in Sumba EBA. Total population on Sumba estimated at 129,600 individuals, based on density of 120 birds/km² in forest. Only recently recorded on Roti, where status not known.

Bibliography. Coates & Bishop (1997), Jepson (1993b), Johnstone & Jepson (1996), Jones, Banjaransari & Grimmett (1990), Jones, Linsley & Marsden (1995), Koopman (1957), Linsley *et al.* (1999), Mayr (1944a), Sibley & Monroe (1990), Trainor (2005b), White & Bruce (1986).

106. Crimson-hooded Myzomela

Myzomela kuehni

French: Myzomèle de Wetar **German:** Wetarhonigfresser **Spanish:** Mielero de la Wetar
Other common names: Wetar/Crimson-hooded/Banda Honeyeater, Banda/Kühn's/Wetar Myzomela

Taxonomy. *Myzomela kuehni* Rothschild, 1903, Wetar, Lesser Sundas.

Forms a superspecies, and sometimes treated as conspecific, with *M. erythrocephala* and *M. dammermani*; all three closely related to the *M. cardinalis* superspecies. Monotypic.

Distribution. Wetar, in E Lesser Sundas.



Descriptive notes. 11 cm. Male has head back to rear of ear-coverts dark red, forming bold hood sharply demarcated from grey of hindneck, mantle, back and scapulars, and with rather broad black loral stripe extending to narrow black band on forehead and thin ring around eye, as well as into malar area below eye (indistinct malar stripe resulting from black feather bases of otherwise red facial feathers); rump and uppertail-coverts dark red (as head); upperwing dark olive-brown, coverts and remiges with narrow pale fringes and edges (diffuse pale panel on folded wing), uppertail dark olive-brown; below, red hood extends down to breast, sharply

demarcated from whitish or pale yellowish-white underbody, undertail dark grey; bill black or blackish-brown; iris blackish-brown; legs blackish-grey. Female, juvenile and immature undescribed. **VOICE.** Calls include moderately high-pitched downslurred whistle, “tsiew”, repeated at rate of c. 1–1.5 notes per second; and short, thin, high-pitched insect-like “tsii-tsii”, syllables repeated every c. 6.5 seconds. **Habitat.** Lowland monsoon forest and gardens; recently observed in mosaic of coastal scrub, overgrown cultivation and tall secondary woodland.

Food and Feeding. No information on diet. Occurs from understorey to canopy; seen singly and in twos (probably pairs), sometimes in mixed-species foraging flocks.

Breeding. No information.

Movements. No information.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Timor and Wetar EBA. Very poorly known. Apparently scarce. Although large areas of forest still remain on Wetar, some logging is now taking place; there have been plans for transmigration within Indonesia to the island, as it currently has only a small human population. Conservation measures proposed for the Endangered Wetar Ground-dove (*Gallicolumba hoedtii*), which include a proposed reserve of c. 450 km² (with full spectrum of habitats) in W Wetar, likely also to benefit present species.

Bibliography. Anon. (2007a), Butchart & Stattersfield (2004), Coates & Bishop (1997), Collar *et al.* (2001), Koopman (1957), Stattersfield & Capper (2000), Stattersfield *et al.* (1998), White & Bruce (1986).

107. Mountain Myzomela

Myzomela adolphinae

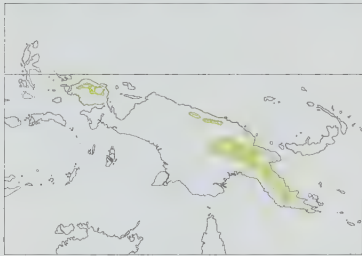
French: Myzomèle montagnard **German:** Arfakhonigfresser **Spanish:** Mielero de Adolfinia

On following pages: 108. Scarlet-bibbed Myzomela (*Myzomela sclateri*); 109. Ebony Myzomela (*Myzomela pammelaena*); 110. Scarlet-naped Myzomela (*Myzomela lafargei*); 111. Black-headed Myzomela (*Myzomela melanocephala*); 112. Yellow-vented Myzomela (*Myzomela eichhorni*); 113. Malaita Myzomela (*Myzomela malaitae*); 114. Sooty Myzomela (*Myzomela tristrami*); 115. Orange-breasted Myzomela (*Myzomela jugularis*); 116. Red-rumped Myzomela (*Myzomela vulnerata*); 117. Red-collared Myzomela (*Myzomela rosenbergii*); 118. Green-backed Honeyeater (*Glycichaera fallax*).

Other common names: Mountain (Red-headed)/Red-headed Mountain Honeyeater, Mountain Red-headed Myzomela, Adolphina's/Elfin/Midget Myzomela

Taxonomy. *Myzomela adolphinae* Salvadori, 1876, Arfak Mountains, north-west New Guinea. Closely related to the *M. cardinalis* superspecies. Some reported variation between specimens from S & SE New Guinea and those from Huon Peninsula and Arfak Mts, with males of S & SE blacker on upperbody and upper breast but with lighter red head, and females also darker above and on breast; study needed. Monotypic.

Distribution. Mountains of W, N & E New Guinea (Vogelkop, C North Coastal Range, Central Highlands E from L Kapiago, Adelbert Mts, Huon Peninsula and SE).



Descriptive notes. 9–10 cm; unsexed mean 7.4 g, two females 7 g and 8 g. Tiny myzomela, and smallest honeyeater. Male is distinctive but somewhat variable, mostly dark grey to dusky black, merging to off-white on belly, flanks, vent and undertail-coverts, with red to bright red hood marked with blackish loreal stripe continuous with blackish ring around eye and short, diffuse and narrow dusky line or smudge behind eye; bright red rump and uppertail-coverts, dark grey uppertail; upperside dark brownish-grey, darker than mantle, back and scapulars (on darker individuals, wing blackish and concolorous with back), greater wing-

coverts finely margined paler brown, remiges with fine olive-brown outer edges (paler panel on folded wing); iris blackish brown to black; bill black, sometimes merging to yellowish base or basal toms of lower mandible, gape black or yellowish; legs dark greenish-grey or yellowish-grey. Female is largely olive-grey, merging to paler dirty white or off-white on belly and flanks to undertail-coverts, with diffuse reddish wash in malar area, lower ear-coverts, chin and upper throat (reddish face), diffuse pale eyering, yellowish-olive fringes on median and secondary coverts and pale yellowish outer edges on remiges (pale panel on folded wing); some may show faint reddish or rufous tone on forehead; gape pale yellow (never black). Juvenile and immature undescribed (nestlings have yellowish-horn bill, blackish-brown irides, brownish legs, yellowish feet). **VOICE.** Calls include high-pitched upslurred “sweeti”, descending wheezy “tzzew”, high-pitched “tsit”, harsh churring calls, and several short rapidly uttered notes. Song of 2 high-pitched notes, the first higher and often upslurred, second often trilled (“tyink”, often followed by somewhat musical, slightly downslurred and lower-pitched trill, appears also to describe song). Song in Varirata National Park said to be very different from those of populations elsewhere in E New Guinea.

Habitat. Montane and mid-montane primary forest, tall secondary growth and other modified habitats, such as settlements and towns, gardens, open areas and farmland, including groves of casuarinas or eucalypts in towns or agricultural areas; common also in *Castanopsis* oak woodland, and described as common in towns in Central Highlands; occasionally in eucalypt savanna in Varirata National Park. Mostly lower mountains between c. 1150 m and 2000 m, but down to c. 500 m and as high as 2225 m.

Food and Feeding. Nectar; small arthropods, apparently mainly insects, including small beetles (Coleoptera) and small homopteran bugs. Frequents canopy of forest, and usually seen well only in gardens and disturbed habitats, in flowering trees. Nectar obtained by probing flowers of canopy vegetation (including *Rhus taitensis*); insects gleaned from foliage. Active and vocal, but often inconspicuous. Usually seen singly, less often in small parties, when sometimes chase each other; readily associates with other species, including congeners such as *M. nigrita*, *M. eques* and *M. cruentata*, in flowering trees.

Breeding. Two nests with chicks in mid-Jul and late Oct (Wahgi Valley). One nest a neat, finely made cup woven into dead bracken frond that projected 10 cm in front of nest to make a verandah, described as having external roof and sides of trailing pale lichen loosely woven into bracken (appears to be unique within genus and rare in family, but frequency of such nest construction by this species not known); at this nest, chicks fed by both parents. No other information.

Movements. Little information. Possibly largely resident, with local movements to exploit flowering plants.

Status and Conservation. Not globally threatened. Generally fairly common to common, but patchily distributed; can be scarce or absent at sites. Common in disturbed sites and in towns and gardens.

Bibliography. Beehler (1978a, 1980b), Beehler *et al.* (1986), Bell (1984b), Brown & Hopkins (1996), Coates (1990), Coates & Peckover (2001), Diamond (1972a), Diamond *et al.* (1989), Eastwood (1989b), Finch (1978), Greenway (1935), Gyllenstolpe (1955a), Hartert (1930), Heron (1977a), Iova (1993), Koopman (1957), Mackay (1991), Mayr & Gilliard (1954), Mayr & Rand (1937), Rand & Gilliard (1967), Sims (1956), Tolhurst (1991), Wahlberg (1988), Watson *et al.* (1962).

108. Scarlet-bibbed Myzomela

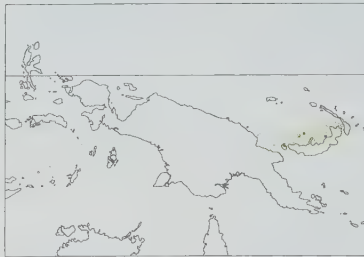
Myzomela sclateri

French: Myzomèle de Sclater **German:** Palakuruhonigfresser **Spanish:** Mielero de Sclater
Other common names: Scarlet-bibbed/Red-bibbed/Scarlet-throated/Sclater's Honeyeater, Scarlet-throated/Sclater's Myzomela

Taxonomy. *Myzomela sclateri* W. A. Forbes, 1879, Palakūru, Credner Islands, off north-east New Britain. Relationships uncertain. Monotypic.

Distribution. Karkar I, off NE New Guinea, and small islands of Bismarck Archipelago, including Crown, Long, Tolokiwa, Tamuniai, Umboi, Unea (Bali), Witu Group, islets in Kimbe Bay and off N coast of New Britain. Talele, Watom and Credner Is (near Duke of York Is, including Nanuk and Palakuru Is).

Descriptive notes. 10.5–12 cm; male 10.5–12 g, female 10–11 g (Karkar), unsexed 10.5 g. Male has top and side of head and neck and upper mantle black-brown, merging to dark olive-brown on most of rest of upperparts, with paler olive-brown rump and uppertail-coverts; median and greater upperside-coverts with fine and diffuse olive fringes, remiges with fine olive outer edges (diffuse paler stripe or wash on folded wing); rectrices edged slightly paler brown; chin and throat bright red; upper breast dark olive-brown, merging into dirty olive-buff on lower breast and to dirty cream to off-white on lower underbody, indistinctly streaked or mottled brownish-grey on belly and anterior flanks; undertail dull greyish, underwing off-white with silvery grey-brown trailing edge and tip; iris blackish; bill black; legs slate-grey. Female is smaller than male, fairly drab, top and side of head and neck and most of upperparts brown to olive-brown above, with rufous-brown rump and uppertail-coverts, fine diffuse paler buff-brown fringes on upperside-coverts, fine yellowish



pair of short, hoarse buzzing notes, second one lower and trilled; and insistent “chip, chip, chip”. Vocalizations likened to those of white-eyes (Zosteropidae).

Habitat. Primary forest (including littoral forest), secondary growth and modified habitats, including coconut plantations; on Karkar also stunted montane shrubland and cool, damp, moss-laden forest at island summit. Sea-level to 1830 m; most islands occupied by this species are very small, low coral islets, other than the recently defaunated volcanic island of Long and neighbouring Tolokiwa and Crown (where occurs from sea-level to summit, at 600–1350 m); on Karkar mainly at 1000–1200 m, but visits lowlands at times.

Food and Feeding. Nectar, insects, fruit and parts of flowers. Forages from canopy to understorey; in forest below summits on Karkar, mainly above 3 m from ground, occasionally descending to understorey, but commonly seen foraging below 3 m in stunted summit shrubland. Gleans, probes and frequently sally-hovers. Noisy and active, making frequent flights of 5–10 m between feeding sites. Usually singly or in loose parties, and up to 15 seen foraging in single flowering tree; seen in flowering trees with other nectarivores.

Breeding. On Karkar, season appears protracted but probably started by May–Jun; nest with young in mid-Aug on Witu. Nest a thin-walled cup, occasionally with spider web attached to exterior, apparently suspended and well concealed, usually in low vegetation (e.g. 2 m above ground in clump of canegrass), but up to 10 m above ground in coconut palm. No information on clutch size and incubation and nestling periods; both parents feed nestlings.

Movements. Resident; on Karkar, may undertake seasonal altitudinal movements.

Status and Conservation. Not globally threatened. Restricted-range species: present in New Britain and New Ireland EBA. Generally common or abundant. Status on Umboi uncertain; at least occasionally occurs, with early reports pre-1955 and more recent records (1994). Possible occurrence on Biem (Bam) I, in Schouten Is (NW New Guinea), seems unlikely.

Bibliography. Beehler *et al.* (1986), Chemnick & Melli (1993), Coates (1990), Coates & Peckover (2001), Diamond (1970a), Diamond & LeCroy (1979), Diamond *et al.* (1989), Eastwood & Gregory (1995), Finch (1981c), Koopman (1957), Mayr (1955), Mayr & Diamond (2001), Rand & Gilliard (1967), Schipper *et al.* (2001), Schönwetter & Meise (1981), Stattersfield *et al.* (1998).

109. Ebony Myzomela

Myzomela pammelaena

French: Myzomèle ébène **German:** Ebenholz-Honigfresser **Spanish:** Mielero Ébano
Other common names: Ebony/Admiralty/Bismarck (Black/Island)/Black Honeyeater, Admiralty/Bismarck (Black)/Black/Islet Myzomela

Taxonomy. *Myzomela pammelaena* P. L. Sclater, 1877, Nares Harbour, Admiralty Islands, Bismarck Archipelago.

Forms a superspecies with *M. lafargei*, *M. melanocephala*, *M. eichhorni*, *M. malaitae* and *M. tristrami*, and formerly suggested that all may be conspecific; this group possibly closely related to the *M. cardinalis* superspecies. Present species formerly treated as conspecific with *M. nigrita*. Population of Wuvulu I currently placed in race *ernstmayri*, but may belong to a different race. Racial identity of recently observed individuals on Timor I (in Kimbe Bay), off NC New Britain, uncertain (possibly *nigerrima*). Racial differences slight. Five subspecies recognized.

Subspecies and Distribution.

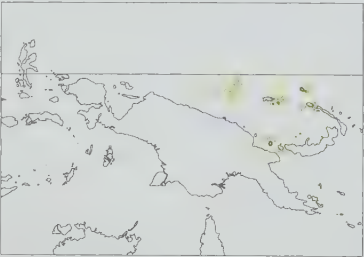
M. p. ernstmayri Meise, 1929 – small islands W of Admiralty Is, including Wuvulu, Manu, Ninigo, Anchorites (Kaniet) and Hermit.

M. p. pammelaena P. L. Sclater, 1877 – Admiralty Is (E Manus, probably established; Rambutyo, Lou, Nauna, and other small islands, including Mandrin, Baluan, Sivisa, Los Reyes, San Miguel, Ponam, Hauwei and Tong).

M. p. hades Meise, 1929 – St Matthias Group (Mussau, Eloaua, Emirau and Tench), NW of New Hanover.

M. p. ramsayi Finsch, 1886 – Tingwon I and small islands off New Hanover (e.g. Tigak) and off N New Ireland, in Bismarck Archipelago.

M. p. nigerrima Salomonsen, 1966 – islands of Long, Crown and Tolokiwa and associated small islets (including Midi, Hein and islets of Siassi Group), between NE New Guinea and Umboi.



Descriptive notes. 11–12.7 cm; male average 17 g, female average 14.6 g, male 12–14 g (*hades*, *ramsayi*), male 13.2–20 g (other races). Male nominate race is entirely glossy black, except for blackish-grey axillaries and underwing-coverts; iris brown to blackish; bill black; legs dark grey to black. Female is very like male but slightly smaller and a little duller. Juvenile is wholly dusky brown, slightly browner below; immature probably black with patches of brownish-grey admixed. Races differ in size and underwing colour: *ernstmayri* has black coloration very similar to that of nominate, perhaps with less gloss, adult male

slightly larger than in nominate, with bill stronger and, on average, longer; *nigerrima* is similar to previous but still larger (male wing 77–79 mm, *ernstmayri* 75–77 mm), also deeper black (with darker greyish-black bases of feathers), male glossier; *hades* is smaller than nominate, with whitish axillaries and underwing-coverts; *ramsayi* resembles last (male wing for the two combined 65–69 mm). **VOICE.** Main call of race *nigerrima* a relatively loud (for *Myzomela*), hoarse, unmusical scolding; vocalizations of *hades* vary, including frequent “sweet, sweet, sweet...”, with notes repeated up to six times, chipping notes like those of a sunbird (Nectariniidae), and a song “shwee, shwee...suit” or “swit”. Nominat race gives harsh “ssht, ssht” during chases.

Habitat. Virtually all available vegetated habitats: primary forest, secondary growth, shrubland, coconut plantations, gardens and around human habitation. On Long I in more open coastal habitats, including fruit gardens, and commonly in crowns of coconut palms. On Manus, occurs on coast and up to 3 km inland, in tall isolated trees. Recorded from sea-level to summits on Long I (maximum elevation 1300 m), Tolokiwa I (c. 1300 m) and Crown I (c. 570 m).

Food and Feeding. Nectar and insects. Forages from understorey and shrub layer to canopy, by cleaning and probing; commonly in flowering shrubs (including hibiscus) and trees. On Manus, seen to forage on leafless branches of a flowering tree, hovering often and fluttering vertically downwards. Conspicuous, often chasing each other. Seen singly, in twos (probably pairs) and in small parties (e.g. of up to six individuals), occasionally in larger gatherings of up to 30 or more in flowering trees; on Manus, in Jun–Jul, three tight cohesive flocks of 3–5 birds seen. In Ninigo Is, thought to defend food resources, and vigorously attacked intruders.

Breeding. Single nest (with nestlings) reported, on 29th Apr: a small cup of fine plant fibre, suspended from horizontal fork 2–4 m above ground in outer foliage of small tree, nest concealed by foliage from above. No other information.

Movements. Probably largely resident, with local movements. Probably now established on Manus, where formerly recorded as a vagrant or occasional visitor from nearby islets, some of which are as little as c. 1 km away.

Status and Conservation. Not globally threatened. Restricted-range species: present in Admiralty Islands EBA, in St Matthias Islands EBA, and in New Britain and New Ireland EBA. Generally common to abundant; considered common on Mussau, Long, Tolokiwa, Crown and Tong; abundant in Ninigo Is; common on Tigak I (off New Hanover). On Manus, recent records of small flocks, and comments by local people that species is found uncommonly on the island; increasing area of degraded vegetation on Manus may have allowed this “supertramp” species to establish a breeding population there. Usually not present on large islands of New Hanover and New Ireland, twice sighted in W New Hanover.

Bibliography. Bell, H.L. (1975), Buckingham *et al.* (1995), Chemnick & Melli (1993), Coates (1990), Coates & Peckover (2001), Coates & Swainson (1978), Diamond (1976), Diamond *et al.* (1989), Eastwood (1996b), Eastwood & Gregory (1995), Gregory (1995c, 2007), Koopman (1957), Leavesley & Leavesley (2000a, 2000b), Mayr (1932), Mayr & Diamond (2001), Salomonsen (1966a), Schipper *et al.* (2001), Silva (1975), Stattersfield *et al.* (1998), Tolhurst (1993).

110. Scarlet-naped Myzomela

Myzomela lafargei

French: Myzomèle à nuque rouge

Spanish: Mielero Nuquirrojo

German: Scharlachnackten-Honigfresser

Other common names: (Small) Bougainville/Scarlet-naped/Red-naped/Red-crowned Honeyeater, (Small) Bougainville/Red-naped/Red-capped Myzomela

Taxonomy. *Myzomela lafargei* Pucheran, 1853, Santa Isabel, Solomon Islands.

Forms a superspecies with *M. pammelaena*, *M. melanocephala*, *M. eichhorni*, *M. malaitae* and *M. tristrami*, and formerly suggested that all may be conspecific; this group possibly closely related to the *M. cardinalis* superspecies. Monotypic.

Distribution. Buka, Bougainville, Shortland Is, Choiseul (and Arnavaon I) and Santa Isabel (and Malakobi and Megapode), in N Solomon Is.



underbody; underwing largely white; iris brown to greyish-brown or dark grey-brown; bill black; legs olive-grey to yellowish-grey, soles yellow. Female is smaller than male, has head and neck greenish-grey to olive-grey, grading to greyish-green or dusky olive on upperbody, with diffuse darker mottling or streaking on crown, reddish-brown tinge in malar area and lower ear-coverts (and possibly chin); wing olive-grey, pale edges of remiges as on male, underbody below throat yellowish-grey to yellowish-olive. Juvenile is like female, but bill duller, grey-black, apparently swollen gape yellow to orange-yellow, and juvenile male probably has some red on forehead and forecrown; immature male not fully described, like adult female but darker above, olive-brown to dark olive-grey, with varying red to scarlet streak in centre of forehead and forecrown (or these areas wholly red), reddish-brown malar area, lower ear-coverts and possibly chin and throat (which described also as bright red), darker below, bill at least sometimes remains duller grey-black, legs grey-brown; immature female very poorly known, possibly indistinguishable in field from adult. **Voice.** Variety of brief calls: sweet, high-pitched “tsip-tsip” like that of a sunbird (Nectariniidae); sharp whistled “chip” or “chitt”; loud dry “chtt” or “chtt, chtt”; reedy cheeps. Rapid twittering song.

Habitat. Lowland, middle-altitude and montane primary forest, including cloudforest, forest edge, also tall secondary forest in lowlands and mountains, lowland swamp-forest, mangroves and other coastal habitats, and modified habitats, including farm clearings in forest, coconut plantations, gardens and villages. Sea-level to above 2000 m. Tends not to co-occur with Olive-backed Sunbird (*Cinnyris jugularis*), although the two are sometimes found in same general area (e.g. around Mabiri and at Burunotui, on W coast of Buka); present species, however, is a forest-dweller that ranges to high altitudes, whereas this sunbird is typically in open country and below 800 m.

Food and Feeding. Nectar and insects. Observed mainly in crowns of trees, including flowering coconut palms in gardens, but forages at all levels, from understorey to canopy. Gleans and probes; also sally-hovers to feed at flowers. Active. Usually seen singly, in twos (possibly pairs) or in small flocks; often in larger numbers in flowering trees, often with lorikeets (of genera *Charmosyna* and *Trichoglossus*). Occasionally forages with Olive-backed Sunbirds in flowering plants at forest edges or at edges of water.

Breeding. Female carrying food in mid-Jan; most birds at c.1500 m in Jul–Aug were in breeding condition, whereas those in lowlands at same time were not. No other information.

Movements. Resident.

Status and Conservation. Not globally threatened. Restricted-range species: present in Solomon Group EBA. Fairly common on Bougainville, uncommon on Choiseul and rare on Santa Isabel.

Presumably still present on Arnavaon I (E of Choiseul) and on Malakobi and Megapode (off N coast of Santa Isabel), but no recent information.

Bibliography. Diamond (1975), Doughty *et al.* (1999), Dutson (2007a), Hadden (1981, 2004), Kaestner (1987), Koopman (1957), Kratter, Steadman, Smith & Filardi (2001), Kratter, Steadman, Smith, Filardi & Webb (2001), Mayr (1932, 1945b), Mayr & Diamond (2001), Schodde (1977), Smith & Filardi (2007), Stattersfield *et al.* (1998), Virtue (1947), Webb (1992).

111. Black-headed Myzomela

Myzomela melanocephala

French: Myzomèle à tête noire **German:** Savohonigfresser **Spanish:** Mielero Cabecinegro
Other common names: Black-headed/Black-cowled/Guadalcanal Honeyeater, Guadalcanal/Islet Myzomela

Taxonomy. *Cinnyris melanocephalus* E. P. Ramsay, 1879, Guadalcanal, Solomon Islands.

Forms a superspecies with *M. pammelaena*, *M. lafargei*, *M. eichhorni*, *M. malaitae* and *M. tristrami*, and formerly suggested that all may be conspecific; this group possibly closely related to the *M. cardinalis* superspecies. Monotypic.

Distribution. Guadalcanal, Savo and Ngella, in EC Solomon Is.



Descriptive notes. 12–13 cm; male 11–14 g, female 10–12.5 g. Male is predominantly rich olive above and on side of neck and breast, with partial glossy black mask covering forehead and crown (merging into olive of hindneck), lores, ear-coverts, malar area and chin and throat; uppertail and upperwing dark olive-brown, median and greater wing-coverts with fine diffuse olive fringes, remiges with fine olive outer edges (olive panel or stripe on folded wing); breast rich olive, continuous with side of neck, merging to slightly dusky, dark greyish-olive lower underbody, which varyingly mottled darker, blackish, especially on

belly and flanks; undertail grey-brown, underwing off-white with silvery grey-brown trailing edge and tip; iris dark brown; bill black; legs slate-grey to greenish-grey or dark brown, soles yellowish. Female is smaller and slightly duller than male, possibly with slightly smaller mask and paler lower underbody (confirmation needed); gape sometimes yellow. Juvenile not fully described, but differs from adult in duller and smaller mask, duller upperparts, greyish-buff belly, also bill dull yellow basally (wholly in one bird), gape bright yellow; immatures apparently like adult but duller, with strong cinnamon or rufous tinge in olive plumage, especially on rump and uppertail-coverts, on lower underbody and on margins of upperwing-coverts. **Voice.** Rather quiet. Short, sharp high-pitched “chiip-chiip” or loud, rather musical piping “teep...teep...”, sometimes with variants (“tleep” or “ti-eeep”); other calls include rapid “ti ti ti ti...” by agitated bird in flight, an unmusical “weh weh weh”, and repeated thin and very metallic “seseses chiu...” interspersed with “sesesh” and “cheh” phrases. Some calls somewhat like those of *M. eichhorni* but softer.

Habitat. Primary forest, forest edge, tall secondary forest, and modified habitats including gardens. Sea-level to at least 1550 m; said also to occur at all altitudes on Guadalcanal, and possibly more abundant at high altitude.

Food and Feeding. Few data on diet; stomachs found to contain insects (mostly small, but one large soft-bodied insect 12.5 mm long). Seen to peck ineffectively at fruit and to investigate myrmecophilous epiphytes. Mainly in canopy, also lower levels at forest edges and in disturbed areas. Forages mainly at flowers, including coconut flowers. Agile and active, often hanging upside-down to reach flowers and jumping from twig to twig, while flicking wings; occasionally sally-hovers, and once seen to sally from (and return to) a perch, presumably after flying insects. Usually seen singly.

Breeding. Newly fledged and still downy young observed mid-Nov. No other information.

Movements. Probably resident.

Status and Conservation. Not globally threatened. Restricted-range species: present in Solomon Group EBA. Very poorly known or, at least, poorly described in literature. Considered common within small range, but described also as rather uncommon on Guadalcanal.

Bibliography. Buckingham *et al.* (1995), Cain & Galbraith (1956), Doughty *et al.* (1999), Dutson (2007a), Koopman (1957), Mayr (1945b), Mayr & Diamond (2001), Ogilvie-Grant (1888), Rothschild & Hartert (1901), Smith & Filardi (2007), Stattersfield *et al.* (1998), Stevens & Tedder (1973).

112. Yellow-vented Myzomela

Myzomela eichhorni

French: Myzomèle à ventre jaune

Spanish: Mielero de Eichhorn

German: Rotbürzel-Honigfresser

Other common names: Yellow-vented/Eichhorn’s/Kulambang(a)r/New Georgia/Central Solomons Honeyeater, Crimson-rumped/Eichhorn’s/Kulambang(a)r Myzomela

Taxonomy. *Myzomela eichhorni* Rothschild and E. J. O. Hartert, 1901, Kolombangara, Solomon Islands.

Forms a superspecies with *M. pammelaena*, *M. lafargei*, *M. melanocephala*, *M. malaitae* and *M. tristrami*, and formerly suggested that all may be conspecific; this group possibly closely related to the *M. cardinalis* superspecies. Three subspecies recognized.

Subspecies and Distribution.

M. e. atrata E. J. O. Hartert, 1908 – Vella Lavella and Bagga, in WC Solomon Is.

M. e. ganongae Mayr, 1932 – Ranongga (S of Vella Lavella).

M. e. eichhorni Rothschild & E. J. O. Hartert, 1901 – Ghizo, Kolombangara, Wana Wana, Kohinggo, New Georgia, Vangunu, Rendova and Tetepare, in WC Solomon Is.

Descriptive notes. 12–13 cm. Male nominate race is predominantly dark olive-grey above, slightly darker on head and hindneck and darker blackish-olive on wing and tail, with scarlet rump and uppertail-coverts, and prominent yellowish-olive margins on wing-coverts and remiges (pale panel on folded wing); chin and throat scarlet, underbody paler yellow-olive; iris brown to dark brown; bill black; legs horn-coloured (silvery) grey to black, with yellow soles. Female is like male but smaller, with upperparts slightly paler, more olive, scarlet on rump and uppertail-coverts replaced with cinnamon-olive or rufous-olive, scarlet throat patch duller and smaller, underbody paler, buff-olive; outermost tail feathers have pale tips. Juvenile is very dull brown-grey, with no olive-green tinge above or below, and with dark reddish-grey spot in middle of chin and throat; immature



plumages not well known, male dark brownish-olive above, darker on top of head, with reddish wash on forehead, cinnamon to rufous rump and uppertail-coverts, olive-cinnamon wing-covert margins, olive edges of remiges and rectrices, dark greyish-olive chin and throat with scarlet feathers in centre, underbody pale cinnamon-olive, tinged buffy olive in centre of belly, largely whitish underwing; immature female apparently like adult but with cinnamon wash throughout (particularly on rump). Races quite similar, differing mainly in overall darkness of plumage; *atrata* is darker than nominate, dull blackish with olive tinge

above, dull blackish-olive below, some males with traces of red on nape; *ganongae* is intermediate between previous and nominate. **Voice.** Frequently gives loud, sharp, high-pitched "tzeep", "bzeet" or "tit-it-tit"; also a sharp "zeeet-zeeet" during aerial chasing. Rapid high-pitched trilling song, like that of Rufous Fantail (*Rhipidura rufifrons*) but faster and not descending scale.

Habitat. Primary forest and tall secondary forest, and seen also at forest edge bordering village gardens, and in gardens and coconut plantations and groves. On Kolombangara common in all habitats with trees or shrubs, and most abundant in high moss forest; near town of Kena, recorded most often in coastal coconut groves, less often in secondary growth and least often in primary forest. Sea-level to 1500 m or above; more numerous at higher altitudes on Kolombangara.

Food and Feeding. Mainly nectar, but also regularly visits ant-plants (myrmecophilous epiphytes) at high altitudes. Said to prefer forest canopy, at least 10 m above ground, but forage also in understorey vegetation. Most reports of small parties, e.g. of up to five in flowering trees, and a family party of adults and two juveniles; up to three seen in mixed-species feeding flocks.

Breeding. Free-flying juveniles in late Aug. No other information.

Movements. No information.

Status and Conservation. Not globally threatened. Restricted-range species: present in Solomon Group EBA. Not well known. Considered common to fairly common.

Bibliography. Blaber (1990), Buckingham *et al.* (1995), Doughty *et al.* (1999), Dutton (2007a), Koopman (1957), Mayr (1932, 1945b), Mayr & Diamond (2001), Sibley (1951), Smith & Filardi (2007), Stattersfield *et al.* (1998).

113. Malaita Myzomela

Myzomela malaitae

French: Myzomèle de Malaita **German:** Malaitahonigfresser **Spanish:** Mielero de la Malaita
Other common names: Red-bellied/Malaita Honeyeater, Red-bellied/Red-vested Myzomela

Taxonomy. *Myzomela cardinalis malaitae* Mayr, 1931, Malaita, Solomon Islands.

Forms a superspecies with *M. pammelaena*, *M. lafargei*, *M. melanocephala*, *M. eichhorni* and *M. tristrami*, and formerly suggested that all may be conspecific; this group possibly closely related to the *M. cardinalis* superspecies, and has been suggested that present species may belong with latter group. Monotypic.

Distribution. Malaita, in E Solomon Is.



Descriptive notes. 12–13 cm; male 13–17 g, female 10.5–12.5 g. Male is predominantly dull black, merging into olive-black on vent and undertail-coverts, and with prominent scarlet rump and uppertail-coverts, and broad scarlet streak on centre of chin and throat grading into scarlet breast and flanks (belly black); uperwing-coverts and remiges finely edged olive (diffuse panel on folded wing), rectrices finely edged olive; underwing-coverts grey; iris brown; bill black; legs bluish-grey. Female is smaller than male, pale greyish-brown to olive-brown above, darker head and neck dull blackish-brown, reddish forehead and fore-

crown and chin-throat, and rufous-red rump and uppertail-coverts; uperwing-coverts finely edged buff-brown, remiges edged olive (paler panel on folded wing), rectrices finely edged olive; underbody buff-olive to yellowish-olive, slightly paler in centre of belly and vent; bare parts as male. Immature male is like adult female, but with more red, having forehead and forecrown redder (sometimes with dark brown mottling), chin and throat red, and rump and uppertail-coverts dull rufous-cinnamon to rufous-red; immature female probably as adult. **Voice.** High-pitched "see-see", usually given in flight.

Habitat. Mainly primary forest; uses secondary growth in some places, but absent from secondary forest in many areas; found also in scrub and gardens. Sea-level to mountain summits; more common in hills and mountains.

Food and Feeding. Seen to forage, presumably for arthropods, with mixed-species flocks, and at ant-plant (myrmecophilous epiphyte) flowers. No other information.

Breeding. No information.

Movements. No information; probably sedentary.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Solomon Group EBA. Scarce or uncommon. Large areas of lowland and hill forest throughout Malaita are being degraded by logging and by clearance for gardens for increasing human population. Much of this meliphagid's population, however, occurs above the altitudes currently threatened by logging or clearance.

Bibliography. Anon. (2007a), Bulchar & Stattersfield (2004), Doughty *et al.* (1999), Dutton (2007a), Gibbs (1996b), Koopman (1957), Mayr (1931b, 1945b), Mayr & Diamond (2001), Smith & Filardi (2007), Stattersfield & Capper (2000), Stattersfield *et al.* (1998).

114. Sooty Myzomela

Myzomela tristrami

French: Myzomèle de Tristram **German:** Tristramhonigfresser **Spanish:** Mielero de Tristram
Other common names: Sooty/Melanic/Santa Ana/Tristram's Honeyeater, Santa Ana/Tristram's Myzomela

Taxonomy. *Myzomela Tristrami* E. P. Ramsay, 1881, San Cristobal, Solomon Islands.

Forms a superspecies with *M. pammelaena*, *M. lafargei*, *M. melanocephala*, *M. eichhorni* and *M. malaitae*, and previously suggested that all might be conspecific; this group may be closely related to the *M. cardinalis* superspecies. Present species formerly considered conspecific with *M. nigrita*. Reported as hybridizing with *M. cardinalis* on San Cristobal. Monotypic.

Distribution. San Cristobal, Santa Ana and Santa Catalina, probably also Ugi, in E Solomon Is.



Descriptive notes. 11–12 cm; male 12.5–16.5 g, female 11.5–14 g. Male is wholly black with faint violet-blue sheen, except for duller and brownish-tinged remiges, slightly paler greyish-black to dull blackish axillaries and underwing-coverts (varyingly mottled off-white), and pale silvery panel across bases of otherwise dark brown remiges on underwing; iris black-brown; bill black; legs slate-grey to black, sometimes with bluish tinge. Females is smaller than male, and possibly slightly duller and with slightly paler legs (but doubtfully distinguishable in field). Juvenile is duller than adult, sooty black above and greyish-olive below

(or blackish with pale grey mottling or smudging below), bill dark yellow to orange-yellow with grey-black distal third, gape bright yellow, and legs paler; immature like adult, but slightly duller black above, olive-grey below with black mottling on breast and belly, and bill dark yellow with black tip. **Voice.** Rather quiet. Vocalizations include soft twitters and whispered chirps, "tz, witecher-witecher-witecher" and "churr, churr, churr-chirr, chi chi chi, churr, churr"; song, heard at dawn (twice), a short nasal whistle followed by fast and then slow twitter, "oowae-oo, chit-it-it-it..chit..chit..chit". Also frequent short sharp contact calls; wheezy upslurred "tweest" when excited.

Habitat. Primary and secondary forest, and modified habitats, including coconut plantations and gardens; occupies all vegetated habitats throughout San Cristobal. Lowlands and mountains, from sea-level to c. 900 m; more common on coast and at middle altitudes than in foothills or at 700–900 m.

Food and Feeding. Mainly nectar, also small insects; once seen to carry a small fruit, which was dropped and caught again in mid-air. Forages mainly in canopy of forest or crowns of tall trees, including coconut palms and large garden trees; also in tall secondary growth and substages where forest disturbed. Searches on outside of crowns of trees or shrubs. Seldom singly; often in small parties of c. 6 individuals (often with more subadults than adults), but also congregates in larger numbers (up to ten, possibly more) in flowering trees, where sometimes forages with *Meliarchus sclateri* and parties of Duchess Lorikeet (*Charmosyna margarethae*); tends to move away from larger *Meliarchus sclateri*. Occasionally joins mixed-species flocks (up to three individuals of present species per flock).

Breeding. Nest with eggs on 5th Sept: nest like that of sunbird (Nectariniidae) but broader and less deep, suspended 10 m above ground from branch of understorey tree. No other information.

Movements. No information.

Status and Conservation. Not globally threatened. Restricted-range species: present in Solomon Group EBA. Poorly known. Considered generally common to abundant; on San Cristobal, very numerous on coast and moderately common inland. Status on Ugi not certain; considered vagrant or occasional visitor, but possible that a resident population exists; study needed.

Bibliography. Buckingham *et al.* (1995), Diamond (1976, 2002), Doughty *et al.* (1999), Dutton (2001), Koopman (1957), Mayr (1932), Mayr & Diamond (2001), McCarthy (2006), Rothschild & Hartert (1908), Stattersfield *et al.* (1998).

115. Orange-breasted Myzomela

Myzomela jugularis

French: Myzomèle des Fidji **German:** Orangebrust-Honigfresser **Spanish:** Mielero Pechinaranja
Other common names: Orange-breasted Honeyeater, Sulphur-breasted Myzomela

Taxonomy. *Myzomela jugularis* Peale, 1848, Vanua Levu, Fiji.

Related to the *M. lafargei* superspecies. Monotypic.

Distribution. Fiji: all main islands and most smaller islands and islets from Yasawa Group S to Kadavu and E to Lau Group.



Descriptive notes. 9–11 cm; male 8–10 g, female 8–9 g. Tiny, short-tailed honeyeater with long, rather slender and decurved bill. Male has head and neck mostly black, with crimson rear crown to nape, dull crimson chin and upper throat usually narrowly bordered below by black or blackish band across lower throat, and yellow to orange-yellow wash on throat and upper breast (latter often mottled blackish, particularly in mid-line); upperbody black, scarlet mottling on lower back, rump and uppertail-coverts (or these tracts mostly scarlet with varying black mottling or scaling); uppertail black-brown, varying small white tip

most obvious on outer rectrices (becomes much reduced or lost with wear); uperwing black, broad white tips on median secondary coverts and fine off-white to buff tips or terminal fringes on greater coverts (two ill-defined broken wingbars, much reduced or lost with wear), fine yellowish-olive outer edges on remiges (yellowish panel on folded wing); yellowish breast merging into dirty white to pale yellow on rest of underbody, diffusely and inconspicuously mottled blackish on sides and belly; undertail black-brown with broad white tip (reduced or lost with wear), underwing white with olive-brown trailing edge and tip; iris black, brownish-black or dark grey-brown; bill and gape black; legs grey-black to blue-black, soles yellow. Female is similar to male but smaller, duller and less strongly marked, with black of head, neck and upperbody sooty black, sometimes paler on top of head and on face, red of upperparts duller, and red on hindcap, rump and uppertail-coverts much reduced in extent or lacking; uperwing patterned as in male but ground colour duller, sooty black to olive-black; chin and upper throat duller red, yellow wash on lower throat and breast weaker and duller and more strongly mottled blackish. Juvenile lacks red in plumage, similar to female but duller still, with faint olive tinge on lower back to uppertail-coverts, single white wingbar (median coverts), and chin to breast dirty olive-grey (with no red), merging to pale greyish-white below; immature male like adult female but darker above, dark olive-brown to blackish-olive, usually no or at most a few red feather tips on nape and rump to uppertail-coverts, much as adult female below (chin and upper throat duller than adult male); immature female similar to immature male, but red confined to chin and duller, lower throat duller (less yellowish),

never any reddish tips on nape or rump. VOICE. Frequently a strident “chit-chit” or “sweet-sweet”, especially from flocks, which can produce almost continuous high-pitched trilling. Song a phrase of 2–4 syllables “tee-ter”, “tzwee-tzwee”, “tsu-tzwee-tzwee” or “tsee-ooop-tee-dee”, uttered monotonously (sometimes aggravatingly) by male from songpost, usually high in tree, for an hour or more; monotonous “tziit” punctuated by higher “tchee” possibly also describes song. Flight call “tee-too, tee-too-tee...”; another call a high-pitched “tee-tee-tee-tee”. Fledged young beg with squeaky “see see”.

Habitat. All habitats, including primary and secondary lowland, hill and montane forest, coastal forest and mangroves; common in disturbed habitats, including roadsides, clearings in forest, plantations and agricultural land, towns, villages and gardens, and scattered trees in open country. On Lakeba, in Lau Group, most abundant in disturbed habitats, especially coastal coconut plantation and mixed and pure pine woodland; decline in relative abundance with maturity of forest, being less numerous in secondary forest on carbonate rock and scarcest in mid-successional to late-successional forest on limestone. In Lomaiviti Group, recorded in all habitats on Gau and Makogai, including mature secondary scrub-forest with virtually no herb layer (grazed by goats) and coconut plantations on Makogai, and dense mature rainforest on Gau. On Viti Levu recorded from 30 m to 1310 m; from near sea-level to 970 m on Taveuni.

Food and Feeding. Mainly nectar; also takes many arthropods, including spiders (Araneae) and insects. Forages at all heights, from low herbs and shrubs up to canopy of tall forest, occasionally on ground; active, even appearing frenetic at times, darting between flowering plants and hopping among small branches and foliage. Takes nectar from wide variety of flowers (e.g. hibiscus, and introduced weed *Stachytarpheta*), by probing while perched, while hanging or while sally-hovering; occasionally pierces flower bases with bill. Gleans insects and spiders from on and around flowers and small branches; on Lakeba, common in nectar-poor habitats of pine woodland and suggested as largely insectivorous in these habitats. Normally seen singly, in twos (probably pairs) or in small groups; can gather in large numbers (30 or more) in flowering trees, when spend much time in chasing. Displaced by larger honeyeaters and by Collared Lory (*Phigys solitarius*).

Breeding. Recorded in all months except Mar–Apr; possibly double-brooded. Nest a fragile and loosely built cup made of grasses and fine rootlets, suspended between vertical stems among dense foliage of shrub, vine or small tree, usually below 4 m. Clutch 2 eggs; no information on incubation and nestling periods; young fed by both parents; family parties of adults and single young observed.

Movements. Mostly sedentary; in dry areas of W Viti Levu undertakes local movements, sometimes in small flocks, and can be absent for months before reappearing.

Status and Conservation. Not globally threatened. Restricted-range species: present in Fiji EBA. Common to abundant, e.g. common on Makogai and Gau, in Lomaiviti Group. Often found in modified habitats. Old reports from Samoa unsubstantiated.

Bibliography. Beckon (1993), Blackburn (1971), Brown & Child (1975), Clunie (1984), Gorman (1975), Holyoak (1979), Koopman (1957), Langham (1989), Mayr (1932, 1945b), McCarthy (2006), Morgan & Morgan (1965), Pernetta & Watling (1978), duPont (1976), Pratt *et al.* (1987), Schönwetter & Meise (1981), Steadman & Franklin (2000), Tarburton (1992), Watling (1982a, 1982b, 1985, 2001).

116. Red-rumped Myzomela

Myzomela vulnerata

French: Myzomèle de Timor **German:** Dreifarben-Honigfresser **Spanish:** Mielero Culiriojo
Other common names: Black-breasted/Sunda/Timor Myzomela, Red-rumped/Black-breasted/Black-chested/Sunda/Timor Honeyeater

Taxonomy. *Nectarinia* (*Myzomela*) *vulnerata* S. Müller, 1843, Timor, east Lesser Sundas. Relationships uncertain; suggested as being close to *M. erythrocephala*, or possibly close to the *M. cardinalis* superspecies. Monotypic.

Distribution. Timor, in E Lesser Sundas.



Descriptive notes. 10.5 cm. Distinctive and striking: has broad black mask across lores, malar area, narrowly over eye and side of neck and joining black breastband and black of mantle, back and scapulars, isolating scarlet cap and scarlet patch on chin and throat; rump and uppertail-coverts scarlet, uppertail blackish; upperwing mostly blackish, narrow greyish margins on coverts and remiges forming diffuse pale panel on folded wing (pale fringes on coverts much reduced with wear, but pale panel on remiges remains distinct); underbody below breastband white to greyish-white; iris blackish; bill and gape black; legs black. Sexes

similar in plumage, male apparently larger. Juvenile and immature undescribed. VOICE. Weak, high-pitched insect-like note, repeated monotonously at intervals of c. 1 second, “sit-sit-sit-...”; rapidly repeated series of similarly toned disyllabic notes, “tipa-tipa-tia-tipa-...”, second syllable lower than first.

Habitat. Mainly secondary monsoon forest and scrub, also in primary forest. Recorded from sea-level up to 1300 m.

Food and Feeding. Mainly nectar, also insects. Forages mostly from middle storey to canopy; at flowers in trees (including *Eucalyptus*) and other plants. Very active, but inconspicuous and infrequently observed; singly or in twos (probably pairs).

Breeding. Female carrying food in early Dec, and immatures or juveniles seen on three dates through May; extrapolated months of laying Mar–Apr and Nov. No other information.

Movements. Probably sedentary, with possibility of local movements.

Status and Conservation. Not globally threatened. Restricted-range species: present in Timor and Wetar EBA. Generally moderately common, and locally very common.

Bibliography. Coates & Bishop (1997), Hellmayr (1914), Koopman (1957), Mayr (1944a), Noske (2003), Noske & Saleh (1994, 1996, 1997), Trainor, Coates *et al.* (2007), Trainor, Santana *et al.* (2008).

117. Red-collared Myzomela

Myzomela rosenbergii

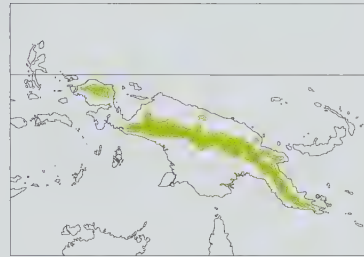
French: Myzomèle de Rosenberg **German:** Rosenberghonigfresser **Spanish:** Mielero de Rosenberg
Other common names: Red-collared/Black-and-red/Red-caped/(Von) Rosenberg’s Honeyeater, Black-and-red/Red-caped/Rosenberg’s Myzomela

Taxonomy. *Myzomela rosenbergii* Schlegel, 1871, Arfak Mountains, north-west New Guinea. Relationships within genus uncertain; may be close to the *M. cardinalis* superspecies or to the *M. lafargei* superspecies. Proposed race *wahgiensis* (Weiga, S slope Wahgi Divide, in Western Highlands) considered inseparable from nominate. Two subspecies recognized.

Subspecies and Distribution.

M. r. rosenbergii Schlegel, 1871 – high mountains of New Guinea from Vogelkop E, including Bewani Mts (C North Coastal Ranges), Adelbert Mts and mountains of Huon Peninsula, to Owen Stanley Range.

M. r. longirostris Mayr & Rand, 1935 – mountains of Goodenough I, in D’Entrecasteaux Archipelago.



Descriptive notes. 10–12.5 cm; male 9.3–12.7 g, female 9–10.7 g (nominate), three males 12.4–15.6 g, three females 7.5–8.5 g (*longirostris*). Male nominate race is striking, glossy jet-black except for broad, brilliant scarlet collar covering all of hindneck, side of neck, throat and upper breast, continuous with scarlet mantle, back, rump and uppertail-coverts; scarlet of underbody has varying scattered black patches or mottling, and sometimes posterior uppertail-coverts wholly black; underwing sooty black with silvery grey-brown remiges; iris brown to blackish-brown; bill black; legs very dark grey to blackish-brown

or black, soles yellow. Female is smaller than male, plumage very different, black-brown above, grading to blackish-brown on lores, malar area and chin and upper throat, diffuse and faint rufous-brown mottling on forehead and crown merging to more pronounced mottling or streaking on hindneck to back and scapulars, with scarlet-red lower rump and most uppertail-coverts, posterior uppertail-coverts and tail usually dark olive-brown to black-brown (sometimes lower back wholly rufous-brown and posterior tail-coverts tinged rufous-brown); median and greater upwerving-coverts with rufous-brown tips (two wingbars, fairly weak across median coverts and appearing broken on greater), remiges with fine, slightly paler dark olive outer edges (palest and most pronounced on tertials); extent of pale tips appears to vary (possibly with wear), wing sometimes appears fairly uniformly blackish-brown, relieved only by pale tips of tertials; lower throat and upper breast red, forming crescent-shaped patch, on some extending to centre of lower breast, rest of underbody rufous-brown, variably mottled blackish to dark brown throughout, underwing white with silvery grey-brown trailing edge and tip; legs possibly slightly paler, light brown to brown or grey-black, rest of bare parts as male. Juvenile is poorly known, fairly uniformly dark brown to chestnut-brown above and slightly paler below, with red wash on breast, blackish remiges, buff-olive tips on median and greater coverts and tertials (broader than on adult female), gape yellow and swollen; immature male possibly varies, like adult female but darker, with diffuse rufous-brown mottling on nape, behind eye and on upper side of neck merging into red (mottled rufous-brown and black) from hindneck to anterior uppertail-coverts and continuous with brilliant red lower side of neck, lower throat and breast, sooty-black scapulars and posterior tail-coverts with faint rufous-brown tinge, worn brownish upwerving-coverts (probably retained from juvenile plumage) with rufous-brown tips, or worn rufous-brown “rosethorns” at tips, faintly paler brown fringes on tertials and outer edges of remaining remiges, underbody below breast black and variably mottled rufous-brown (some may be more like adult female); immature female poorly known, like adult but smaller patch of red on throat to breast, little or no red on underbody, largely rufous-brown forehead and crown streaked blackish-brown, less distinctly dark face, large rufous-brown rosethorns at tips of median and greater coverts, may also have dark postocular stripe. Race *longirostris* is larger and with much longer bill than nominate, male plumage much as nominate but red deeper and darker, female differs from nominate in having head and upperparts olive-brown, with red on nape, hindneck, mantle and rump to uppertail-coverts, olive-grey below, yellow tinge on chin and throat, red breast patch. VOICE. Often noisy. Vocalizations include high-pitched, upslurred and rather drawn-out “tuweeist” or shorter “tswi” or “tsi”, a high “ts-ts”, and harsh “chh” in flight. Song a breathless, high-pitched sibilant trill or rapid repetition of 2 notes on different pitches, which may be same as rushed, sibilant whistled “swi-swi swit-swi...” from canopy.

Habitat. Lower montane to high mountain primary forest, including cloudforest, moss forest, oak (*Castanopsis*) forest and dense riverine forest, and in forest edge and secondary forest; recorded also in alpine shrubland and *Pandanus* scrub; occasionally in gardens with flowering shrubs. In Snow Mts one seen well above tree-line at c. 3350 m in scattered shrubs growing on talus slope; at Dokfuma Meadow (Star Mts) recorded in subalpine herbfield with dense mat of ferns, small stands of tree-ferns and shrubs, and bordered by open *Dacrydium* woodland and some stands of mossy upper montane forest in sheltered areas. On Mt Albert Edward (SE New Guinea) common in dense *Dodonea* regrowth. On Goodenough I common in montane oak forest. The only New Guinea member of genus occurring above 2000 m; mainly between 1200 m and 3700 m, occasionally foraging down to 600 m; recorded to 3950 m in Snow Mts. On Goodenough I, common at 1000 m and above.

Food and Feeding. Primarily nectar; also small arthropods, occasionally small fruits. Nectar taken from wide range of flowering plants, including trees (e.g. *Albizia*, *Terminalia*, *Syzygium*, *Xanthomyrtus* and flowering rhododendron), epiphytes and vines and shrubs (including *Dimorphanthera*). Arthropods mainly insects, including beetles (Coleoptera) and Hymenoptera. Gleans from foliage and probes flowers. One hopped about in dense foliage of forest tree, pausing only briefly to search, until it reached a flower; it then hung beneath this and probed with bill. Active, aggressive and conspicuous. Often congregates in flowering trees, usually up to about twelve individuals but at times in larger numbers, e.g. 25–30 (mostly males); associates with other honeyeaters, and other bird species, in flowering trees. Also seen singly or in twos (possibly pairs).

Breeding. Nestlings recorded in late Jul and late Sept, fledglings mid-Jul and juveniles early Sept; “breeding birds” in Aug (one) and Oct–Dec. One nest a bulky cup made of rootlets and lined with finer rootlets, c. 3 m above ground in vertical fork of shrub. At one nest, young fed only by female. No other information.

Movements. Largely resident, but variation in local numbers to exploit flowering trees indicate at least local movement or dispersal; at Crater Mt, seen only during times of maximum flower availability.

Status and Conservation. Not globally threatened. Common to abundant; abundant in Albert Range at 1400–1600 m; considered common on Goodenough I. Males seen far more often than females (e.g. at one site, ratio estimated at 20+:1), suggesting either biased sex ratio in population or sexual differences in behaviour and conspicuousness or in ecology; on Mt Karimui (apparent sex ratio male-biased 7:1), some data indicate that males and females forage differentially in flowering trees, where most birds are sighted, and that sexes appear also to exhibit some altitudinal segregation. Skins of males are used as ornaments by Papuans in SE New Guinea, with head of skin placed through a hole in the ear-lobe.

Bibliography. Archbold & Rand (1935), Beehler (1978a, 1980b), Beehler *et al.* (1986), Bell (1969, 1970b, 1971a), Bishop (1978), Clapp (1986b), Coates (1990), Coates & Peckover (2001), Coles (1995), Diamond (1972a), Eastwood (1989b), Filewood (1969), Friih & Friih (1992), Gibbs (1994), Gilliard & LeCroy (1961, 1968), Gregory (1995b), Gregory & Johnston (1993), Gyldenstolpe (1955a, 1955b), Hartert (1930), Heron (1977a), Hopkins (1992), Iova (1993), Koopman (1957), LeCroy & Peckover (1999, 2000), Mack & Wright (1996), Mayr & van Deusen (1956), Mayr & Gilliard (1954), Mayr & Rand (1935, 1937), Murray (1988b), Ogilvie-Grant (1915), Pratt (1982), Rand (1942b), Rand & Gilliard (1967), Ripley (1964), Sims (1956), Wahlberg (1988), Weston (1977).

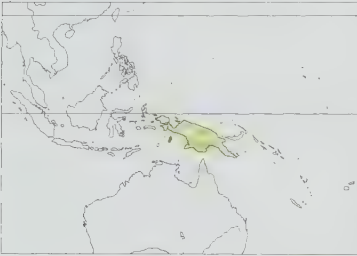
Genus *GLYCICHAERA* Salvadori, 1878

118. Green-backed Honeyeater

Glycichaera fallax

French: M  liphage trompeur **German:** Gr  nmantel-Honigfresser **Spanish:** Mielero Dorsiverde
Other common names: Green-backed Straightbill, Grey-headed/Puff-backed Honeyeater; White-eyed Honeyeater (*fallax*); Pale-eyed Honeyeater (*poliocephala*)

Taxonomy. *Glycichaera fallax* Salvadori, 1878. Hall Sound, south-east New Guinea. Sometimes placed in genus *Timeliopsis*. Birds of this species on Salawati of unknown racial identity, provisionally included in *pallida*. Four subspecies recognized.
Subspecies and Distribution.
G. f. pallida Stresemann & Paludan, 1932 – West Papuan Is (Waigeo, Batanta, Salawati).
G. f. poliocephala Salvadori, 1878 – Misool I (West Papuan Is), Aru Is and lowland NW New Guinea E to head of Geelvink Bay (lower Menoo R) and Onin Peninsula (Kapaur).
G. f. fallax Salvadori, 1878 – Yapen I (Geelvink Bay) and lowland New Guinea E of Geelvink Bay and Onin Peninsula to Milne Bay.
G. f. claudi (Mathews, 1914) – NE Queensland (E Cape York Peninsula S as far as Princess Charlotte Bay), in NE Australia.



Descriptive notes. 11–12.5 cm; male 7.5–18 g and female 8–12 g (New Guinea), two males 10.5–11.5 g and female 9.5 g (*claudi*). Small, nondescript honeyeater with almost straight, moderately long and pointed bill. Nominate race has head and neck greyish olive-brown, slightly paler on lores, cheek and ear-coverts, narrow, pale yellow eyering; pale yellowish chin and throat with olive mottling; upperbody dark olive, yellow tinge on rump and uppertail-coverts; upperwing olive-brown, fine pale olive edges and tips on coverts and remiges; uppertail dark olive-brown with fine and diffuse olive edges; underbody dull yellowish, undertail brownish

grey, underwing yellowish with brownish-grey remiges; iris light blue-grey; bill grey-black on upper mandible, paler horn-coloured on lower, gape pinkish-buff; legs blue-grey to dull grey. Sexes alike in plumage, male slightly larger than female. Juvenile is very like adult but duller, with slightly paler face, paler and inconspicuous eyering; pale yellow fleshy gape, and brown iris. Race *pallida* is like nominate, but greyer, contrasting with back, and underparts paler; *poliocephala* has bill intermediate

between nominate and *claudi*, and further differs in much greyer upperparts, ashy-grey head and neck, grey tinge in olive upperparts, grey mottling on chin and throat, and pale yellow underbody; *claudi* has slightly longer and less curved bill and slightly longer wing and tail than others, also very pale yellowish chin and throat, and brighter pale greenish-yellow underparts with stronger yellow tone. **Voice.** In New Guinea, usual call described as repeated high-pitched “chick”, or as repetitive “whit whit”, notes spaced at intervals of c. 1 second; also an infrequent dry “chit”. In Australia, contact call a pleasant busy twittering, sometimes with slight upward inflection, given mainly in flight or after alighting; also soft single peep (audible only at close range) during foraging; rapidly repeated loud single “twit” during chasing, developing to longer “twee-twee-twit-twit” for a while, also given more slowly in response to presence of observer. In New Guinea, considered quiet and easily overlooked. **Habitat.** Primary and secondary tropical rainforest and rainforest edge, in Australia including gallery forest, semi-deciduous vine thicket, semi-deciduous mesophyll vine forest, and edges of rainforest bordering clearings and roads, and in New Guinea monsoon forest. Recorded also in swamp-forest, riparian scrub and, rarely, in mangroves in New Guinea. In Australia, occasionally at edges of eucalypt forest bordering rainforest. In examination of vegetation succession (from gardens to forest) resulting from slash-and-burn agriculture in New Guinea, found in late regrowth and undisturbed plots; in New Guinea often considered common in forest clearings and secondary growth. Lowlands; in New Guinea in lowlands and hills, mainly to 850 m, exceptionally to 1200 m, becoming less common with altitude. **Food and Feeding.** Primarily insectivorous; also takes small fruits (including of *Poikilospermum*), and seen to forage among eucalypt flowers, taking either nectar or insects. In Australia, forages usually in canopy, particularly upper canopy, to 20 m above ground; less often in small trees and shrubs at 2–6 m, rarely to within 1 m of ground. Foraging height in New Guinea less clear: said to forage often in substages and less often in forest canopy, but also, conversely, said to forage mainly in canopy; study needed. Searches mainly among foliage, also on outer branches and twigs, and among vines. Active, rapidly hopping and running along branches, flitting from tree to tree, sometimes hanging sideways or upside-down. Obtains insects from foliage typically by gleaning; also by sally-hovering at foliage (including undersides of leaves) or small branches, or by sally-striking in air. Usually singly, in twos or in threes; sometimes in small parties of 5–10 individuals during dry season, when regularly chase one another in short quick flights through and below canopy; birds usually stay within 1–5 m of each other, though can appear to be foraging individually at times. In Australia, often associates with Rufous Fantail (*Rhipidura rufifrons*), sometimes with Fairy Gerygone (*Gerygone palpebrosa*) and Lemon-bellied Flyrobin (*Microeca flavigaster*); in New Guinea, occasionally in mixed flocks of insectivores. **Breeding.** Very poorly known. In New Guinea, nesting observed in Aug and Dec, juveniles in Jul and Oct, and birds in breeding condition Jul, Oct and Dec; probably breeds in dry season in NE Australia (dependent fledgling Aug, and another Jun). Fledgling fed by both adults. Nests possibly parasitized by bronze-cuckoos (*Chrysococcyx*), as adult feeding cuckoo chick in New Guinea. No other information. **Movements.** Apparently resident, probably with some local movements. **Status and Conservation.** Not globally threatened. Locally common in New Guinea, but generally considered uncommon there. In Australia, race *claudi* fairly common but occupying only a small area; most records at Iron Range, but a specimen from McIlwraith Range; doubtful reports from near Weipa. **Bibliography.** Bailey (1992), Barrett *et al.* (2003), Beehler (1978a), Beehler, Pratt & Zimmerman (1986), Beehler, Sengo *et al.* (1995), Bell (1970c, 1982a, 1982b, 1982d, 1984b), Beruldsen (1979), Blakers *et al.* (1984), Bowman *et al.* (1990), Coates (1990), Finch (1980b, 1983), Forshaw & Muller (1978), Gannon (1962), Garnett & Crowley (2000), Geeves & Horton (1990), Gilliard & LeCroy (1967a, 1968), Greenway (1966), Gregory (1995b), Hartert (1930), Higgins *et al.* (2001), Holland (1972), Hoogerwerf (1971), Johnson & Hooper (1973), Keast (1968a), Longmore (1991b), MacGillivray (1915, 1918), Mack & Wright (1996), Mayr & Rand (1937), McAllan (1990), Ogilvie-Grant (1915), Pavey (1991, 1994), Rand (1942a, 1942b), Ripley (1964), Schodde & Mason (1999), Sch  nwetter & Meise (1981), de Silva Garza (1993), Terborgh & Diamond (1970).



Genus *PTILOPRORA* De Vis, 1894

119. Leaden Honeyeater

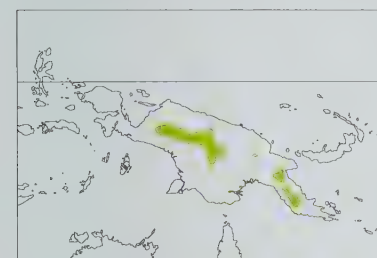
Ptiloprora plumbea

French: Méléphage gris-de-plomb **German:** Bleikehl-Honigfresser **Spanish:** Mielero Plomizo
Other common names: Leaden Streaked Honeyeater

Taxonomy. *Ptilotis plumbea* Salvadori, 1894, Moroka, south-east New Guinea. Two subspecies recognized.

Subspecies and Distribution.

P. p. granti Mayr, 1931 – patchily in Central Ranges of New Guinea (Nassau Mts E to Hindenburg Mts).
P. p. plumbea (Salvadori, 1894) – patchily in mountains of SE New Guinea, including Herzog Mts.



Descriptive notes. 14–15 cm; two males 13.5 g and 14 g, one female 12.5 g (nominate), one male 16.5 g (*granti*). Nominat race has head, neck and upperbody leaden grey, fine blackish-brown streaking on top of head, hindneck and side of neck, merging to dense fine pale grey to off-white speckling on side of head and chin and throat, and to broader and more diffuse blackish-brown streaking on mantle, back and scapulars (sometimes appearing as mottling); upperwing and uppertail grey-brown, browner than upperparts, wing-coverts and remiges with fine olive to olive-grey outer edges and tips (boldest on tertials and secondaries and basal edges of central primaries); underbody almost uniformly leaden grey, with fine and sparse white speckling across breast and olive-brown wash on belly; undertail brownish, underwing pale buff-grey with dark brownish-grey trailing edge and tip; iris typically light grey to silvery grey, in some (possibly immature) brown; bill black to grey-black; legs pale slate-blue or blue-grey. Sexes alike in plumage, male larger than female. Juvenile and immature apparently undescribed. Race *granti* is like nominate but slightly darker, slate-grey, with darker streaking on upperparts, and longer wing. Voice. Calls include whistled and somewhat breathy “wshee wshee wshee...”; and weak “teu teu” or “tswee” notes repeated about every 3 seconds.

Habitat. Mid-montane primary forest, forest edge and secondary growth; recorded also in gardens in Ok Tedi area. From 1000 m to 2100 m, possibly to 2400 m.

Food and Feeding. Arthropods and nectar from flowers. Forages from canopy level almost to ground, frequently in lower and middle stages (3–15 m above ground). Arthropods gleaned from foliage, twigs and petioles; nectar taken from flowers, including understorey flowers, e.g. ginger (Zingiberaceae). Not shy, but inconspicuous; active, continually flitting about when foraging in openings in forest. Usually seen singly, and often adopts posture with tail cocked; often flicks tail upwards.

Breeding. No information.

Movements. Sedentary.

Status and Conservation. Not globally threatened. Restricted-range species: present in Central Papuan Mountains EBA. Generally rare, and absent from much of Central and Eastern Highlands; can be fairly common to common locally, e.g. common in forest interior at Suria (Central Province, in SE New Guinea).

Bibliography. Beehler (1978a, 1978c, 1988), Beehler *et al.* (1986), Coates (1990), Coates & Peckover (2001), Diamond (1969), Eastwood & Gregory (1995), Gilliard (1950b), Gilliard & LeCroy (1961), Gregory (1995b), Mayr & Rand (1937), Murray (1988b), Ogilvie-Grant (1915), Rand & Gilliard (1967), Stattersfield *et al.* (1998).

120. Olive-streaked Honeyeater

Ptiloprora meekiana

French: Méléphage de Meek **German:** Meekhonigfresser **Spanish:** Mielero de Meek
Other common names: Yellowish(-streaked)/Meek’s (Streaked) Honeyeater

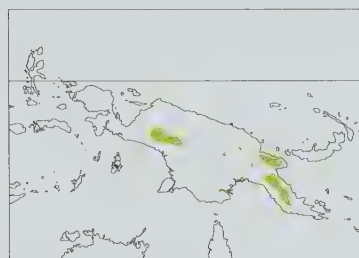
Taxonomy. *Ptilotis meekiana* Rothschild & E. J. O. Hartert, 1907, Upper Aroa River, south-east New Guinea.

In E New Guinea, isolated records at Tari Gap (Southern Highlands), Trauna Gap, near Baiyer River Sanctuary (Central Highlands), and Mt Michael (Eastern Highlands) involve birds of unknown racial identity; may represent an undescribed race (but specimen from Mt Michael intermediate between *occidentalis* and nominate). Two subspecies recognized.

Subspecies and Distribution.

P. m. occidentalis Rand, 1940 – upper slopes of E Nassau Mts and W Oranje Mts, in W New Guinea.
P. m. meekiana (Rothschild & E. J. O. Hartert, 1907) – Saruwaged Mts (Huon Peninsula), Herzog Mts and mountains of SE New Guinea (including upper Mambare R and Mt Tafa-Efogi area).

Descriptive notes. 16–17 cm; one male 18.5 g (nominate), two females 20–21 g (*occidentalis*). Nominat race has top and side of head and neck and upperbody yellowish-olive with bold blackish-olive streaking, streaks fine on top of head and hindneck, broader elsewhere, most prominent on mantle and back (aligning to give boldly striped appearance to upperparts); streaking on side of head fairly dense, giving diffusely masked appearance in which pale eye prominent; upperwing and uppertail blackish-brown to dark brown, darker than upperparts, narrow yellowish-olive edges on upperwing-coverts, remiges and rectrices; pale yellowish-olive below, with paler yellowish chin and throat and yellowish belly, strong dusky olive streaking throughout, strongest on throat; yellowish tuft at side of breast below angle of wing; undertail dusky brown, underwing pale yellowish with dark trailing edge and tip; iris light grey to greenish-grey; bill black, grey lower mandible and cutting edges, gape olive; legs blue-grey. Sexes alike in plumage, male larger than female. Juvenile and immature apparently undescribed. Race *occidentalis* is on average larger but with apparently shorter bill than nominate, also brighter all over, greenish (less grey-toned) above, with brighter rump and wing and tail edgings,



brighter throat with darker dusky streaking, and brighter yellowish underbody. Voice. Call note an indistinct “cht” or “chip”, frequently repeated.

Habitat. Mid-montane to montane forests and secondary growth. Recorded at 2200–2800 m in Snow Mts (race *occidentalis*); at 2440 m at Mt Michael; and from c. 1300 m to 2300 m, mainly 1500–2100 m, in SE (nominate).

Food and Feeding. Mainly arthropods, including medium-sized insects; also nectar from flowering trees. Forages usually in middle and upper levels of forest, and often in flowering trees; in Snow Mts, usually seen when gleaning through crowns of substage trees. Difficult to observe. Usually singly or in pairs; often in mixed-species feeding flocks in Snow Mts.

Breeding. Breeding female in Dec. No other information.

Movements. Sedentary.

Status and Conservation. Not globally threatened. Restricted-range species: present in Adelbert and Huon Ranges EBA and in Central Papuan Mountains EBA. Poorly known. Considered generally uncommon to rare; locally common, e.g. on N slopes of Snow Mts.

Bibliography. Beehler (1978a), Beehler *et al.* (1986), Bishop (1987), Coates (1990), Coates & Peckover (2001), Diamond (1969, 1972a), Greenway (1935), Mayr & Rand (1937), Rand (1940a, 1942b), Rand & Gilliard (1967), Ripley (1964), Stattersfield *et al.* (1998).

121. Rufous-sided Honeyeater

Ptiloprora erythropleura

French: Méléphage à flancs roux **German:** Rotflanken-Honigfresser **Spanish:** Mielero Flanquirro
Other common names: Rufous-sided Streaked Honeyeater, Red-sided (Streaked) Honeyeater

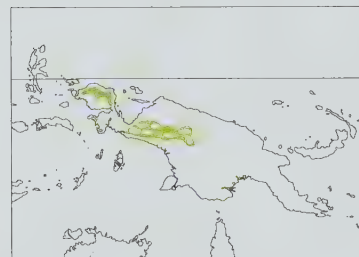
Taxonomy. *Ptilotis erythropleura* Salvadori, 1876, Arfak Mountains, north-west New Guinea.

Formerly considered conspecific with *P. mayri*, *P. guisei* and *P. perstriata*, but the four differ in size, plumage (crown colour, dorsal coloration, colour of wing-covert edgings, distinctness of ventral spotting, flank colour) and iris colour. Present species is sympatric (and with broad altitudinal overlap) with *P. perstriata* over distance of at least 400 km in W New Guinea. Birds from Wissel Lakes area (between Weyland Mts and Snow Mts) described as race *incerta*, but validity uncertain, and thought possibly a hybrid between race *dammermani* and *P. perstriata* (of nominate race); further study needed. In NW (Bomberai Peninsula), female specimen in Kumawa Mts like race *dammermani* in size and iris colour, but with pale yellowish wash below; birds almost certainly of this species seen commonly in Fakfak Mts also had somewhat yellowish underbody, and thought by later researchers to differ from nominate race in larger size, distinct streaking below and lack of rufous in plumage (also, tuft at side of breast yellowish, and at least some had pale iris); both populations provisionally included with present species, but study required in order to determine whether they represent one or two undescribed races, or even new species. Two subspecies currently recognized.

Subspecies and Distribution.

P. e. erythropleura (Salvadori, 1876) – mountains of Vogelkop and Bomberai Peninsula, in NW New Guinea.

P. e. dammermani Stresemann & Paludan, 1934 – Weyland Mts E to Nassau Range and Oranje Mts, in W New Guinea.



Descriptive notes. 17 cm; male 21–25 g and female 18.5–20.5 g (nominate), one female from Kumawa Mts 21 g. Nominat race has head and neck leaden grey, fine and dense pale greyish speckling or scaling on forehead and lores and in diffuse suborbital crescent, fine pale dull olive edges on top of head and hindneck (faintly scaled or streaked effect); upperparts dusky to blackish-brown with fine and obscure dull olive-grey streaking or scaling, olive-brown wash on rump and uppertail-coverts; upperwing-coverts varying edged rufous to very pale olive, pale olive edges on remiges; underbody pale leaden grey, fine off-white to pale grey feather edges on breast and centre of belly (faintly scaled or streaked effect), chestnut-brown flanks; iris red, brownish-red or red-brown; bill black, sometimes blackish-grey; legs blue-grey to grey-blue or slate-grey. Sexes alike in plumage, male larger than female. Juvenile and immature not properly known, but plumage generally washed olive or creamy yellow to greenish-yellow, especially below. Race *dammermani* is like nominate but darker grey below, with darker brown flanks, iris apparently dull pale green, also wing slightly longer but tail possibly shorter (few data for latter). Voice. Song consists of plaintive whistled “chwee” notes given at rate of 2 per second. In Kumawa Mts and Fakfak Mts, consisted of high plaintive slurs repeated at intervals of 3–6 seconds (similar to song of *P. guisei*, *P. mayri* and *P. perstriata*); at least in Kumawa Mts, repeated element often 2–3 separate notes at different pitches, first one usually staccato.

Habitat. Mid-montane and montane forest and secondary growth. Recorded at 1300–2800 m; heard commonly above 1200 m in Fakfak Mts.

Food and Feeding. Diet includes arthropods (mainly insects), nectar and fruit (including berries). Forages mainly in middle and upper levels of vegetation, but extends to understorey; gleans and probes. Active, confiding, quick-moving and usually conspicuous; seen in twos (probably pairs) and in small groups (possibly family parties).

Breeding. No information.

Movements. Presumed sedentary.

Status and Conservation. Not globally threatened. Restricted-range species: present in West Papuan Highlands EBA and in Central Papuan Mountains EBA. Not well known. Considered generally uncommon, but said to be quite common at higher altitudes in Arfak Mts; uncommon in Kumawa Mts.

On following pages: 122. Mayr’s Honeyeater (*Ptiloprora mayri*); 123. Rufous-backed Honeyeater (*Ptiloprora guisei*); 124. Black-backed Honeyeater (*Ptiloprora perstriata*); 125. Tawny-crowned Honeyeater (*Gliciphila melanops*); 126. Banded Honeyeater (*Cissomela pectoralis*); 127. Scaly-crowned Honeyeater (*Lichmera lombokiana*); 128. Olive Honeyeater (*Lichmera argentauris*); 129. Indonesian Honeyeater (*Lichmera limbata*); 130. Brown Honeyeater (*Lichmera indistincta*); 131. Dark-brown Honeyeater (*Lichmera incana*); 132. Scaly-breasted Honeyeater (*Lichmera squamata*); 133. Silver-eared Honeyeater (*Lichmera alboauricularis*); 134. Buru Honeyeater (*Lichmera deningeri*); 135. Seram Honeyeater (*Lichmera monticola*); 136. Yellow-eared Honeyeater (*Lichmera flavicans*); 137. Black-necklaced Honeyeater (*Lichmera notabilis*).

Bibliography. Beehler *et al.* (1986), Coates & Peckover (2001), Diamond (1969, 1985), Eastwood (1996a), Gibbs (1994), Gilliard & LeCroy (1970), Gyldenstolpe (1955b), Hartert (1930), Hoogerwerf (1971), Hombuckle (2001), McCarthy (2006), Melville (1980), Ogilvie-Grant (1915), Rand (1942b), Rand & Gilliard (1967), Ripley (1964), Stattersfield *et al.* (1998), Stein (1936).

122. Mayr's Honeyeater

Ptiloprora mayri

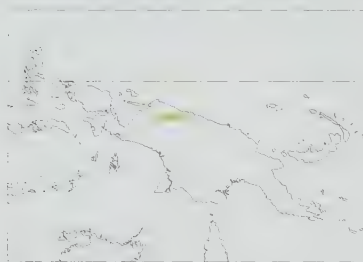
French: Méléphage de Mayr **German:** Mayrhonigfresser **Spanish:** Mielero de Mayr
Other common names: Mayr's Streaked Honeyeater

Taxonomy. *Ptiloprora guisei mayri* E. J. O. Hartert, 1930, Cyclops Mountains, north New Guinea. Formerly considered conspecific with *P. erythropleura*, *P. guisei* and *P. perstriata*, but the four differ in size, plumage (crown colour, dorsal coloration, colour of wing-covert edgings, distinctness of ventral spotting, flank colour) and iris colour. May form a superspecies with *P. guisei*, and often treated as conspecific with that species alone, but comparative studies indicate that the two are better considered separate species. Two subspecies recognized.

Subspecies and Distribution.

P. m. mayri E. J. O. Hartert, 1930 – Foja Mts and Cyclops Mts, in N New Guinea.

P. m. acrophila Diamond, 1969 – summit of Mt Menawa (Bewani Mts), in N New Guinea.



Descriptive notes. 19.5 cm; male 30–37.5 g and female 24–29 g (nominate), male 29.3–36.3 g and female 25.5–29.2 g (*acrophila*). Nominate race has top and side of head and neck and upperbody black-brown to dusky black, irregular pale grey streaking on top of head (grey edges of feathers; crown can appear pale with dark spotting), merging to pale rufous-brown mottling on lower hindneck and side of neck and to heavy pale rufous-brown mottling on mantle, back and scapulars, and more diffuse and weaker mottling on rest of upperbody; upperwing and upperpart blackish-brown, wing-coverts with pale grey outer edges, primaries with pale grey to olive-

grey outer edges; mostly light grey below, diffusely mottled dusky on chin and throat, distinctly streaked dusky grey on breast and belly, merging to dusky grey with rufous tinge and streaked with pale rufous-brown on sides of breast and belly and on flanks; vent and undertail-coverts as belly, but washed rufous-brown or yellowish and only faintly streaked; undertail brownish-grey; iris green or greyish-green; bill black; legs bluish-grey. Sexes alike in plumage, male larger than female. Juvenile is washed olive or greenish-yellow below. Race *acrophila* differs from nominate in having pale feather on forehead and crown slightly darker grey, merging to dull olive on nape and hindneck, rufous-brown edges on upperbody darker, duller and tinged olive, wing-covert edges varying light rufous-olive (not pale grey), and streaking below paler and greyer and less contrasting. **Voice.** Plaintive whistles. Song described as high plaintive slur repeated monotonously once every 3 seconds, but varying, e.g. a rising disyllable, descending disyllable, rising and falling slur or falling and then rising slur. Call a startled, moderately high-pitched slightly squeaky "cheep".

Habitat. Hill and montane forest, moss forest and secondary forest. Nominate race at 1200–2150 m; *acrophila* apparently confined to summit of Mt Menawa (highest peak in North Coastal Range), from 1280 m to 1885 m.

Food and Feeding. Diet includes arthropods (insects), nectar and fruit. Forages from understorey to canopy, including crowns of flowering trees; gleans, and probes flowers.

Breeding. Female ready to lay in early Sept. No other information.

Movements. Presumed sedentary.

Status and Conservation. Not globally threatened. Restricted-range species; present in North Papuan Mountains EBA. Poorly known; considered generally abundant within its altitudinal limits.

Bibliography. Beehler *et al.* (1986), Coates (1990), Coates & Peckover (2001), Diamond (1969, 1985), Hartert (1930), Rand & Gilliard (1967), Stattersfield *et al.* (1998).

123. Rufous-backed Honeyeater

Ptiloprora guisei

French: Méléphage à dos roux **German:** Rotrück-Honigfresser **Spanish:** Mielero Dorsirrojo
Other common names: Red-backed/Green-eyed/Guise's Honeyeater, Brown-backed Streaked Honeyeater

Taxonomy. *Ptilotis (?) guisei* De Vis, 1894, Mount Maneao, south-east New Guinea.

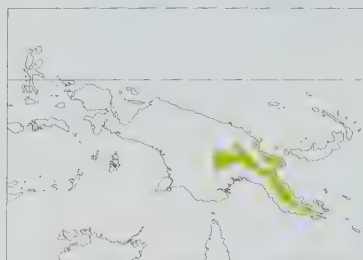
Formerly considered conspecific with *P. erythropleura*, *P. mayri* and *P. perstriata*, but the four differ in size, plumage (crown colour, dorsal coloration, colour of wing-covert edgings, distinctness of ventral spotting, flank colour) and iris colour. May form a superspecies with *P. mayri*, and often treated as conspecific with that species alone, but comparative studies indicate that the two are better considered separate species. Has sometimes been thought conspecific with *P. perstriata*, but the two occur sympatrically (with mutually exclusive altitudinal ranges) over at least 560 km in E New Guinea. Birds of Huon Peninsula intermediate between nominate and *umbrosa*, but closer to latter and generally included within it; populations of Adelbert Mts and Mt Bosavi likewise provisionally placed in *umbrosa*. W limits of nominate race uncertain; populations of Bismarck Range and Kubor Range placed in nominate, but may belong with *umbrosa* (or intergradient between the two races). Two subspecies recognized.

Subspecies and Distribution.

P. g. umbrosa Mayr, 1931 – Adelbert Mts, Mt Bosavi, Huon Peninsula (Saruwaged Mts), Schrader Range and Eastern Highlands (W at least to Tari), in NE & E New Guinea.

P. g. guisei (De Vis, 1894) – mountains of SE New Guinea, E from Bismarck and Kubor Ranges and Herzog Mts.

Descriptive notes. 16–18 cm; male 21–27 g and female 19–22 g (Huon Peninsula), male 21.3–27.7 g and female 17.6–24 g (Eastern Highlands). Nominate race has top of head and hindneck black with irregular olive to olive-grey streaking, merging to rufous-brown mottling on lower hindneck and lower side of neck; side of head blackish with grey streaking and wash, especially prominent on supercilium and around eye (rather "open-faced" expression); upperbody black to black-brown, mottled with rufous-brown, heavily so on mantle and scapulars and more diffusely and more weakly on rest of upperbody; upperwing and upperpart blackish-brown, pale olive to yellowish-olive margins on median coverts and outer edges of greater coverts, pale olive to olive-rufous outer edges of primaries; chin and throat light grey, diffusely mottled dusky; breast and belly largely pale grey to greyish-white



light blue, blue or blue-black (reported also as leaden grey), soles yellow. Sexes alike in plumage, male larger than female (latter c. 10% smaller). Juvenile is like adult, but duller and with more diffuse and weaker streaking above, and below washed olive-yellow to greenish-yellow, with reduced and duller rufous. Race *umbrosa* is slightly smaller than nominate, with crown streaking brownish-grey to light grey (not olive), somewhat duller brownish (less bright rufous) feather edges on upperbody. **Voice.** Varies locally and geographically, but all typically loud whistled notes usually repeated many times; heard throughout day. Typical vocalizations described as plaintive, high-pitched, lisp-like whistle of 2–3 notes "uree yooee" and variants. In SE, common calls include whistled "sieiew", and a slurred note followed by a falling note, "isiiep teuwp" or "siieei pup". In Eastern Highlands and Chimbu Province, calls include short staccato or buzzing note followed by plaintive slurred whistle, or the reverse; a whistled downslur followed by upslur; and a series of identical downslurred whistles (c. 1 note per second). Also staccato "chip". Wingbeats loud and conspicuous.

Habitat. Montane and upper montane primary forest, especially moss forest, also forest edge and secondary growth. Preference for moss forest, or its associated climatic conditions, shown by lower altitudinal limits of the species (linked to local variation in lower limits of moss forest): from c. 1340 m to 2500–2900 m in Central Ranges (replaced at higher altitudes by *P. perstriata*) and, on Iluon Peninsula, to tree-line at c. 3500 m (in absence of congener); mainly above 1800 m. Altitudinal overlap with *P. perstriata* of up to several hundred metres in some areas: on Mt Michael transition between the two occurs at 2890–3200 m, whereas on Mts Hagen, Kubor and Wilhelm transition at c. 2400 m.

Food and Feeding. Predominantly arthropods (mainly insects); also fruit, seeds (probably ingested with fruit) and nectar. Ranges from understorey to canopy, mainly in shrub layer and middle storey; occasionally visits flowering trees and shrubs (including *Xanthomyrtus papuanis*). Forages by gleaning and probing (epiphytes and flowers), and often hangs upside-down while foraging. Observed to steal nectar by probing pierced slits at bases of epiphytic *Rhododendron* flowers, although not seen to pierce the flowers. Active, conspicuous, and inquisitive. Usually singly, but often twos (probably pairs) mist-netted; sometimes associates with other species in flowering trees. Often adopts characteristic cocked-tail posture, and frequently flicks tail up.

Breeding. Few data. Nestling recorded early Feb and juvenile early May. Two nests found, 1.25 m and 2 m above ground in sapling (one a casuarina); another nest described as of this species, but suggested as more likely to be that of *P. perstriata*. Clutch apparently 1 egg; no information on incubation and nesting periods.

Movements. None known; presumed resident, possibly with some local movements.

Status and Conservation. Not globally threatened. Restricted-range species; present in Adelbert and Huon Ranges EBA and in Central Papuan Mountains EBA. Generally common to abundant in suitable habitat, e.g. on Mt Albert Edward, and in Simbai Valley; locally scarce to fairly common. The most abundant and characteristic species in moss forest in Eastern Highlands.

Bibliography. Beehler (1978a, 1980b), Beehler *et al.* (1986), Bell (1971a), Clapp (1996), Coates (1990), Coates & Peckover (2001), Coles (1995), Diamond (1969, 1973), Filewood (1969), Frith (1971), Frith & Frith (1992), Gilliard & LeCroy (1961, 1968), Gyldenstolpe (1955a), Heron (1977a), Hicks (1988d), Hicks & Burrows (1989, 1992), Lake (1958), Mayr (1931c), Mayr & Gilliard (1954), Mayr & Rand (1937), Rand (1936b), Rand & Gilliard (1967), Richards & Rowland (1995), Schönwetter & Meise (1981), Sims (1956), Stattersfield *et al.* (1998), Wahlberg (1988), Weston (1976a, 1977).

124. Black-backed Honeyeater

Ptiloprora perstriata

French: Méléphage strié **German:** Streifenhonigfresser **Spanish:** Mielero Estriado
Other common names: Grey-streaked/Many-streaked Honeyeater, Black-backed Streaked Honeyeater

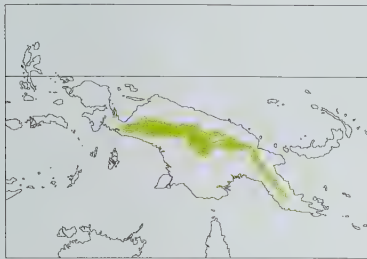
Taxonomy. *Ptilotis perstriata* De Vis, 1898, Wharton Range, south-east New Guinea.

Formerly considered conspecific with *P. erythropleura*, *P. mayri* and *P. guisei*, but the four differ in size, plumage (crown colour, dorsal coloration, colour of wing-covert edgings, distinctness of ventral spotting, flank colour) and iris colour. Present species has sometimes been thought conspecific with *P. guisei*, but the two occur sympatrically (with mutually exclusive altitudinal ranges) over at least 560 km in E New Guinea. Sympatric (and with broad altitudinal overlap) also with *P. erythropleura* over distance of at least 400 km in W New Guinea. Proposed race *lorentzi* (described from Hellwig Mts, in Oranje Range) considered inseparable from nominate. Birds from Wissel Lakes area (between Weyland Mts and Snow Mts) described as race *incerta*, but validity uncertain, and thought possibly a hybrid between nominate race and *P. erythropleura* (of race *dammermani*); further study needed. Two subspecies currently recognized.

Subspecies and Distribution.

P. p. praedicta E. J. O. Hartert, 1930 – mountains of Wandammen Peninsula, in NW New Guinea. *P. p. perstriata* (De Vis, 1898) – New Guinea mountains from Weyland Mts and Nassau and Oranje Ranges E, including high peaks in Hindenburg, Victor Emanuel and Bismarck Ranges, to Wharton Range (in SE).

Descriptive notes. 19.5–20 cm; male 23.5–30 g and female 21–25.5 g (nominate), three males 29.5–32 g and one female 26 g (*praedicta*). Nominate race has head and neck black-brown, irregular light grey streaking on top of head, hindneck and side of neck, merging to dense fine pale grey streaking and speckling on side of head; upperbody black-brown to almost black, irregular light grey streaking on mantle merging to more olive-grey to pale olive-brown streaking on back and scapulars (whole of saddle appearing somewhat mottled); upperwing and upperpart dark brown, slightly browner than upperparts, median coverts and outer edges of greater coverts with rufous-brown tips, and rufous-brown basal outer edges on all except outer 2–3 primaries (which have faint rufous tinge on outer edges, apparently rapidly lost with wear); chin brown to dark brown, faintly mottled light grey, merging to light grey and diffusely brown-streaked on throat; underbody black-brown to dark brown or dark reddish-brown, heavily but irregularly streaked with light grey to off-white, and overlaid with strong rufous-brown wash on flanks, side of belly and vent and undertail-coverts; undertail olive-brown; underwing off-white to buff, mottled brown on coverts, with dark brownish-grey trailing edge



and tip; iris green to pale green or greyish-green; bill black; legs blue to blue-grey or leaden. Sexes alike in plumage, male larger than female. Juvenile is apparently largely dark brown to dark olive-brown and appearing unstreaked above (edges of feathers differing little from centres), heavily brown-streaked yellowish-olive below, lacking conspicuous rufous on flanks, with greyer chin and throat, also soft pale gape, brown (not green) iris, and greyish-brown legs. Race *praedicta* is larger than nominate (but highest-altitude populations of latter in Snow Mts more similar), has slightly paler ground colour on top of head, broader pale streaking on

crown to back and scapulars, greyer rump and uppertail-coverts, paler greyish-black to dark grey underbody with broader pale streaking, and paler and less extensive rufous-brown wash on flanks and sides. VOICE. Range of brief high-pitched and often slurred whistles, repeated every few seconds, such as “sueei-yu” (duration 0.75 seconds) and trisyllabic “ss’wei’ssii” (0.9 seconds) or “whee-u”, “wee dyu”, “a-whee”, “chee-a-wee”, “deeyur whit” or “peeyu seeyu”; also a loud, monotonously repeated upslurred “seeu”, a downslurred “seeee”, and continuous series of dry “chip” notes.

Habitat. Upper mid-montane and montane primary forest, from open to dense forest and including moss forest, at forest edge, tongues of stunted trees and shrubs extending into alpine grassland, and alpine and subalpine shrubland. From c. 1300 m to 3750 m in W New Guinea, fairly common above 1500 m in Ok Tedi region in C, but only above c. 2500 m in E. Largely above range of *P. guisei*, but altitudinal overlap of up to several hundred metres in some areas; on Mt Michael transition between the two occurs at 2890–3200 m, whereas on Mts Hagen, Kubor and Wilhelm transition was at c. 2400 m.

Food and Feeding. Diet includes arthropods (mostly insects), fruit and nectar. Forages from understorey shrubs, close to ground, up to canopy level; also commonly in shrubs of edge habitats. Takes insects and fruit by gleaning from foliage, twigs, branches and roots, probing moss and epiphytes, and occasionally sallying for flying insects; nectar, and probably some insects, taken by probing flowers, including of shrub *Dimorphanthera*, flowers of which it probed from below. Active and generally unwary; clammers about in vegetation and sometimes hangs upside-down. Usually seen singly, less often in twos (probably pairs); at least occasionally in mixed-species flocks.

Breeding. Eggs recorded in early Oct and late Jan (and almost certainly late Apr), nestlings early Jul, late Oct and early Nov (another nestling, probably of this species, in early Oct), fledglings early Sept and early Nov, and juveniles mid-Aug to mid-Sept; apparently carrying nesting material in early Feb. Nest a deep bulky cup, exterior made of moss, coarse grass, leaves and twigs and covered with live green moss (hangs from walls of nest), with some dry fine tendrils and green epiphytic orchid stems around upper rim, interior a cup of dry, paper-like pieces of *Pandanus* frond and *Nastus* bamboo leaves, lined thickly with hair-like plant fibres and feathers and fine hair, for three nests external diameter 10.5–11.6 cm, depth 11–14.5 cm, internal diameter 5–6.2 cm, depth 3.5–4.5 cm, another 9.5 × 12.5 cm externally and 5.5 × 3.5 cm internally; one nest suspended by rim from fork of sapling branch, another apparently supported on branch and against trunk of small tree, a third was atop a tree-fern (*Cyathea*) frond and another suspended by rim between horizontal forks, first three nests respectively 2.5 m, 5.5 m and 3.9 m above ground; nest originally described as that of *P. guisei* but more likely of present species was made of rootlets and dried leaves (of climbing bamboo), covered externally with living moss, lined with hair-like plant fibres and a few feathers, suspended from leafy fork of hanging vine; another nest probably of this species made of coarse grass, leaves and twigs, lined with feathers and grass, with strands of moss attached to exterior, external dimensions 11 × 13 cm. Clutch of 1 egg recorded (2 eggs possible); four nests each contained a single young, as also did nest originally described as that of *P. guisei*; no information on incubation and nestling periods.

Movements. Presumed sedentary.

Status and Conservation. Not globally threatened. Restricted-range species: present in West Papuan Highlands EBA and in Central Papuan Mountains EBA. Not well known; considered generally fairly common to abundant.

Bibliography. Beehler *et al.* (1986), Coates (1990), Coates & Peckover (2001), Coles (1995), Diamond (1969, 1972a, 1973), Eastwood (1996a), Frith & Frith (1988, 1992), Gilliard & LeCroy (1961), Gregory (1995b), Gyldestolpe (1955a), Hartert (1930), Hopkins (1992), Loke (1958), Mayr & Gilliard (1954), Mayr & Rand (1937), McCarthy (2006), Melville (1980), Murray (1988b), Ogilvie-Grant (1915), Rand (1936b, 1942b), Rand & Gilliard (1967), Richards & Rowland (1995), Ripley (1964), Rowland (1995), Schönwetter & Meise (1981), Sims (1956), Stattersfield *et al.* (1998), Stein (1936), Weston (1977).

Genus GLICIPHILA Swainson, 1837

125. Tawny-crowned Honeyeater

Gliciphila melanops

French: Méléphage à calotte fauve **German:** Goldscheitel-Honigfresser **Spanish:** Mielero Coronado
Other common names: Fulvous-breasted/Fulvous-fronted Honeyeater

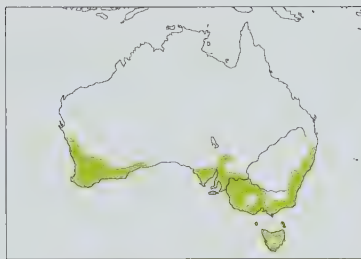
Taxonomy. *Certhia melanops* Latham, 1801, Nova Wallia Australi = New South Wales, Australia. Spelling of genus name sometimes emended to *Glyciphila*; currently awaiting official decision from ICZN. Until recently, genus subsumed in *Phylidonyris*. Formerly, birds from Kangaroo I were separated as race *braba* and those from Bass Strait islands and E Tasmania as *crassirostris*, but no significant differences from mainland birds. Two subspecies recognized.

Subspecies and Distribution.

G. m. melanops (Latham, 1801) – SW Western Australia (S from Kalbarri–Geraldton), E across S Australia (largely absent Nullarbor coast and Nullarbor Plain) to SE South Australia including Kangaroo I (and extending N through Flinders Ranges to Wilpena Pound), Victoria, and E coast of New South Wales (except far NE); also islands in Bass Strait (King I, Hunter Is, Furneaux Group; historical records in Kent Group), and E Tasmania.

G. m. chelidonia Schodde & Mason, 1999 – NW, W & SW coasts of Tasmania.

Descriptive notes. 14–18 cm; male 14.7–22 g, female 14–19 g (nominate). Nominat race is largely grey-brown above, streaked and mottled pale olive-brown on mantle, back and scapulars, and with distinctive head pattern of off-white forehead merging into rufous-brown to pale orange or ochre crown, bold white supercilium, black-brown facial stripe extending down side of neck to side of upper breast and enclosing small white crescent over rear ear-coverts, and white chin and throat; upwearing mostly dark brown, coverts with off-white to pale olive-brown margins, remiges with



narrow olive-yellow outer edges (diffuse pale panel on folded wing); uppertail dark brown, with fine white tip and side (in fresh plumage); underbody white, except for black-brown crescent at side of upper breast, grey-brown mottling on side of lower breast and belly, and grey-brown flanks; undertail grey-brown, underwing rufous-brown to salmon with grey-brown trailing edge and tip; iris dark brown; bill and gape black; legs grey-black to black. Sexes similar in plumage, male slightly larger than female. Juvenile differs markedly from adult, has head and neck brown, fine white streaking on top of head, hindneck and side of neck, diffuse whit-

ish crescent on rear ear-coverts, yellowish-white malar area, chin and throat, upperbody mostly brown, merging to pale olive-grey on rump, with bold white to pale brown streaking (except on rump), bolder off-white to buff margins on most wing-coverts, breast mottled brown and white, only hint of darker crescent at side, belly and vent off-white, rest of underbody pale grey-brown, bill black-brown or black with pale base of lower mandible, gape orange-yellow to yellow-brown. Race *chelidonia* differs from nominate in having distinct rufous tinge on mantle and upper back, and slightly rufous or buff tinge on side of breast and upper flanks. VOICE. Song, from perch and in flight, consists of simple, clear, plaintive bell-like or flute-like whistles, described as single drawn-out note followed by quick repetition of double note, and repeated 6–8 times, or ethereal high-pitched ascending “a-peer-peer-pee-pee-pee”; in spring often sings before dawn, and song a main component of dawn chorus. Other main vocalization a mournful drawn-out note, heard often. Other calls include “ciff, ciff, ciff” by female during distraction display, and undescribed distress calls.

Habitat. Primarily coastal and semi-arid inland heathland, preferring low (no more than 2 m tall) dry heathland with open structure, typically dominated by *Banksia* or *Allocasuarina* and with scattered emergent low trees or clumps of stunted trees (often *Eucalyptus* or *Angophora*). Also commonly in non-heath shrublands, and in Tasmania in buttongrass (*Gymnoschoenus*) sedge-land-moorland. Occasionally in mallee woodlands or shrublands, especially low dense heath-like mallee, but also in taller mallee with heathy or sparse understorey. Less often in low woodland of *Banksia* (or *Banksia* and stringybark eucalypts), open woodland or forest with heath or shrubby understorey, and dense low regrowth vegetation.

Food and Feeding. Mainly nectar, from wide range of plants (including *Banksia*, *Grevillea*, *Adenanthos*, *Xanthorrhoea*, *Astroloma*, *Correa*, *Eucalyptus*); also arthropods (mainly insects), and honeydew. Estimated ratio of nectar to insects in diet 42:58 near Adelaide (South Australia) and 68:32 at Golton Vale (Victoria); “insect” proportion at latter involved mostly honeydew. Forages in low shrubs, at flowers and among foliage; also much on ground, including among low grasses. Probes flowers for nectar; insects caught mainly by sallying, mostly sally-striking in air, but honeydew and some insects gleaned from bark, foliage or ground. Often shy. Usually singly, in twos or in small groups of up to ten individuals, but often appears to forage solitarily; sometimes gathers at food sources, but not in coherent flocks. At one site, many hundreds on one day fed on large influx of flying insects.

Breeding. Season Jul–Apr, clutches recorded mainly Aug–Nov (78.5% of 70 clutches) and nestlings Aug–Apr; in SW eggs Jul–Feb inland and Nov–Jan near S coast; in Sydney laying formerly coincided with flowering of *Boronia serrulata*, but nesting peak just N of Sydney coincided with flowering of *Banksia ericifolia*; possibly double-brooded if conditions suitable. Nest a deep cup made of shredded bark and grass, less often twigs, leaves, rootlets and spider web, lined with shredded bark, soft grass seeds and leaves, flowers, feathers and plant down, external diameter 8.3–11.4 cm, depth 7–8.9 cm, internal diameter 5.1–5.7 cm, depth 5.1–3.5 cm; suspended by rim or supported in fork or upright stems (including grasses and sedges), and usually woven into stems, normally low and well concealed in dense shrub or grass tussock, occasionally on ground, or up to 1.2 m (mean 0.3 m) above ground. Clutch usually 2 eggs, rarely 1 or 3 (4 eggs in one nest almost certainly involved laying by different females); incubation by female, period c. 13–16 days; chicks fed by both sexes, nestling period twice recorded as 12 days, and two 13-day-old young left nest on approach of human observer; fledglings fed by both parents. Nests parasitized by Horsfield’s Bronzeczuckoo (*Chrysococcyx basalis*) and Pallid Cuckoo (*Cuculus pallidus*).

Movements. Resident over most of range, with some seasonal patterns in occurrence or abundance. For example, at one site N of Sydney, present all months but densities lowest Nov–Feb; reporting rates in W Victoria indicate some movement between coastal and inland (more common on coast in Dec–Apr and inland May–Oct); in Wheatbelt of Western Australia, recorded throughout year but more often in winter than in summer. Considered nomadic or semi-nomadic at some sites, with occurrence irregular, though extent of movements not known and probably often only local. Occasional at some sites outside normal range, e.g. Eyre Bird Observatory (on Nullarbor coast), where recorded mainly May–Jul. Occasional influxes recorded, more often in W than in E; at Driptstone (New South Wales) large flock appeared in Jun and disappeared within two days. In W range, suggested that some seasonal movements related to flowering of plants, although near Albany more common when nectar scarce than when abundant (possibly because excluded by other honeyeaters). Influxes sometimes coincide with flowering of foodplants, sometimes with drought.

Status and Conservation. Not globally threatened. Fairly common; recorded densities of 0.05–1.6 birds/ha at various sites. Range and numbers have decreased at some sites as a result of habitat clearance, such as in Wheatbelt of Western Australia. In urban E Sydney, population reduced to a few pairs by late 1960s and extirpated by 1971.

Bibliography. Abbott (1981), Althofer (1936), Barrett *et al.* (2003), Bell (1983b), Blakers *et al.* (1984), Campbell (1900), Carpenter & Matthew (1986), Colston (1974), Cooper (1974, 1975a), Emission *et al.* (1987), Ford (1976, 1977), Ford & Paton (1977), Frith (1969), Gannon (1962, 1966), Gosper, C.R. & Baker (1997), Gosper, D.G. (1986), Green (1989), Halse *et al.* (1985), Higgins (1999), Higgins *et al.* (2001), Hobbs (1969), Johnstone & Storr (2004), Keast (1968a), Lepschi (1993), Matthew & Carpenter (1993), McFarland & Sale (1986), McGarvie & Templeton (1974), Morris *et al.* (1981), North (1906), Paton (1980), Paton & Paton (1980), Pizzey (1980), Possingham & Possingham (1997), Recher (1971), Reilly (1991a), Saunders & Ingram (1995), Schodde & Mason (1999), Sedgwick (1949b, 1986), Serventy & Whittell (1976), Terrill & Rix (1944), Wooller (1981).

Genus CISSOMELA Bonaparte, 1854

126. Banded Honeyeater

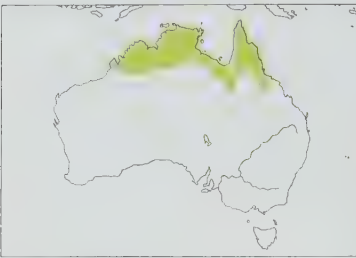
Cissomela pectoralis

French: Méléphage à collier **German:** Brustband-Honigfresser **Spanish:** Mielero Bandeado

Other common names: Banded Myzomela

Taxonomy. *Myzomela pectoralis* Gould, 1841, Kimberley Division, Western Australia. This species and *Sugomel nigrum* often placed in genus *Certhionyx* because of similarities in external appearance to *Certhionyx variegatus*; DNA-sequencing studies, however, indicate that the three species are unrelated. Monotypic.

Distribution. N Western Australia (S to about Broome, including a few inshore islands, e.g. Sir Graham Moore, Boongaree and Sunday I) E through Top End of Northern Territory (S to Barkly Tableland) to N Queensland (S to Atherton Tableland–Burdekin R–Hughenden).



Non-breeding plumage similar, but mantle, back and scapulars varying brown (ranging from light brown with bold black streaking to black with scattered small patches of light brown); gape yellow. Sexes alike in plumage, male larger than female. Juvenile is like adult but duller, cap pale brown, upperbody largely light rufous-brown, rump grey with faint rufous-brown wash, lores grey-black and ear-coverts washed pale yellow (small blackish spot on lower rear coverts), upperwing and uppertail black-brown, wing-coverts and tertials with broad light rufous-brown fringes, narrower edges on remiges (contrasting panel on folded wing), light brown edges on rectrices (soon lost), underbody faintly tinged cream, narrow pale brown breastband, buff-white underwing with dusky patch on primary coverts and dark grey trailing edge and tip, gape-flanges yellow and initially swollen, and iris paler (sometimes grey-brown). Voice. Buzzing call notes, given constantly; high-pitched double whistle; single loud whistle, sometimes in repeated series. Song, from perch and in song flight, a short, clear tinkling or twittering; partners also sing poorly co-ordinated antiphonal duets, consisting of series of 2–5 calls by one bird and repeated by mate. Also soft song during courtship display.

Habitat. Mainly open or savanna eucalypt woodlands or forests, dominated by such species as variable-barked bloodwood (*Eucalyptus dichromophloia*), Darwin box (*Eucalyptus tectifica*), Darwin stringybark (*Eucalyptus tetradonta*) and Darwin woollybutt (*Eucalyptus miniata*), with ground cover of dense, tall grasses dominated by *Sorghum*, *Heteropogon*, *Allotriopsis* and *Themeda*, or of spinifex (*Triodia*), and with sparse or no shrub layer. Also often in open or closed riparian paperbark (*Melaleuca*) forest, especially of weeping paperbark (*Melaleuca leucadendra*), sometimes mixed with *Lophostemon* and eucalypts, and with thickets of *Pandanus*. Sometimes in patches of monsoon rainforest or in mangroves; occasionally in thickets of mixed lancewood–bullwaddy (*Acacia shirleyi*–*Macropteranthus keckwickii*) woodland, and in tropical heathland, mixed broadleaf woodland and wet sclerophyll forest; also in urban gardens.

Food and Feeding. Mainly nectar; also arthropods (mainly insects, also spiders), and seeds. In NW Australia, seen to feed on flowers that provided best source of nectar. Forages in crowns of trees, less often in subcanopy and shrub layer; mostly among flowers and in outer and inner foliage, sometimes on branches in upper levels, on trunks, or in air. Probes flowers for nectar; most insects taken by gleaning, sometimes by sally-hovering or flutter-chasing. Active. Usually in twos or in small to large parties of 5–20 or up to hundreds of individuals, rarely singly; sometimes in large numbers in flowering trees, particularly paperbarks, e.g. at least 1000 in flowering paperbarks and 200 or more in flowering eucalypts. Sometimes in mixed-species flocks, e.g. with other meliphagids.

Breeding. Season Nov–Jul/Aug, with eggs or laying recorded Nov, Feb–Mar, May and Jul. Nest small and cup-shaped, made of grass, strips of bark, twigs and plant fibre, bound with spider web, usually lined with fine grass, external diameter 3.8–5.6 cm, depth 2.5–4.8 cm, internal diameter 3.8–5 cm, depth 3–4.4 cm; suspended by rim from thin fork of branch 0.45–5.2 m (mean 2.1 m) above ground, usually in outer foliage of shrub or small tree. Clutch usually 2 eggs; incubation by female, both parents feed nestlings and fledglings; no information on duration of incubation and nestling periods.

Movements. Not well known. Widely described as nomadic or dispersive. Abundance or occurrence appears seasonal at some sites, e.g. visits Atherton Shire (NE Queensland) in Aug–Dec; and at other sites present throughout year. Numbers and apparent movements often related to flowering of foodplants, birds arriving when trees in flower and leaving when flowering finished. Influxes sometimes occur where large patches of trees are in flower. Vagrant in Torres Strait (Goode I) and, far to S, in New South Wales (Greenwell Point).

Status and Conservation. Not globally threatened. Common to locally common. In Northern Territory, recorded densities of 0.2–1.6 birds/ha in Kakadu National Park; and in Yinberrie Hills, NW of Katherine, mean of 3.35 birds/ha, with maximum density of 17.9 birds/ha at start of wet season.

Bibliography. Aumann (1991), Barrett *et al.* (2003), Blakers *et al.* (1984), Bravery (1970), Brooker *et al.* (1990), Campbell (1900), Collins (1995), Colston (1974), Cooney *et al.* (2006), Franklin & Noske (2000a), Frith & Davies (1961), Frith & Hitchcock (1974), Garnett & Bredl (1985), Higgins *et al.* (2001), Horton (1975), Immelmann (1961), Johnson & Hooper (1973), Johnstone (1983), Johnstone & Burbidge (1991), Johnstone & Storr (2004), Keast (1968a), Le Souëf (1902a), Liddy (1962), McKean (1985), McLean (1995), Nielsen (1996), North (1906), Sage (1994), Schodde (1976), Sedgwick (1988b), Smith *et al.* (1978), Storr (1953, 1973, 1977, 1984), White (1922), Woinarski (1990, 1993), Woinarski & Fisher (1995a, 1995b), Woinarski & Tidemann (1991), Woinarski, Press & Russell-Smith (1989).

Genus *LICHMERA* Cabanis, 1851

127. Scaly-crowned Honeyeater

Lichmera lombokia

French: Méléphage de Lombok **German:** Lombokhonigfresser **Spanish:** Mielero de Lombok
Other common names: Sunda/Lombok Honeyeater

Taxonomy. *Meliphaga lombokia* Mathews, 1926, Lombok. Originally described as *Ptilotis virens*, but that name invalid, as preoccupied. Forms a superspecies with *L. argentauris*. Has been suggested that ecological and slight morphological differences exist

between populations of Lombok and those of Sumbawa and Flores (slightly darker), and latter sometimes separated as race *fumidigula* (type locality Flores); morphological differences, however, considered trivial (especially in view of changes in appearance with wear and fading of plumage), and supposition of ecological differences possibly in error; study needed. Proposed race *narmadae* (from Lombok) is a synonym of the name *lombokia*. Treated as monotypic.

Distribution. Lombok, Sumbawa and Flores, in W Lesser Sundas.



to bluish-grey. Sexes apparently alike in plumage, male probably larger than female. Juvenile undescribed. Voice. Short, unmusical nasal downslurs, typical of honeyeater; also, short series of rapidly repeated, semi-sweet chattering notes.

Habitat. Primary forest and degraded forest, including upper montane semi-evergreen forest and lower montane forest, forest edge, scrub, lightly wooded agricultural land, and in gardens. More common at higher elevations, sometimes absent at lower levels. Sea-level to 1600 m or above, mainly above 800–1000 m (some authors state mostly below 1000 m), on Lombok; only above 800 m on Sumbawa; 700–2140 m, mainly above 1000 m, on Flores. In recent surveys on Flores and Sumbawa, common at all montane sites and generally more common with increasing altitude.

Food and Feeding. No details of diet. Occurs from substage to lower canopy; will forage in fruit trees. Seen singly, in twos (probably pairs) and, often, in small groups of up to ten individuals; also often in mixed-species flocks.

Breeding. No information.

Movements. No information; probably sedentary.

Status and Conservation. Not globally threatened. Restricted-range species: present in Northern Nusa Tenggara EBA. Common at all montane sites in recent surveys on Flores and Sumbawa. Not considered under threat on these two islands, where extensive forest remains within its altitudinal range. Creation of a protected area of montane forest and mid-altitude rainforest suggested as being of high priority for conservation of high-altitude species, including present species. No information from Lombok.

Bibliography. Brooks & Butchart (1993), Butchart *et al.* (1996), Coates & Bishop (1997), Johnstone *et al.* (1996), Mees (2006), Myers & Bishop (2005), Rensch (1931a), Stattersfield *et al.* (1998), Trainor (2002a), Verhoye & Holmes (1999), Wallace (1863), White & Bruce (1986).

128. Olive Honeyeater

Lichmera argentauris

French: Méléphage à joues argent **German:** Silberohr-Honigfresser **Spanish:** Mielero Cariplateado
Other common names: Plain Olive/Silver(-spangled) Honeyeater

Taxonomy. *Ptilotis argentauris* Finsch, 1870, “Neu Guinea und die Papu-Inseln” = Waigeo, West Papuan Islands.

Forms a superspecies with *L. lombokia*. Birds from Halmahera, Damar and Gebe sometimes separated as a geographical race, *chloris* (described from Gebe I), but morphological differences considered insignificant; birds on Lusaolale I (off N Seram) described as race *pataisiwa*, but unlikely to be distinct and species not resident on this island. Treated as monotypic.

Distribution. Halmahera, Damar, Gebe, West Papuan Is (Waigeo, Schildpad, Misool), Lusaolale I (off N Seram) and almost certainly Seram.



nile undescribed. Voice. A harsh “zhip”.

Habitat. Occurs among coastal trees, palms and scrub, including littoral stands of casuarina and coconut palms.

Food and Feeding. Diet includes nectar and apparently fruit. Forages in casuarinas, at flowers of coconut palms and papaya (*Carica*) trees, and in fruiting trees. Seen singly, in twos (probably pairs) and in small groups; flock of 40 birds once recorded.

Breeding. No information.

Movements. Mainly resident; only isolated records on Lusaolale, where probably not resident.

Status and Conservation. Not globally threatened. Restricted-range species: present in Seram EBA, in Northern Maluku EBA and in West Papuan Lowlands EBA. Not well known; described as generally rare and local in Wallacea. Assumed presence on Seram based on observation of a single individual which flew from Lusaolale I towards Seram (c. 1 km distant).

Bibliography. Beehler *et al.* (1986), Bowler & Taylor (1989a, 1993a, 1993b), Coates & Bishop (1997), Poulsen & Lambert (2000), Rand & Gilliard (1967), Stattersfield *et al.* (1998), Stresemann (1914a), White & Bruce (1986).

129. Indonesian Honeyeater

Lichmera limbata

French: Méléphage frangé **German:** Balihonigfresser **Spanish:** Mielero Indonesio

Taxonomy. *Meliphaga (Ptilotis) limbata* S. Müller, 1843, Timor.
Forms a superspecies with *L. indistincta* and *L. incana*; often treated as conspecific with former. Monotypic.
Distribution. Bali, and Lesser Sundas on Lombok, Sumbawa, Sangeang, Komodo, Flores, Lomblen, Alor, Sumba, Savu, Roti, Ndao, Ndao, Semau and Timor (including Atauro I).



brown trailing edge and tip; iris dark brown; bill and gape black; legs grey. Female is like male but smaller, has chin and throat yellowish-olive to dirty yellow (colour possibly curving up onto side of neck behind ear-coverts), rest of underbody tinged yellowish, and top of head concolorous with upperparts; bare parts possibly differ, with pale yellow gape and base of lower mandible (confirmation needed). Juvenile not fully described, like female but slightly browner above and below, with yellow wash on face (as well as chin and throat), and with no or only trace of yellowish tuft behind eye, bare parts presumably differ (e.g. pale bill base, swollen yellow gape). VOICE. Variety of moderately loud staccato notes, whistles, and harsh chatters; alarm call described as harsh grating. Song sweet and strong, can be given in long continuous bursts, once for c. 75 seconds.

Habitat. Monsoon woodland, mangroves, secondary growth, open woodland (e.g. dry thorny woodland on Komodo) and savanna, forest and forest edge, scrub and riparian vine scrub along creeks, also semi-cultivation and cultivation, coconut groves and plantations, and parks and gardens in towns and villages. On Lomblen, recorded in swamp-forest, a closed forest of diverse floristics to 25 m tall, and coastal complex vegetation (a mix of human-modified habitats in coastal lowlands) from sea-level to c. 100 m, including coconut plantations, grassland and shrubland. On Alor, significant preference for *Eucalyptus* savanna over rainforest. Mainly at higher elevations on Lombok (sea-level to 2600 m, mainly 800–1200 m) and Sumbawa (sea-level to 1000 m, mainly above 800 m), but mainly coastal on Sumba (to 950 m, mainly below 400 m), Timor (to c. 150 m) and Atauro I (to 800 m); at all altitudes, particularly higher altitudes, on Bali. In E Flores, what is thought to be this species occurs mainly above c. 1000 m.

Food and Feeding. Diet includes nectar, and presumably insects. Forages at flowering trees and shrubs. Active, noisy and aggressive; acrobatic. Usually seen singly, in twos (probably pairs) and in small groups.

Breeding. Nestling on Roti in mid-Apr. No other information.

Movements. Resident on Sumba and Lomblen; probably resident, with some local movements, throughout range.

Status and Conservation. Not globally threatened. Locally common to moderately common on Lombok, Sumbawa, Sangeang (off NE Sumbawa), Sumba and Timor; abundant on Atauro I; not uncommon to very common or locally abundant on Bali. Generally uncommon in rest of range.

Bibliography. Bishop (1992), Bruce (1987), Coates & Bishop (1997), Conole (1997), Johnstone & Jepson (1996), Johnstone *et al.* (1996), Jones *et al.* (1990), Linsley *et al.* (1999), MacKinnon & Phillips (1993), Mayr (1944a), Mees (1975, 1982, 2006), Myers & Bishop (2005), Rensch (1931a), Trainor (2002c, 2005a, 2005b), Trainor & Soares (2004), Verhoeve & Holmes (1999), White & Bruce (1986).

130. Brown Honeyeater

Lichmera indistincta

French: Méléphage brunâtre **German:** Braunhonigfresser **Spanish:** Mielero Pardo
Other common names: Australian Brown/Least/Warbling Honeyeater

Taxonomy. *Meliphaga indistincta* Vigors and Horsfield, 1827, King George Sound, south Western Australia.

Forms a superspecies with *L. limbata* and *L. incana*. Race *ocularis* intergrades with nominate through SE Gulf of Carpentaria Drainage. Four subspecies recognized.

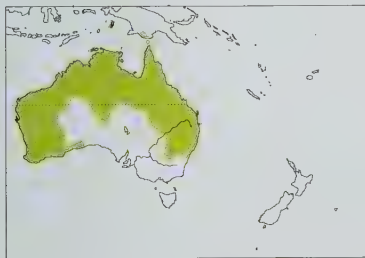
Subspecies and Distribution.

L. i. nupta (Stresemann, 1912) – Aru Is.

L. i. melvillensis (Mathews, 1912) – Tiwi Is (Bathurst I, Melville I), off N Northern Territory (N Australia).

L. i. indistincta (Vigors & Horsfield, 1827) – Western Australia (E to fringes of deserts and, in S, along coastal fringe S of Nullarbor Plain to about Eyre) and Northern Territory (S to C ranges) E to SE Gulf of Carpentaria and NW Queensland (Selwyn Range), and CN South Australia.

L. i. ocularis (Gould, 1838) – S New Guinea (S Trans-Fly region, including around Merauke, Bensbach R and L Daviambu), Saibai I (in N Torres Strait) and E Australia from Cape York Peninsula S to SW Queensland and CN & CE New South Wales (S to around Sydney).



larger coverts; below, brownish-grey on breast, merging to dirty brownish-white on rest of underbody; undertail grey-brown or olive-brown; underwing off-white with grey-brown trailing edge and tip, yellow tinged on leading edge at angle of wing; iris dark brown; bill black, gape black when breeding, pale yellow at other times; legs grey-black. Female is smaller than male, differs also in having forehead and crown concolorous with upperparts; gape always pale yellow. Juvenile

is like female, but slightly paler and browner upperparts, no (or minute) yellowish tuft behind eye, pale yellow wash on lower underbody, black-brown bill with pink-grey base, bright yellow and swollen gape. Races differ only subtly: *ocularis* is similar in size to nominate, but male significantly longer-billed (and said to be larger than nominate at equivalent latitudes), male cap slightly darker, contrasting more with hindneck and side of head, olive margins on wing and tail feathers bolder and brighter, and throat and breast slightly darker; *nupta* is like previous but darker above, lacks yellow postocular tuft, has larger area of bare skin around eye; *melvillensis* is similar in size to nominate, but male has significantly longer bill and female significantly shorter tail, male differs further in slightly darker upperparts, with little contrast between top of head and hindneck, stronger and brighter olive margins on wing and tail feathers, and darker throat and breast, female very similar to male (sexes indistinguishable in field). VOICE. Noisy, calls throughout year (apparent seasonal peaks, e.g. vocal activity in Western Australia greatest Aug–Dec), also throughout day, most frequently in early morning. Song a very loud, rich, liquid, rolling phrase but with somewhat harsh tone, rendered as “sweet-sweet-quarty-quarty”, possibly has territorial function; similar to song of Australian Reed-warbler (*Acrocephalus australis*). Calls include harsh “ke-ke” given several times at intervals of 1 second, or variant of single “ke”, varying in length; a loud “plik” (New Guinea) and series of “plink” notes, from prominent perch, and sometimes answered with song from bird in dense low vegetation (Australia). Snaps bill in aggressive interactions.

Habitat. Throughout range occupies wide range of habitats, often near water, including watercourses, swamps, billabongs, waterholes, bores, springs, tanks and drainage-lines. In Australia, commonly in mangrove forests, woodlands or shrublands along tidal flats, creeks, estuaries and shorelines, and in ecotone between mangrove and other coastal forests, woodlands and shrublands, such as those dominated by *Banksia*; commonly in dense forests, woodlands or thickets of paperbarks (*Melaleuca*), and in closed and open sclerophyll forests and woodlands dominated by *Eucalyptus* (including mallee eucalypt woodlands and shrublands), by *Acacia* e.g. of mulga (*Acacia aneura*), gidgee (*Acacia cambagei*) and brigalow (*Acacia harpophylla*), or by casuarinas, *Grevillea* or *Hakea*; also often in riparian associations with flowering *Callistemon*, or riparian thickets of *Pandanus* (especially mixed associations with eucalypts); less often in low, dense habitats, including heathland, sedgeland, fernland, saltmarsh and coastal scrub. On Arnhem Land islands (N Northern Territory), most abundant in tropical heathland dominated by *Grevillea pteridifolia*, *Asteromyrtus symphyocarpa*, *Calytrix*, *Acacia* and spinifex (*Triodia*). In Northern Territory occurs in subcoastal and lowland monsoon forest or rainforest (though less so in these habitats elsewhere), and in ecotone between open eucalypt forest and monsoon forest; occasionally in coastal tussock grassland. Commonly in suburbs, towns and around homesteads, in parks, gardens and streets; and in remnant vegetation along roads or in farming land. In New Guinea mainly in low, open *Banksia* savanna, but also other open savannas, open monsoon woodland and edges of rainforest; also forages in flowering mangroves and paperbarks. Mainly near sea-level in New Guinea.

Food and Feeding. Mainly nectar; also small invertebrates, mainly insects, also spiders (Araneae). Nectar frequently of *Banksia* or *Eucalyptus*, also *Dryandra*, *Adenanthos*, *Calothamnus*, *Grevillea*, *Melaleuca*, and mangroves (including *Rhizophora*, *Bruguiera*, *Ceriops*, *Avicennia* and *Lumnitzera*); in various studies, proportions of observations of nectar-feeding 56–99%. Forages at all levels, from crowns of trees to shrub layer and ground, also in air; mainly at flowers or among foliage or branches in inner and outer canopy, also in flowering or fruiting mistletoes (Loranthaceae), on trunks of trees, on palm fronds, in saplings and on twigs. Obtains nectar mainly by probing flowers, occasionally sally-hovering; sometimes hangs below branch to probe for nectar from pendulous *Eucalyptus* flowers. At one site in Western Australia, nectar available all year but some plants probed more often than others, and preferred species possibly changes during day. Insects mostly gleaned from foliage and bark; sometimes caught by sallying (including sally-striking in air, sally-striking at hard substrate, such as foliage and twigs, and sally-hovering) or by flutter-chasing (moving rapidly through vegetation, disturbing and pursuing prey). Active and usually conspicuous, but can be unobtrusive. In Australia and New Guinea usually singly or in twos (probably pairs), sometimes in small groups of up to 10–20 individuals in flowering trees. Occasionally in mixed-species flocks with other meliphagids. Sometimes aggressive.

Breeding. In New Guinea birds said to be in breeding condition in Aug–Sept, but no other information. All following details refer to Australia. Breeding recorded in all months (91% of 120 clutches May–Nov), but season appears to vary, with breeding and clutches mainly late autumn to late winter (dry season) in N Australia, and winter to summer or early autumn in E & S. Nest built by female alone or by both sexes, a rounded or elliptical and open cup of small pieces of grass and bark, sometimes paper or leaf skeletons, bound or woven with spider web, less often wool, hair or plant fibre, usually lined with plant down or, less often, fine grass, hair, downy seeds or flowers, and spider egg sacs or cocoons sometimes attached to exterior (and sometimes leaves of nest plant incorporated into sides), external diameter 5–7.6 cm, depth 3.8–6.4 cm, internal diameter 3.4–5.1 cm, depth 2.9–4.6 cm (elliptical nests had external length and breadth of 5.3–6.6 × 4.3–5 cm); typically well concealed in dense outer foliage or twigs, less often close to trunk, in crown of tree or in shrub (often mangrove, eucalypt or paperbark), sometimes in grass-tree (*Xanthorrhoea*), dense vines, mistletoe or epicormic growth, occasionally in loose bark, in fallen tree or branch, or among rushes (*Typha*) or ferns, often near water and usually low, 0.03–7 m (mean 1.3 m) above ground. Clutch 1–3 eggs, mostly 2 (mean 1.94); incubation apparently by female only, period 13–14 days, possibly 12–15 days; chicks evidently brooded by female alone and fed by both sexes, nestling period 13–17 days. Nests parasitized by Brush (*Cacomantis variolosus*) and Pallid Cuckoo (*Cuculus pallidus*), Horsfield’s Bronze-cuckoo (*Chrysococcyx basalis*) and possibly Shining Bronze-cuckoo (*Chrysococcyx lucidus*). From 113 eggs in 57 nests, 0.49 fledged young per nest; of 96 nests at which outcome known, 43.8% fledged at least one young.

Movements. Resident in many areas; also widely described as nomadic or partly nomadic, but extent of any such movements not known, and possibly mostly local. Suggested as being resident or moving only locally in areas of high or regular rainfall, but that elsewhere movements related to flowering of foodplants; aforementioned local movements, however, probably also linked to flowering, and again no understanding of extent of movements. In study at Wongamine Nature Reserve, in Western Australia, maximum numbers coincided with peak in number of *Banksia* inflorescences. In many regions, sedentary populations probably augmented by influxes of birds in response to flowering of foodplants, causing fluctuations in numbers; in ringing study in SE Queensland, major influxes consisted almost entirely of juveniles. Considered a seasonal visitor or migrant in some areas, e.g. at Meandarra (SE Queensland) recorded mostly Mar–Aug and few records at other times; few reports from N South Australia, all except one in Jun–Nov; and in SW Australia winter visitor Jul–Oct at Albany. Irregular visitor at other sites, usually associated with flowering events (although no analysis of flowering without presence of honeyeaters). Vagrants and occasional irruptions recorded in areas well beyond normal range.

Status and Conservation. Not globally threatened. Locally common but generally scarce in New Guinea; on Fly R, sex ratio recorded during one survey strongly male-biased. Common to abundant in Australia, and recorded at mean densities of up to of 2.31 birds/ha. In study in SW Australia, equally common in vegetation of road verges, wandoos (*Eucalyptus wandoo*) woodland with understorey and agroforestry sites, and significantly more abundant than in wandoos woodland without understorey and reforested sites. Declined in Wheatbelt of SW Australia after large-scale clearing.

Bibliography. Abbott (1981, 1982), Arnold (2003), Ashton *et al.* (1996), Aumann (1991), Barrett *et al.* (2003), Beehler *et al.* (1986), Beruudsen (1979), Blakers *et al.* (1984), Boekel (1979a), Brooker & Parker (1985), Brooker *et al.* (1990), Campbell (1900), Clarke (2004), Coate (2003), Coates (1990), Collins (1980), Collins & Briffa (1982, 1983), Collins & Rebelo (1987), Collins & Spice (1986), Collins *et al.* (1984), Colston (1974), Cooney *et al.* (2006), Davies (1982), Dawson *et al.* (1991), Deignan (1964), Draffan *et al.* (1983), Ford (1998b), Franklin (1997), Franklin & Noske (1999, 2000a, 2000b), Frith & Hitchcock (1974), Gibson (1977), Griffioen & Clarke (2002), Gwynne (1948), Halse (1978), Halse *et al.* (1985), Higgins (1999), Higgins *et al.* (2001), Hopper & Moran (1981), Johnstone & Storr (2004), Johnstone, Dell *et al.* (1977), Johnstone, de Rebeira & Smith (1979), Keast (1968a, 1975, 1985a, 1985b), Lamont & Collins (1988), Lavery (1986), Le Souëf (1903), Leach (1988), Liddy (1962, 1989), Longmore (1978), Matheson (1981), McFarland (1988, 1994b), McKean (1985), Mees (1982), Morris & Wooller (2001), Morris *et al.* (1981), Newland & Wooller (1985), North (1906), Noske (1996), Ramsay (1989), Rand (1938, 1942a), Rand & Gilliard (1967), Recher & Davis (1998), Sage (1994), Saunders & Ingram (1995), Schodde & Mason (1999), Schönwetter & Meise (1981), Sedgwick (1949a, 1949b, 1973a, 1988a), Serventy & Whittell (1976), Storr (1977, 1984), Storr *et al.* (1975), Thompson (1978, 1983), Tullis & Wooller (1981), Tullis *et al.* (1982), Verbeek *et al.* (1993), Walters (1985), Whitmore *et al.* (1983), Woinarski (1993), Woinarski & Tidemann (1991), Woinarski, Fisher *et al.* (2001), Woinarski, Press & Russell-Smith (1989), Woinarski, Tidemann & Kerin (1988), Woodall (1995), Wooller (1981).

131. Dark-brown Honeyeater

Lichmera incana

French: Méliphage à oreillons gris **German:** Grauhör-Honigfresser **Spanish:** Mielero Orejigris
Other common names: Grey-eared/Loyalty (Islands)/Silver-eared(!) Honeyeater

Taxonomy. *Certhia incana* Latham, 1790, New Caledonia.
Forms a superspecies with *L. limbata* and *L. indistincta*. Five subspecies recognized.
Subspecies and Distribution.
L. i. griseoviridis Salomonsen, 1966 – C Vanuatu, including Malakula, Ambrym, Paama, Lopévi, Epi, Tongoa, Tongariki, Emae, Makura, Mai, Nguna and Éfaté.
L. i. flavotincta (G. R. Gray, 1870) – Erromango, in S Vanuatu.
L. i. poliotis (G. R. Gray, 1859) – Beautemps Beauré, Ouvéa and Lifou, in Loyalty Is.
L. i. marensis Salomonsen, 1966 – Maré, in Loyalty Is.
L. i. incana (Latham, 1790) – New Caledonia.



breast and upper belly and paler on lower underbody; undertail olive-brown, faint olive tinge at edges of rectrices, underwing off-white with silvery brownish-grey trailing edge and tip; iris brown to pale grey-brown to dull dark brown; bill black; legs mid-grey to brown. Sexes alike in plumage, male noticeably larger than female. Juvenile is slightly paler and duller than adult, lacking conspicuous silvery ear-patch, and with prominent yellow to yellow-orange gape. Races differ only slightly: *flavotincta* is larger than nominate, darker grey-brown on chin, throat and breast with less olive tone; *griseoviridis* is slightly larger than nominate, and with darker grey-brown chin, throat and breast (although some almost indistinguishable from nominate); *marensis* is much smaller than previous, and paler grey below, with stronger yellow tinge on lower breast and belly; *poliotis* is very similar to last in size and plumage, paler grey below with little or no olive tinge. **Voice.** Noisy, with vocalizations described as cheery or pleasing; most vocal in morning and evening, and one of first birds to call, well before dawn. Main call a loud, harsh “tchoo-tchoo-tchoo”; also “cheelp-cheelp” like chirp of sparrow (*Passer*); short, musical warbling song. Said to mimic other species.
Habitat. Widespread and common in all habitats except humid forests and open fields: primary and secondary forest, forest edge, mangroves, scrub, gardens in villages and towns and other urban areas, and agricultural landscapes, particularly coconut plantations. Also niaouli (*Melaleuca leucadendra*) savanna woodland in New Caledonia. Sea-level to lower hills.
Food and Feeding. Nectar, pollen, fruit, also small arthropods (including insects, spiders). Feeds on wide range of flowering plants, but on Vanuatu shows strong preference for flowering coconut palms, which available all year; in gardens, seen to feed at flowering hibiscus, banana, lantana and ornamental ginger (*Zingiberaceae*). Forages from canopy to shrub layer, seeking flowers and searching for arthropods on leaves and branches, clambering about and hanging in all positions. Appears to forage mainly by gleaning (including from underside of leaves) and probing. Sometimes sally-hovers to take nectar from flowers or to take trapped insects from spider webs, or sallies for flying insects. Large insects may be bashed against perch to stun or kill them, or perhaps to remove limbs. Constantly active, noisy and conspicuous. Usually singly or in twos (which appear to be pairs); also in groups of 10–30 individuals in preferred flowering trees, where it will forage throughout day, often with *Myzomela cardinalis*, white-eyes (*Zosterops*) and lorikeets (*Charmosyna*, *Trichoglossus*).
Breeding. Season protracted, but few data for timing of laying or nestlings: in New Caledonia normally Oct/Nov–Jan, but earlier statements claim nestlings in Jun–Jul (as well as Nov) and two peaks of breeding in year (confirmation needed); in Vanuatu normally Oct–Feb, but eggs recorded on Tongoa late Aug and early Sept and nests with young as early as Jun, probably several broods in a year. Extent of territoriality not certain; stated as territorial throughout year, and pair said to defend area from conspecifics for years, but described also as territorial only when breeding, defending only area around nesting tree. Nest apparently built by both sexes, a small, deep cup made of grass, other plant fibres, a few small leaves and spider web, lined with feathers at bottom, often fine (eggs visible through nest), external diameter at least 5.5 cm, internal diameter 4–5.5 cm, suspended by rim from fork of thin branch at height of 2–12 m in shrub or tree. Clutch usually 2 eggs (clutches of 1 reported); incubation allegedly by both sexes (unusual, confirmation needed), period 14 days; chicks fed by both parents, nestling period 12 days; fledglings fed by both adults.
Movements. Sedentary; local movements to flowering plants.
Status and Conservation. Not globally threatened. Restricted-range species: present in Vanuatu and Temotu EBA and in New Caledonia EBA. Common and widespread throughout its range. In Vanuatu, possible sight records on Espiritu Santo claimed in 1944, but there appear to be no other reports from that island; said to have been recorded on Tanna (S Vanuatu) in 1879, probably in error.

Bibliography. Bregulla (1992), Delacour (1966), Diamond & Marshall (1976), Doughty *et al.* (1999), Hannecart & Létocart (1980), Layard & Layard (1878, 1880, 1882), Mayr (1932, 1937, 1938, 1945b), Medway & Marshall (1975), Myers (2004), Parker (1967), Ross (1988), Salomonsen (1966a), Scott (1946), Stattersfield *et al.* (1998), Stokes (1980), Tristram (1879).

132. Scaly-breasted Honeyeater

Lichmera squamata

French: Méliphage à plumet blanc **German:** Salvadorihonigfresser **Spanish:** Mielero Escamoso
Other common names: White-tufted/Scaly/Scaled/Tanimbar/Banda Sea/Mottle-breasted Honeyeater

Taxonomy. *Stigmatops squamata* Salvadori, 1878, Choir Island = Koer Islands, east Banda Sea. Forms a superspecies with *L. alboauricularis*. Populations of Tanimbar Is sometimes separated as geographical race *salvadorii* (type locality Timorlaut) and those from elsewhere in E Lesser Sundas as *kebiensis* (type locality Babar I); study needed. Treated as monotypic.
Distribution. Tayandu Is (Ree, Tayandu), Koer Is (Kilsoein), Manggoer, Fathol, Taam, Kai Is (Kai Besar, Er) and Godan I, in SE Moluccas, and Wetar, Romang, Damar, Leti, Moa, Luang, Sermata, Babar and Tanimbar Is (including Larat, Loetoe and Moloe), in E Lesser Sundas.



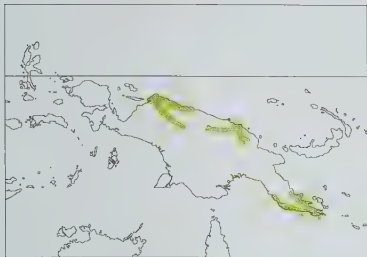
Descriptive notes. 14.5 cm; one female 13 g, one unsexed 13 g. Plumage is olive-grey above, with paler olive to yellow-olive rump and uppertail-coverts; distinctive facial pattern of largely bare blackish-brown to black skin covering lores and narrowly above eye and broadly below and behind eye, finely speckled with small, stiff white feathers (sparsely on lores, more heavily below and behind eye in radial pattern) merging into small silvery white to greyish-white triangular or crescent-shaped patch on upper rear ear-coverts (at least sometimes finely speckled black), this bordered above by diffuse blackish line extending from upper rear of blackish facial patch; pale grey submoustachial stripe and lower ear-coverts, bordered below by black malar stripe; upperwing largely olive-grey, as back, with brownish-grey inner webs of remiges and diffuse paler tips on some outer coverts; chin and throat off-white to yellowish-white; underbody appears to vary (not known whether variation sex-related or age-related or geographical) from off-white to pale yellowish-olive, grading to bright yellow on belly on some, and with distinctive blackish-olive “rosethorns” across breast fading onto belly and flanks, petering out to dirty streaks or mottling on lower flanks and undertail-coverts; undertail greyish-brown; iris yellowish-grey to dark brown or red-brown; bill black; legs grey. Sexes alike in plumage, male larger than female; gape of one female described as yellow, but photos of adults of unknown sex have black gape; whether gape varies sexually, or seasonally (as with nominate *L. indistincta*), not known. Juvenile is like adult, but underparts olive-grey with only faint or obsolete scaling, and with bare pinkish spot behind eye. **Voice.** On Wetar, calls include downslurred whistled “chirrup” or upslurred “chirrup” or “chisip” of moderate pitch, repeated at intervals of 2–10 seconds; loud descending trill of moderate pitch and slowing towards end, “teu, tututututututututututu-tu”, lasting c. 5 seconds; repeated “whitcheo whitcheo, whitcheo whitcheo” (at rate of 1.6 notes per second); rapidly repeated, sharp and somewhat harsh whistling “tsi-tsi-tsi-tsi...” or “tchi-tchi-tchi-tchi...” in bouts of varying duration (at rate of 6.5 notes per second); and series of 5 rapid whistles of same pitch and volume, lasting c. 1.2 seconds.
Habitat. Coastal and lowland secondary monsoon woodland, open scrub and shrubland, mangroves, lightly wooded agricultural land, coconut plantations and trees, forest edge, and villages with scattered trees. Less often in primary forest and in selectively logged semi-evergreen forest.
Food and Feeding. Nectar and, presumably, insects. Occurs from substage to canopy. Forages at flowers, including of coconut palms and inconspicuous flowers in canopy and middle storey; also gleans from undersides of leaves. Noisy and conspicuous. Seen singly, in twos (probably pairs) and in small groups of up to six individuals; occasionally with mixed-species flocks.
Breeding. Nest is neat structure, decorated on outside with cobwebs, wool and cotton, with entrance to side, sometimes with partial roof, and tail hanging down from below. Clutch 2 eggs. No further relevant information.
Movements. Little information; considered resident in Tanimbar Is.
Status and Conservation. Not globally threatened. Restricted-range species: present in Timor and Wetar EBA and in Banda Sea Islands EBA. Generally common to abundant; one of the commonest bird species on Yamdena and Damar. Rare on Terbang Utara and Terbang Selatan, two islets (each 56 km² in extent) lying, respectively, c. 10 km and c. 15 km S of Damar.
Bibliography. Bishop & Brickle (1999), Coates & Bishop (1997), Gadow (1884), Hartert (1900b, 1901), Lewis (1993), Schodde & Mathews (1992), Schönwetter & Meise (1981), Stattersfield *et al.* (1998), Trainor (2002d, 2007b), Verbeek (1996), White & Bruce (1986).

133. Silver-eared Honeyeater

Lichmera alboauricularis

French: Méliphage grivelé **German:** Ohrflecken-Honigfresser **Spanish:** Mielero Pechipinto
Other common names: Eared/Freckled/White-eared(!)/White-spangled Honeyeater

Taxonomy. *Stigmatops albo-auricularis* E. P. Ramsay, 1878, south-east coast of New Guinea. Forms a superspecies with *L. squamata*. Two subspecies recognized.
Subspecies and Distribution.
L. a. olivacea Mayr, 1938 – lowlands of NC New Guinea, from L Sentani and Idenburg–Mamberamo rivers E to Ramu R, including middle and lower Sepik R.
L. a. alboauricularis (E. P. Ramsay, 1878) – coastal lowlands of SE New Guinea E from Popondetta and, in S, from around Bereina to Milne Bay, including small coastal islands of Mailu (off Amazon Bay) and Heath and Doini (near Samarai I).
Descriptive notes. 15 cm; male 13.5–19 g, three females 12.5–14.5 g. Nominat race is dull brown above, darker olive-brown on wing and tail, with faint buff tips on median coverts, olive-green outer edges on outer greater coverts and remiges (diffuse greenish wash on folded wing), and with broad, diffuse olive-green outer edges on rectrices; in fresh plumage, edges of upperpart feathers faintly paler, giving slight mottled or streaked effect; broad but sparsely feathered dark brown to blackish-grey crescent from lower lores to beneath and behind eye, variably flecked with prominent (but sparse) small black feathers, this crescent bordered at rear edge by large pale patch on



ish-grey to dark brown; bill black-brown to black; legs grey to blue-grey. Sexes alike in plumage, male larger than female. Juvenile undescribed. Race *olivacea* is like nominate, but darker olive above. VOICE. Noisy. Main call, often given by several birds at same time, a loud descending series of musical but coarse, squawking notes, “skwitch-skwitch-skwitch...”, “kweek-kweek-kweek...”, “shree-shree-shree-shree...” or “szi-szi-szi-szi...”, usually of 5 notes and given rapidly; described also as loud descending series, accelerating towards end, “chip...chip-chip-chip-chip-chip-chip”. Reported also as giving variant that ascends in pitch and decelerates. Dawn call a repeated, lively, sibilant “jit”. Song described as coarse trill, this possibly same as one of aforementioned vocalizations; song also said to be identical to that of *L. indistincta*.

Habitat. Usually near water. Preferred habitat tall canegrass (*Saccharum*) and other grasses (e.g. *Imperata*), often in or bordering wetlands, but also inhabits canegrass savanna with scattered shrubs and trees, and commonly in mangroves. Found also in groves of coconut palms or *Pandanus* in or bordering canegrass or beside lagoons and other wetlands; reeds in riparian marshland; riparian secondary growth; riparian and coastal scrub; coconut plantations; and locally common in trees and shrubs in gardens of some towns or homesteads. Said to occur also in riparian woodland. Confined to lowlands, usually near coast.

Food and Feeding. Nectar and insects. Forages among stems and leaves of canegrass, and among other foliage; seen also to forage at flowers (including *Melaleuca*, coconut palms, and *Hibiscus* in gardens). Singly, in twos (probably pairs) or in small groups. Active, conspicuous and often confiding; moves rapidly in dense vegetation, and can be difficult to observe.

Breeding. Recorded in most months, with possible peak in late dry season (Sept–Oct) and little or no breeding in early wet season, clutches early Mar, Apr, Jun–Jul and Sept–Oct, active nests Aug and Nov, and juveniles Apr; also nest-building in Nov and Dec and birds in breeding condition late Mar to Apr. Nest built by both sexes, usually taking 7–10 days, sometimes only four days, a neat, compact but still fairly substantial cup of dead leaves, plant fibres (e.g. of coconut palm), small pieces of bark and some dried grass, bound with spider web and egg sacs and cobweb, lined with plant down, occasionally incorporating artificial materials (e.g. pieces of paper, and threads of plastic) when around human habitation, two nests externally 78 × 57 mm and 70 × 64 mm; usually suspended by rim from outer twigs, commonly in shrubs but also in trees (including coconut palm) or in herbs and suggested that probably mainly in canegrass, mean height above ground 1.7 m for 21 nests, of which 14 in shrub less than 2 m tall, five in raintree (*Samanea*) 2–5 m above ground, and singles 1.5 m up in yam (*Dioscorea variegata*) and 2.5 m above ground in mango (*Mangifera indica*). Clutch 2 eggs; incubation period for one egg 14 days; chicks fed by both parents, nestling period for one chick 12 days; parents did not abandon eggs or nestlings even when observed closely.

Movements. No information; probably largely resident.

Status and Conservation. Not globally threatened. Considered locally common to abundant; recently found to be uncommon in Idenburg–Mamberamo Basins. Unconfirmed reports of nominate race in Ok Tedi region (Ok Ma and Ok Menga), to 750 m; perhaps unlikely, but meriting investigation.

Bibliography. Anon. (1978b), Archbold *et al.* (1942), Beehler *et al.* (1986), Bell (1970a), Coates (1990), Coates & Peckover (2001), Eastwood (1989b), Finch (1980b, 1983), Gilliard & LeCroy (1966), Gregory (1995b, 1996), Hartert (1930), Heron (1974, 1977b), Hicks (1990a, 1990c), Mayr & Rand (1937), Rand (1942b), Rand & Gilliard (1967), Richards & Suryadi (2002), Schönwetter & Meise (1981), White & Bruce (1986).

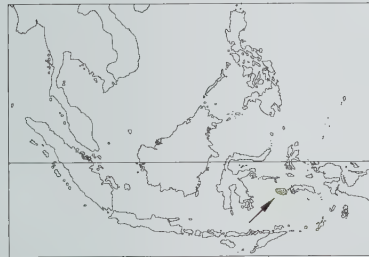
134. Buru Honeyeater

Lichmera deningeri

French: Méliphage de Buru **German:** Buruhonigfresser **Spanish:** Mielero de Buru

Taxonomy. *Stigmatops deningeri* Stresemann, 1912, Buru, Moluccas.
Forms a superspecies, and possibly conspecific, with *L. monticola*. Monotypic.

Distribution. Buru, in S Moluccas.



age, female smaller and apparently slightly paler than male. Juvenile undescribed. VOICE. Song described as “kew-kew-kew”, rather like that of *Philemon* but softer.

Habitat. Primary rainforest, selectively logged and disturbed forest, tall secondary forest and scrub. Lowlands to 2060 m, mainly above 1500 m; in surveys in year 2000, recorded at 1240–1500 m.

Food and Feeding. No information on diet. Seen to forage at flowers of rhododendron and other plants. Seen singly and in twos (probably pairs); sometimes associates with *Myzomela wakoloensis* when foraging in same tree.

Breeding. A captive recently fledged juvenile in Nov to early Dec. No other information.

Movements. Presumably sedentary, with some local movement.

Status and Conservation. Not globally threatened. Restricted-range species: present in Buru EBA. Poorly known. No estimates of population, but described as generally uncommon.

Bibliography. Coates & Bishop (1997), Jepson (1993a), Jones *et al.* (1990), Poulsen & Lambert (2000), Siebers (1930), Stattersfield *et al.* (1998), Stresemann (1914b), White & Bruce (1986).

rear ear-coverts, silvery white on upper coverts and pale grey on lower ear-coverts; pale greyish-brown malar area becomes mottled with white on side of throat, merging into mottled brown-and-white side of neck; chin and throat off-white, speckled or diffusely streaked brown; underbody off-white, with pale yellowish wash on breast and even weaker tinge on flanks, and with brown streaking or even mottling heaviest across breast and upper belly, and largely petering out in centre of belly; undertail brown; underwing off-white, with brownish mottling on coverts, and with pale brownish-grey trailing edge and tip; iris brown-

135. Seram Honeyeater

Lichmera monticola

French: Méliphage de Céram **German:** Seramhonigfresser **Spanish:** Mielero de Seram
Other common names: Ceram (Mountain)/Moluccan/Spectacled Honeyeater

Taxonomy. *Stigmatops monticola* Stresemann, 1912, Seram, Moluccas.
Forms a superspecies, and possibly conspecific, with *L. deningeri*. Monotypic.

Distribution. W & C Seram, in S Moluccas.



Descriptive notes. c. 14.5–16.5 cm. Male is olive-grey above, paler greenish-olive on rump and uppertail-coverts, and diffusely streaked darker, dusky olive, on top of head, hindneck, side of neck, mantle, back and scapulars, some median and greater upperwing-coverts tipped yellowish-white; distinctive facial pattern of uniformly dark olive-grey forehead and lores, narrow grey to bluish-grey orbital ring bordered on lower half by partial eyering of small, stiff silvery white feathers, with narrow bare yellowish-buff line extending from yellowish gape beneath eyering and (at least sometimes) curving up a little behind it, greyish-white to yellowish-

white ear-coverts with small yellowish patch on uppermost rear coverts, long grey submoustachial stripe bordered anteriorly by fine pale malar line; greyish-white chin merging to dusky grey throat, mottled with white; underbody very pale greyish-yellow to pale olive-yellow, strongly streaked or mottled with dusky olive to grey-black on lower throat and breast, petering out on side of belly, and aligning to form long streaks on anterior underbody; centre of belly stronger yellow-olive to pale-yellow and unmarked; undertail brownish-grey; iris dark brownish-grey; bill black, yellow to yellowish-buff base of lower mandible and around nasal groove on upper mandible, and yellowish-buff gape; legs leaden grey or bluish-grey, with feet often dull brownish. Female is like male but smaller, also lacks white feathered eyering, this area instead bare. Juvenile undescribed. VOICE. Loud, repeated “tschök tschök tschök”, somewhat like alarm call of Common Blackbird (*Turdus merula*).

Habitat. Montane forest and, especially, montane heath at high altitudes, wherever main foodplants occur; on Mt Kobipoto, found in elfin moss forest above 2500 m. Recorded from 900 m to at least 2500 m, mainly above 1200 m; once down to 600 m.

Food and Feeding. Nectar and, presumably, insects. Main foodplants are ericaceous trees and shrubs, including *Rhododendron*, and seen to forage at flowers of these. Usually in small flocks.

Breeding. No information.

Movements. No information; presumed sedentary, probably with some local movements.

Status and Conservation. Not globally threatened. Restricted-range species: present in Seram EBA. Very poorly known. No estimates of population, but considered common to abundant. Absent from E of island, where altitude too low for this species.

Bibliography. Bowler & Taylor (1989a, 1993a, 1993b), Coates & Bishop (1997), Isherwood *et al.* (1998), Stattersfield *et al.* (1998), Stresemann (1914a), Verbelen (1996), White & Bruce (1986).

136. Yellow-eared Honeyeater

Lichmera flavicans

French: Méliphage de Timor **German:** Timorhonigfresser **Spanish:** Mielero de Timor
Other common names: Timor/Flame-eared Honeyeater

Taxonomy. *Melithreptus flavicans* Vieillot, 1817, “Nouvelle Hollande”; error = Timor.
May form a superspecies with *L. notabilis*. Monotypic.

Distribution. Timor, in E Lesser Sunda.



Descriptive notes. c. 12.5–14 cm. Distinctive, medium-small honeyeater with moderately long and sturdy decurved bill. Plumage is rich greenish-olive above, with blackish mask over lores, narrowly above and below eye and diffusely behind eye, bordered below by pale grey to pale bluish-grey submoustachial stripe and anterior ear-coverts, and with large, bold golden-yellow patch covering rear ear-coverts; mostly olive-yellow below, with dusky grey chin and upper throat merging to heavy but diffuse dusky olive spotting or streaking over lower throat, breast, upper belly and flanks; undertail greyish-olive; iris dark brown; bill

black; legs grey to blackish-grey. Sexes alike in plumage, male probably larger than female. Juvenile not fully described, like adult but lacks yellow ear-patch, and with less distinct spotting or streaking below. VOICE. Calls include varying series of short, rapid, bubbling whistled notes lasting c. 1.5 seconds; brief soft nasal “bzz” and louder variant of this, which possibly same as harsh “fssh” notes (also reported). Somewhat harsh chortling song, some notes with bell-like quality, and variety of other phrases including “ik-a-blik”, “ze-plerk” and “klook-klook”.

Habitat. Monsoon forest, forest edge, riparian woodland, secondary growth, and open forest of *Eucalyptus urophylla*. Lowlands (at least 230 m) to 2000 m, mainly 500–1000 m.

Food and Feeding. Diet includes nectar and insects. Apparently mainly nectarivorous, foraging at flowers mainly in upper middle storey. Seen singly and in twos (probably pairs).

Breeding. Single report of breeding in Apr. No other information.

Movements. Resident, probably with some local movements.

Status and Conservation. Not globally threatened. Restricted-range species: present in Timor and Wetar EBA. No estimates of population level; considered common but patchily distributed.

Bibliography. Coates & Bishop (1997), Hellmayr (1914, 1916), Mayr (1944a), Noske (2003), Noske & Salch (1994, 1996, 1997), Stattersfield *et al.* (1998), White & Bruce (1986).

137. Black-necklaced Honeyeater

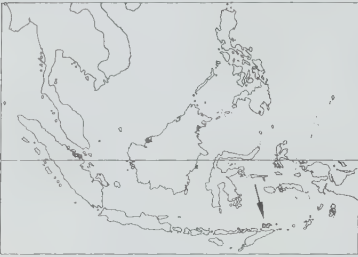
Lichmera notabilis

French: Méliphage de Wetar **German:** Finschhonigfresser **Spanish:** Mielero Acollarado

Other common names: Black-chested/Finsch's/Wetar/White-bellied Honeyeater

Taxonomy. *Stigmatops notabilis* Finsch, 1898, Wetar, Lesser Sunda Islands. May form a superspecies with *L. flavicans*. Monotypic.

Distribution. Wetar, in E Lesser Sundas.



across side of neck and across upper breast as bold narrow breastband, enclosing large white throat

Descriptive notes. c. 13–15 cm. Striking, medium-small honeyeater with moderately long, slender and gently decurved bill. Plumage is largely yellowish-olive above, with dull black forehead becoming boldly streaked blackish on hindneck, side of neck, and mantle, back and scapulars; distinctive facial pattern of narrow whitish supercilium extending behind eye over rear ear-coverts, dull black and sparsely feathered lores, blackish ear-coverts finely speckled with silvery grey feather tips (can appear pale silvery grey with black speckling), and strong black moustachial stripe continuing below rear ear-coverts and curving down

patch (covering malar area, chin and throat); underbody below breastband yellow, rear edge of breastband breaking into black streaking across rest of breast, upper belly and anterior flanks; iris dark brown to reddish-brown; bill black; legs grey to bluish-grey. Sexes alike in plumage, male probably larger than female. Juvenile undescribed. **VOICE.** No information.

Habitat. Lowland monsoon forest and gardens; observed also in mosaic of coastal scrub, overgrown cultivation and tall secondary woodland.

Food and Feeding. Forages at flowers in canopy and in tangles of vines; seen singly and in twos (probably pairs). No other information.

Breeding. No information.

Movements. No information.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Timor and Wetar EBA. Very poorly known. No estimates of total population, but considered generally uncommon within its tiny global range, which restricted to a very small island. Extensive forest remains on Wetar, including lowland and hill forests and savanna woodland with intrusions of semi-evergreen monsoon forest; logging of unknown extent is occurring, however, and loss of lowland habitats could have been substantial. Wetar also has a low human population, and there were plans for transmigration settlements from elsewhere in Indonesia, although these have apparently been set aside.

Bibliography. Anon. (2007c), Butchart & Stattersfield (2004), Coates & Bishop (1997), Collar *et al.* (2001), Stattersfield & Capper (2000), Stattersfield *et al.* (1998), White & Bruce (1986).

11. The first of the two
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PLATE 50

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PLATE 50

Family MELIPHAGIDAE (HONEYEATERS) SPECIES ACCOUNTS

Genus *PHYLIDONYRIS* Lesson, 1830

138. Crescent Honeyeater

Phylidonyris pyrrhopterus

French: Méliphage à croissants **German:** Goldflügel-Honigfresser **Spanish:** Mielero Alafuego
Other common names: Crested/Egypt/Horseshoe/Tasmanian/Lesser Crescent Honeyeater

Taxonomy. *Certhia pyrrhoptera* Latham, 1801, Nova Hollandia = region of Port Jackson, New South Wales, Australia.

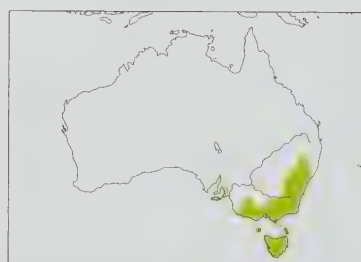
Proposed race *indistinctus* (from Mt Lofty, in S Australia) is considered inadequately differentiated from *halmaturinus*, and *rex* (from King I. in Bass Strait) and *inornatus* (Tasmania) are synonymized with nominate. Two subspecies recognized.

Subspecies and Distribution.

P. p. halmaturinus (A. G. Campbell, 1906) – Mt Lofty Ranges S to Fleurieu Peninsula and on Kangaroo I, in SE South Australia.

P. p. pyrrhopterus (Latham, 1801) – SE Australia on and E & S of Great Divide, from CE New South Wales (S from about Gosford, inland to Bathurst) S to E & S Victoria and extreme SE South Australia; islands in Bass Strait (King I, Kent Group, Furneaux Group); and Tasmania (including offshore islands).

Descriptive notes. 14–17 cm; male 15–23 g and female 12–20 g (nominate), male average 15.2 g and female average 12.5 g (*halmaturinus*). Male nominate race has head, neck and upperbody dark grey, faint paler grey streaking on top of head and neck and side of neck, with grey-black forehead, narrow white supercilium bordered below by diffuse black eyestripe to behind eye, and white malar area, chin and throat heavily but finely streaked dark brown; uppertail black, bold golden-yellow panel on basal side, white tips on inner webs of outer rectrices (usually seen only when tail spread); upperwing black, fine pale tips on tertials, bold yellow edges on other remiges (striking golden-yellow panel on folded wing); underbody largely brownish-grey, white breast marked with bold narrow black crescents extending toward mid-line; undertail grey-brown, off-white tips on outer feathers, underwing light grey-brown; iris dark red; bill and gape black; legs dark grey. Female is like a smaller, duller and washed-out version of male: upperparts mainly dark olive-brown, merging to lighter brown on rump and uppertail-coverts, head with reduced and dull, buff rear supercilium, indistinct dusky eyestripe, yellow panels on upperwing and tail much



duller, yellow-olive; brownish-grey of lower underbody merges to off-white on breast, where dark crescents much duller olive-brown, and lower breast streaked brownish-grey, also lacks obvious white tips on outer rectrices. Juvenile male is like adult female, differing mainly in mostly creamy breast lacking crescents (at most, some dark feathers at side of breast), darker black-brown eyestripe, wing and tail much as in adult male (bright yellow panel on folded wing much brighter than that of female) and prominent white tips on rectrices, off-white to yellow gape, and dull dark-brown iris; juvenile female similar to juvenile male, but eyestripe, wing and tail like those of adult female, from which differs in juvenile pattern of breast. Race *halmaturinus* is significantly smaller than nominate but with significantly longer bill, slightly shorter and less distinct supercilium, slightly duller yellow on wing and tail, and slightly shorter white tips on rectrices, adult female further differs from female nominate in less distinct breast-crescents. **VOICE.** Noisy, with varied and complex repertoire of contact and social vocalizations; throughout year, and at any time of day, from or before dawn, but most often in breeding season; sometimes utters same vocalization repeatedly for several minutes, whereas at other times bouts made up of several different vocalizations. Male louder than female. Main calls a loud, high-pitched “eejik” or “e-gypt”, stress on second syllable, and a simple sharp “jik”, like second note of “eejik”; “eejik” said to be usual in spring and summer, and “jik” in winter. In alarm a harsh, broad-frequency chattering (probably equivalent of harsh scolding given when threatened) and narrow-frequency tonal whistles; when mobbing, alternates between chatter and whistle. Male also has complex melodious song, from exposed or concealed perch; occasionally continuous piping in song flight while quivering wings. Both members of pair heard to utter a series of soft low notes when female on nest and male nearby. Calls of two or more syllables given significantly more often by male during breeding season than in non-breeding season; monosyllabic calls by male throughout year, possibly to maintain contact with mate. Male usually calls from same perches for some months, and calls more than female; in 66% of observations males were calling loudly and in 8% softly, whereas females called softly in 8% of sightings and were silent in rest. Can snap bill in aggression.

Habitat. Often found in tall, *Eucalyptus*-dominated sclerophyll forests, including wet sclerophyll forest, typically with well-developed middle storey of *Acacia* or understorey of tall dense shrubs;

and open and drier eucalypt forests with well-developed understorey, especially gully associations with dense shrub layer and ground cover. In Tasmania, occurs equally commonly in dry and wet sclerophyll forests. Also frequently present in eucalypt woodlands with dense heath shrub layer or understorey of heath; in Mt Lofty Ranges to Fleurieu Peninsula (race *halmaturinus*), inhabits open stringybark eucalypt forest with heath understorey that grades to open shrub and heath on steeper slopes. At higher altitudes, commonly in subalpine forest or woodland dominated by eucalypts, especially snow gums (*Eucalyptus pauciflora*), or conifers, often stunted, and with dense and floristically rich shrub layer. Less often in closed eucalypt-beech (*Eucalyptus-Nothofagus*) forest with dense understorey of ferns, or in low closed forest dominated by lilly pilly (*Acmena smithii*); very occasionally in mallee eucalypt woodland, though more often in mallee heathland. In coastal regions, often in dense heathland or shrubland dominated by vegetation such as tea-trees (*Leptospermum*), paperbarks (*Melaleuca*), *Banksia* and Epacridaceae; at higher altitude, in alpine heathland, scrub or moorland. Also in heath-woodland with dense shrub layer, such as *Banksia* woodland. Occasionally in sedge-lands. Sometimes found in urban parks and gardens; and pine plantations.

Food and Feeding. Nectar, fruit and insects, as well as manna, honeydew and lerp. Near Adelaide (South Australia), fed on nectar and insects in roughly equal proportions. Forages mostly in shrubs of understorey or in middle storey, also in canopy of tall forest or woodland and very occasionally on ground; mean foraging height at one site 4.7 m, with 74% of 177 feeding observations in shrubs. Searches at flowers, among foliage, on bark of trunks and branches, and occasionally in air or on ground. Mainly probes (for nectar at flowers, and for insects on loose bark and trunks of trees and shrubs) and gleans (foliage, branches and loose bark); less often sallies, including sally-strikes at prey on foliage, and sallying in air. When feeding on nectar of *Banksia ericifolia*, spent mean of 15.3 seconds per visit (range c. 10–60 seconds); when feeding on *Astroloma conostephioides* and *Eucalyptus cosmophylla*, visited respectively 34 and 31 flowers per minute. In pairs; in non-breeding season also in small loose parties, and may congregate in larger numbers (15–20 individuals) at sources of abundant food; some move in loose feeding flocks.

Breeding. Recorded in all months except Jun, mainly late winter and spring, nominate race eggs Jul–Jan and nestlings late Jul and Sept–Mar, *halmaturinus* eggs Jul–Oct, Dec and Feb–May and nestlings Nov and Apr (Mt Lofty Ranges) and eggs Jul–Aug and Oct and nestlings Oct (Kangaroo I); in one season in S Victoria, pairs made mean of 2.86 nesting attempts per season, but only one pair successfully raised two broods. Breeds in simple territorial pair or in semi-colonial cluster. Nest built by female, a bulky untidy cup of strips of bark, grass, twigs, rootlets, leaves and other fine plant fibres, some lightly bound with spider web, lined with soft grass, bark, plant down, moss, fur, hair, feathers, exterior can have small clumps of moss attached, 49 nests from S Victoria had mean external diameter 132 mm, depth 88.5 mm, internal diameter 51.5 mm, depth 46 mm; usually supported, but sometimes suspended by rim or sides, in upright or horizontal fork, among dense foliage of low shrub or other vegetation, including low ferns such as bracken (*Pteridium esculentum*) or clump of sword-grass (*Gahnia*), 0.25–3 m (mean 1.26 m) above ground throughout range (almost identical heights in S Victoria alone, mean 1.27 m), typically near centre of nest plant and often sheltered from above; site often in dense understorey near creek in gully. Clutch usually 2 eggs, occasionally 1 or 3, mean throughout range 2.06 (mean in S Victoria 2.82), claims of occasional 4-egg clutches require confirmation; incubation by female, begins with laying of second egg, period in S Victoria 13.1–13.5 days (mean 13.2 days); chicks brooded by female, fed by both sexes, female providing almost twice as many feeds as male, nestling period 13 days, young leave nest prematurely at 12 days if disturbed; fledglings fed and tended by both parents, feed independently after 10–28 days; male may undertake most or all care of fledglings if female renests. From 17 eggs in seven nests, 0.57 fledged young per nest; from 76 eggs in 27 nests in S Victoria during one season, success 0.82 young per nest, and 29.6% of nests fledged at least one young.

Movements. Resident over most of range, some altitudinal migration in parts of range in Tasmania and SE mainland. In Southern Highlands of Australian Capital Territory–SE New South Wales, present at higher altitudes and virtually absent at lower altitudes during spring–summer, but numbers at higher altitudes decline and birds commonly recorded at lower altitudes (in Canberra and on coast) during winter; largely resident in coastal and subcoastal E Victoria, with numbers augmented in winter by apparent migrants from highlands. In Tasmania, mainly autumn–winter visitor to lowlands and coast, only few remaining at low altitudes in spring–summer. Some seasonal movements local, e.g. at Toolangi, in S Victoria, present throughout year but moves out of gulleys in winter. Also, irregular visitor at some sites, and described as nomadic or partly nomadic; some movements said to be related to exploitation of nectar sources. Influxes occasionally recorded. Sometimes seen far from normal range.

Status and Conservation. Not globally threatened. Locally common. No estimates of total population; recorded densities of 0.06–8.7 pairs/ha at various sites. Widespread in Tasmania, but sparsely scattered in NE & SW.

Bibliography. Barrett *et al.* (2003), Baxter (1989), Blakers *et al.* (1984), Campbell (1900), Clarke, R.H. (1997), Clarke, R.H. & Clarke (1999, 2000), Colston (1974), Cooper (1960), David & Gosselin (2002b), Emison *et al.* (1987), Ford (1976, 1980), Ford & Forde (1976), Ford & Paton (1976c, 1977, 1982), Friend (1982), Gannon (1962), Green (1995), Griffioen & Clarke (2002), Hardy & Farrell (1990), Higgins (1999), Higgins *et al.* (2001), Jurisevic & Sanderson (1994a, 1994b), Kavanagh & Stanton (2003), Keast (1968a), Keast & Condon (1968), Lamm & Wilson (1966), Lamm *et al.* (1963), Loyn (1980, 1985c, 1993), Mac Nally (1997), McCarthy (2006), Milledge (1972), North (1906), Osborne & Green (1992), Paton (1988, 1991), Paton & Paton (1980), Paton *et al.* (1994), Pizzey (1980), Prendergast (1984), Pyke (1980), Pyke & Recher (1988), Ratkowsky (1984), Ratkowsky & Ratkowsky (1977), Recher & Holmes (1985), Recher *et al.* (1985), Routley (1980), Schodde & Mason (1999), Schulz (1991), Sharland (1958), Smith (1984), Taylor, M. (1992), Taylor, R. *et al.* (1997), Thomas (1965, 1968, 1972, 1979, 1980), Wheal (1996).

139. New Holland Honeyeater

Phylidonyris novaehollandiae

French: Méléphage de Nouvelle-Hollande **Spanish:** Mielero de Nueva Holanda

German: Weißbaugen-Honigfresser

Other common names: Yellow-winged/White-bearded/Bearded/Golden-winged/Long-billed/White-eyed Honeyeater

Taxonomy. *Certhia novaeHollandiae* Latham, 1790, “Nova Hollandia” = region of Port Jackson, New South Wales, Australia. Five subspecies recognized.

Subspecies and Distribution.

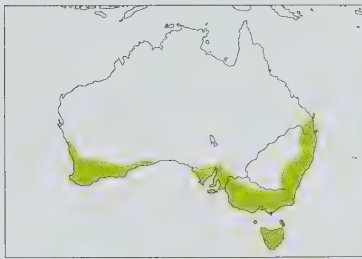
P. n. longirostris (Gould, 1846) – SW & S Western Australia S & SE from about Geraldton (occasionally farther N) to Esperance, thence coastally and subcoastally to Israelite Bay.

P. n. novaehollandiae (Latham, 1790) – SE mainland Australia from SE Queensland (S from Gympie) and E New South Wales (reaching W slopes of Great Divide) S to S Victoria (extending farther inland in W) and SE South Australia (E from Eyre Peninsula).

P. n. campbelli (Mathews, 1923) – Kangaroo I (South Australia).

P. n. caudatus Salomonsen, 1966 – King I and Furneaux Group, in Bass Strait.

P. n. canescens (Latham, 1790) – Tasmania.



Descriptive notes. 18 cm (16–20); male 10–25 g and female 10–23 g (nominate), male 13–23 g and female 10.5–20 g (*longirostris*), male 20.5–22 g and female 18–19 g (*campbelli*), male 22.3–29 g and female 19.8–23 g (*caudatus*), male 20–24 g and female 16.5–23.5 g (*canescens*). Striking medium-sized honeyeater, strongly black and white and with distinctive head pattern, conspicuous pale eye. Nominate race has head mainly black, with small white-streaked patch at side of forehead, white lateral crownstripe, broad wispy white malar plume, prominent white neck plume (below and behind ear-coverts and fanning onto

side of neck), and elongated white bristles on lower throat (appearing as finely streaked beard); upperbody mostly black-brown, with diffuse grey-brown streaking on neck, bold white streaking on mantle and scapulars, and fine brown streaking on back, rump and uppertail-coverts; upperside and uppertail brownish-black to black, remiges and rectrices with bright yellow outer edges (striking panels on folded wing and side of tail), small white tip on outer tail (when tail spread, white tips visible on all except central feathers); underparts white, boldly streaked with black, undertail greyish-brown with broad off-white tip, underwing greyish-brown with paler leading edge of coverts; iris white; bill and gape black; legs blackish-brown. Sexes alike in plumage, male slightly larger than female. Juvenile is like adult but much duller and paler, head and neck dark brown with yellow tinge in white markings (other than neck plume), upperparts brown with faint grey-brown streaking, underparts off-white and more sparsely streaked with dark brown, upperside with paler brown fringes on greater coverts, yellowish edges on greater primary coverts, paler yellow panel on folded wing, iris dark grey or grey-brown, bill black-brown or grey-brown with pale tip and base, gape pale yellow and swollen, legs tinged pink. Races differ in morphometrics and slightly in plumage: *longirostris* is like nominate in size but with longer bill, much smaller and narrower malar plume; *campbelli* is on average larger than nominate, with significantly shorter wing and longer bill than adjacent mainland populations, has sparser white beard, blacker mantle and back with finer white streaking, black streaking on breast broader; *caudatus* male is significantly larger than male nominate, female similar in size to female nominate but significantly longer-tailed, both sexes with plumage very like previous but with longer malar plume; *canescens* is similar in size to nominate but female significantly longer-tailed, differs from nominate in slightly longer white malar plume, sparser white beard, and slightly broader black streaking on breast. VOICE. Noisy, with complex repertoire dominated by simple single-note calls. Probable contact or location calls given regularly, consist of high-pitched single or double note, e.g. “cheet”, “seet”, “sssee” or “sit”. Alarm calls in response to predators a rapid series of loud penetrating descending staccato whistled notes (audible to 500 m) and a chatter of short harsh notes usually in short series (audible only to 20–30 m), may alternate between these when alarmed; staccato whistles from high exposed perch, then while diving to cover as predator nears, the usual alarm in response to raptor; chatter also from high perch or from dense shrub in response to approach of other type of predator or potential threat; chatter may be given also during distraction display. Corroborate call a repeated single note, given only during corroborees (see page 534). Male has soft, warbling flight song, roughly rendered as 2–6 repeated “yeeep” calls, uttered during last half of outward song flight and apparently adjusted to length of song flight; occasionally given when perched. Other calls include “squark”, during intraspecific chases; a series of 2-note whistles, given from high exposed perch for up to two minutes at a time, function of which not known; and harsh distress call or rapidly repeated “chirrup” that may be given during fighting. Snaps bills during chases and nest defence.

Habitat. Mainly heathland and dense shrubland, including mallee heathland, sometimes with scattered emergent *Eucalyptus* or *Angophora*, and consisting of diverse range of shrubs such as *Banksia*, *Leptospermum*, *Melaleuca*, casuarinas, epacids, and other proteaceous or myrtaceous shrubs. In Tasmania, also in buttongrass (*Gymnoschoenus sphaerocephalus*) sedge-land. Also in eucalypt woodland or dry, open eucalypt forest with dense shrub or heath understorey; occasionally in mallee woodland or shrubland, sometimes with broombush (*Melaleuca uncinata*) in understorey. In SW Australia, recorded in jarrah (*Eucalyptus marginata*) forest with middle storey including *Banksia grandis* and a low shrub layer. Occasionally in wet sclerophyll forest, usually with well-developed understorey, in E Australia. Sometimes in pine plantations near eucalypt forest, or edge of closed forest. Often in parks and gardens in urban areas.

Food and Feeding. Mainly nectar, also manna, and arthropods, lerp and honeydew (of eriococcids and psyllids). Arthropods mainly insects and their larvae, but also mites and ticks (Acarina) and spiders (Araneae). Tends to feed mainly or almost exclusively on nectar, but in a few studies diet found to comprise higher proportion of insects than of nectar; foraging behaviour varies with season and time of day (e.g. breeding birds usually take more insects). Time spent in foraging may vary with changes in availability of nectar; most of the time spent in foraging when nectar scarce, but little time in foraging when nectar abundant. Forages mainly in shrub layer, but also at all levels from canopy to, rarely, ground. Nectar obtained by probing flowers; insects taken mainly by sallying (including sally-striking for flying insects, and sally-hovering) and by gleaning from foliage or bark of branches and trunks; other carbohydrates obtained by gleaning and probing. Forages singly, in pairs or in small groups. Singletons or (especially when breeding) pairs defend feeding territory, either throughout year (but with variation in intensity and duration of defence) or only for short periods, by attacking and chasing intruders, also displacing other birds, and occasionally fighting; small groups also seen to defend territory; territorial behaviour and social organization vary with abundance of conspecifics and other nectarivores in avian community (e.g. small honeyeaters usually readily driven off, but larger *Anthochaera* wattletbirds and *Glossopsitta lorikeets* difficult to evict), vary also with number of intrusions, and with abundance and density of resources, e.g. in S Australia up to 20 of present species (and occasionally *Anthochaera carunculata*) defended individual feeding territories in single tree. Occasional

anecdotal observations of birds congregating in an area to forage on abundant resources (but individuals may still defend territories).

Breeding. Recorded throughout year but season mainly winter–spring, with 55% of clutches Aug–Oct and 71% Jul–Nov, and only 6% Dec–Feb; at one site in New South Wales season centred on winter peak of nectar availability, laying beginning mid-Feb (when nectar availability low) and most pairs nesting late Feb/Mar to mid-Aug; in Victoria two distinct breeding periods at one site, with eggs in spring (Jul–Oct) and autumn (Feb–Apr), but at a second site clutches recorded only in spring (Aug–Oct). Occasional instances of co-operative breeding, with helpers. Nest built by female, often accompanied by male, usually a neatly woven cup typically made of grass, strips of bark, twigs, leaves (including casuarina and pine needles), rootlets, pieces of vine, and cobweb and wool, lined with fine grasses and plant down (e.g. from *Banksia* inflorescences, *Macrozamia* cycads, or ferns), flowers or floral parts (e.g. *Banksia* bracts), moss, soft seeds, or wool, fur, hair or feathers, external diameter 7.6–12 cm, depth 6.4–8.9 cm, internal diameter 5.1–5.7 cm, depth 3–3.8 cm; nests in Victoria had three distinct layers, outer layer of dead twigs, usually bound with spider web, middle layer of strips of bark or vines and some bark, and lining of soft plant material and wool (extending c. 1 cm up sides of nest); either supported in upright fork or suspended by rim, and usually well concealed in foliage of live shrub or small tree, less often in ferns, rushes or grass or other low sites, 0.05–7 m (mean 1.33 m) above ground. Clutch usually 2–3 eggs, occasionally 1 (few records of 4, but not certainly laid by only one female), mean for whole range 2.09, in E appears to increase with increasing latitude (New South Wales 2.05, Victoria 2.19, South Australia 2.13, Tasmania, 2.38), mean in Western Australia 2.11; incubation by female, usually from completion of clutch, period 13–15 days; chicks brooded by female, fed by both sexes (female providing more feeds), occasionally assisted by helpers, nestling period 12–16.5 days, young sometimes leave nest prematurely if disturbed; fledglings tended by both parents, occasionally also by helpers, at two sites in Victoria young independent c. 4 weeks after fledging. Nests parasitized by Pallid Cuckoo (*Cuculus pallidus*) and Horsfield’s Bronze-cuckoo (*Chrysococcyx basalis*). From 490 eggs in 243 nests for which outcome known, 0.56 fledged young per nest; of 327 nests, 67% fledged at least one young; predation a major cause of failure, known predators of eggs or young include Laughing Kookaburra (*Dacelo novaeguineae*), Pied Currawong (*Strepera graculina*), Spotted Harrier (*Circus assimilis*) and black rat (*Rattus rattus*), and snakes also thought responsible for much predation.

Movements. Primarily resident; some movements, probably largely local. Descriptions as nomadic, partly nomadic and locally nomadic often based solely on irregular or apparently unpredictable occurrence at sites. Suggested that probably permanently resident where nectar available throughout year, and undertaking local, sometimes seasonal, movements elsewhere. Such movements can result in influxes at sites where nectar available, and thus increases in numbers in areas where resident populations occur. Where flowering seasonal, movements and occurrence may also be seasonal. Occasional visitor at some sites, and vagrants recorded well beyond normal range. At any given site, mobile population typically transient, with few retraps of ringed individuals; in one study also found that most (69%) were immature. Sometimes observed while moving in flocks on apparent passage, sometimes with *Lichenostomus chrysops*. An influx S of Sydney coincided with irruption of *P. niger*.

Status and Conservation. Not globally threatened. Locally common. Widespread in SW and in much of SE, widespread also in Tasmania; more sparse in N of range and in W part of South Australian range (only scattered records on Eyre Peninsula). No estimates of total population, but many estimates of density from throughout range; maximum recorded densities 20 birds/ha and c. 38 birds/ha, and of 16 breeding birds/ha. Range has possibly expanded on Adelaide Plain, in South Australia, where said to have become established since mid-1970s.

Bibliography. Abbott (1981), Armstrong (1990a, 1990b, 1991a, 1991b, 1992a, 1992b, 1996), Armstrong & Pyke (1991), Ashton (1985, 1996), Ashton *et al.* (1996), Barrett *et al.* (2003), Blakers *et al.* (1984), Burbidge *et al.* (1979), Campbell (1990), Colston (1974), Cooney *et al.* (2006), Cooper (1975a), David & Gosselin (2002b), Egan (1997), Emison & Porter (1978), Emison *et al.* (1987), Ford, H.A. (1979, 1980, 1981a, 1983), Ford, H.A. & Forde (1976), Ford, H.A. & Paton (1976b, 1977, 1982), Friend (1982), Gannon (1962), Gosper (1999), Green (1989), Griffioen & Clarke (2002), Higgins (1999), Higgins *et al.* (2001), Johnstone & Storr (2004), Jurisevic & Sanderson (1994a, 1994b), Keast (1985a), Kleindorfer *et al.* (2006), Lambert & Kleindorfer (2006) Leishman (1994), Loyn (1980, 1985a, 1985c, 1993), Major & Gowing (1994), Major *et al.* (1994), Marshall (1932b), Martindale (1980), McFarland (1983a, 1984b, 1985, 1986a, 1986b, 1986c, 1986d, 1994a, 1995, 1996, 2002), McFarland & Sale (1986), Milledge (1972), Nichols & Nichols (1984), North (1906), Paton, D.C. (1979, 1980, 1981, 1982a, 1982b, 1982c, 1985a, 1985b, 1991), Paton, D.C. *et al.* (1994), Possingham & Possingham (1997), Pyke (1983, 1989), Pyke & Armstrong (1993), Pyke & O’Connor (1989, 1993), Pyke & Recher (1988), Pyke, O’Connor & Recher (1993), Pyke, Recher & O’Connor (1989), Recher (1971, 1975, 1977), Recher & Davis (1998), Recher *et al.* (1971), Rooke (1979), Rooke & Knight (1977), Saunders & Ingram (1995), Schodde & Mason (1999), Sedgwick (1988a), Smith, L.E. & Chafer (1987), Smith, P. (1984), Stanley & Lill (2002c), Taylor, M. (1992), Taylor, R. *et al.* (1997), Terrill & Rix (1944), Thomas (1979), Tullis & Wooller (1981), Tullis *et al.* (1982), Wheal (1996), Wood (1995), Wooller (1981), Wooller & Calver (1981b).

140. White-cheeked Honeyeater

Phylidonyris niger

French: Méliphage fardé **German:** Weißohr-Honigfresser **Spanish:** Mielero Cariblanco
Other common names: Herberton/Moustached Honeyeater

Taxonomy. *Certhia nigra* Bechstein, 1811, “Neuholland” = region of Sydney, New South Wales, Australia.

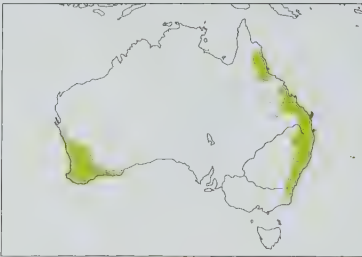
Two subspecies recognized.

Subspecies and Distribution.

P. n. gouldii (Schlegel, 1872) – coastal and subcoastal SW Australia from Murchison R S to Esperance–Israelite Bay, occasionally E to Eyre Bird Observatory (50 km S of Cocklebeiddy).

P. n. niger (Bechstein, 1811) – E Australia on and E of Great Divide, from NE Queensland (Mt Windsor Tableland S, inland to Wongabel, Ravenshoe and upper reaches of Burdekin R, to Paluma Range) and, disjunctly, from Eungella National Park (inland from Mackay) S to SE New South Wales (Illawarra region to Shoalhaven R).

Descriptive notes. 16–20 cm; male 15.5–25 g and female 15.5–20.5 g (nominate), two males 18.1 g and 21.5 g and one female 16 g (*gouldii*). Striking, medium-sized honeyeater with strongly pied appearance. Nominate race has head and neck mostly black, small white patch at side of forehead meeting narrow white lateral crownstripe, and with broad triangular white cheek patch fanning out to cover ear-coverts, and sides of neck and throat; upperparts largely black-brown, heavily streaked white from nape to mantle, back and scapulars, mottled brown on rump and uppertail-coverts; diffuse black-brown mottling on black upperswings-coverts and alula, bright golden-yellow outer edges of remiges (conspicuous panel on folded wing); uppertail brown, bold golden-yellow panel at side; chin to throat black, underparts largely white, with black streaking heavy on breast, very sparse in centre of belly and merging to black-brown mottling on undertail-coverts; flanks and thighs brownish; underwing off-white to pale greyish-brown with broad dark brown



wispy and differently shaped white cheek patch narrowing towards rear. Voice. Noisy, with frequent loud chattering. Four main call types recognized. Variety of brief calls, typically of 1–3 notes, with loud 2-note “e-chip” common and characteristic. Other brief calls include short “tu-tu” (may be an appeasement signal), loud clear double whistle, often repeated rapidly several times in succession, and squeaky single-note whistle. Corroboree call (see page 534) a series of single-note calls. Alarm in response to predator includes continuous rasping and a rapid “hee-hee-hee...” call. Male song a melodious warbling “twee-ee-twee-ee”, preceded and followed by a few chirps and whistles, given during song flights and occasionally when perched. Snaps bill during chases.

Habitat. Primarily low moist to wet heathland or, less often, drier heathland, or ecotone between dry and wet heathland, sometimes with taller emergents. Often low shrubland or other dense vegetation, especially in damp or swampy areas, such as swamps of bottlebrush (*Callistemon*), paperbark (*Melaleuca*) and tea-tree (*Leptospermum*) or riparian associations. Heathland and shrubland typically include *Banksia* species, as well as *Melaleuca*, *Acacia*, *Calothamnus* and *Adenanthos*; in SW Australia, some apparent preference for *Dryandra*, which usually present in occupied habitats. Occurs in some areas in moist sedgeland with patches of, or scattered, flowering shrubs (e.g. *Baeckea*, *Grevillea*), and sword-grass (*Gahnia*) swamps. Commonly in woodlands dominated by *Eucalyptus*, *Angophora* or *Banksia* and with dense shrub or heath understorey; less often in open forest with open shrubby understorey, and only occasionally in wet sclerophyll forest; in SW, very occasionally in open forest dominated by jarrah (*Eucalyptus marginata*), marri (*Eucalyptus calophylla*) or wandoo (*Eucalyptus wandoo*). In NE Queensland, mainly in wet sclerophyll or tall open eucalypt forest, often along watercourses, and in riparian woodland or thickets of *Callistemon*; sometimes at rainforest edge. Occurs in parks and gardens and along streets of urban areas throughout range.

Food and Feeding. Mainly nectar, also insects. Frequently takes nectar from *Banksia* and *Eucalyptus*, and, in SW Australia, *Dryandra*, but also from wide range of other rich nectar-producing Proteaceae, Myrtaceae and Epacridaceae, including *Grevillea*, *Lambertia*, *Darwinia*, *Adenanthos*, *Calothamnus* and *Epacris*. Proportions of food types in diet vary greatly, reflecting seasonal availability of food resources and breeding requirements, e.g. in one study in CE Australia 96.7% of time spent in feeding on two species of *Banksia*, whereas in another study in same area 78% of observations involved insect-catching; at one site in SW Australia, ratio of nectar to insects in diet 72:28. Time spent in foraging correlated with changes in availability of nectar; at one site, foraging comprised 14% of observations in one year and 7% in another. Arboreal, foraging at all levels from low shrubs to canopy and aerially above canopy, but usually at low levels, typically in shrubs; only occasionally feeds on or from ground. Probes flowers for nectar. Frequently sallies for aerial insects, including sally-striking and sally-hovering, and can catch several insects in single flight; also gleans insects from foliage and bark. Active, noisy and conspicuous. Singly, in twos and often in small groups of up to 10–20 individuals, occasionally in larger assemblages; gregariousness appears to vary, possibly reflecting abundance of resources and season, e.g. at one site often foraged in groups in both breeding and non-breeding seasons, but at another site flocks not observed.

Breeding. Recorded in all months, with peak in winter, eggs or estimated laying Feb–Dec (mainly Apr–Aug); in New South Wales 80% of clutches Apr–Aug (peak in Jul), in W Australia 76.2% of 21 clutches in Jun–Aug; in Brisbane Water National Park (New South Wales), nesting usually centred around winter flowering of heath banksia (*Banksia ericifolia*), with 1–4 clutches per territorial male per year. Nest built by female alone, cup-shaped, often with flattened rim, made of fine twigs, strips of bark, plant stems, grass, spider web and, sometimes, wool, lined with fine grass, casuarina needles, spider web and floral parts or small flowers or seedheads and plant down, external diameter 8.3–11.4 cm, depth 7–7.6 cm, internal diameter 4.4–5.1 cm, depth 3.5–3.8 cm; suspended by rim and typically well concealed in lower branches of shrub or small tree (often in upright fork) or in grasses, generally 0.15–3.6 m (mean 0.58 m) above ground, 96% of nests below 1 m, mean height of nest plant 1.1 m; sometimes resting on ground, and occasionally as high as 6.1 m; in Brisbane Water National Park builds in clumps of vegetation higher and denser than surrounding heath, and near high point on which birds perch. Clutch 1–3 eggs, usually 2 (mean in W of range 2.12, in E 1.99); incubation by female, apparently from completion of clutch, period 13–15 days, possibly 15.5 days; chicks brooded by female, fed by both sexes, nestling period, 13–15 days, possibly up to 16.5 days, young leave nest early if threatened; fledglings fed by both parents, for up to several weeks, family ranging over 1–4 ha in first two weeks. From 119 eggs in 60 nests at which outcome known, average of 1.0 young fledged per nest. In SW Australia, estimated survival rates of adults and immatures combined 65.5%, and of juveniles 52%.

Movements. Apparently largely resident, with at least some movements; occurrence or changes in numbers often coincide with flowering of shrubs or trees, and considered seasonal or irregular visitor to some sites. Described as nomadic or partly nomadic by some authors, but most movements, where studied, are local, to exploit flowering in different habitats. Recorded all seasons at Wongamine Nature Reserve (SW Australia), but highest densities spring–summer and thought to be result of local populations congregating in response to flowering, rather than any movement into area. Predictable annual fluctuations in flowering may lead to seasonal patterns of abundance, e.g. study in in SW Australia found regular seasonal movements of up to 14 km within and between patches of remnant vegetation, main movements in late spring–early summer and autumn coinciding with flowering in different habitats at different sites; and in another study movements of up to 5 km recorded, again coinciding with seasonal flowering in different habitats and sites. Extent of some movements not known, e.g. in studies in Brisbane Water National Park (E Australia) present all year, but at times much movement through area, mostly by subadults, which usually remain for only few days. Influxes occasionally recorded, e.g. irruption of 200–300 individuals recorded around Nowra, in SE New South Wales, in late 1980. Vagrants occasionally farther inland, and in E of range farther S, into E Victoria.

Status and Conservation. Not globally threatened. Locally common; sparsely distributed in extreme SW. No estimates of global abundance, but recorded densities of 0.06–0.4 birds/ha.

Bibliography. Armstrong (1990b, 1991a, 1991b, 1992a, 1992b, 1996), Armstrong & Pyke (1991), Ashton *et al.* (1996), Barrett, G. (1995), Barrett, G.W. *et al.* (2003), Blakers *et al.* (1984), Bravery (1970), Campbell (1990), Cody (1991b), Collins (1980), Collins & Briffa (1982), Collins & Spice (1986), Collins *et al.* (1984), David &

Gosselin (2002b), Emison *et al.* (1987), Ford (1971), Gannon (1962), Gosper (1992), Griffin (1995), Griffioen & Clarke (2002), Halse (1978), Halse *et al.* (1985), Hardy & Farrell (1990), Higgins *et al.* (2001), Hopper (1980a), How & Dell (1990), Johnstone & Storr (2004), Keast (1968a), Lamont & Collins (1988), Lavery (1986), Leishman (1994), Liddy (1965), Mawson & Massam (1995), McFarland (1984b, 1984c, 1986b, 1986c, 1988), Morris (1975a), Nichols & Nichols (1984), North (1906), Paton (1991), Pizzey (1980), Pyke (1983, 1985, 1989), Pyke & Armstrong (1993), Pyke & O'Connor (1989, 1993), Pyke & Recher (1986, 1988), Pyke *et al.* (1989), Recher (1971, 1975, 1977), Recher & Abbott (1970b), Roberts & Ingram (1976), Saunders & Ingram (1995), Schodde & Mason (1999), Serventy & Whittell (1976), Smith *et al.* (1984), Storr (1984), Stranger (1993), Tullis & Wooller (1981), Tullis *et al.* (1982), Vaughton (1990), Wheeler (1967b), Woodall (1995), Wooller (1981).

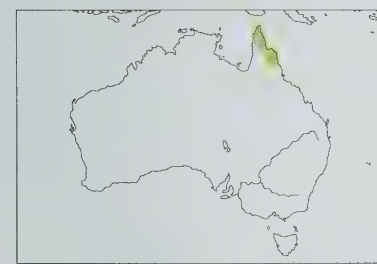
Genus *TRICHODERE* North, 1912

141. White-streaked Honeyeater

Trichodere cockerelli

French: Méliphage de Cockerell **German:** Uferhonigfresser **Spanish:** Mielero de Cockerell
Other common names: Brush-throated/Cockerell's Honeyeater

Taxonomy. *Ptilotis cockerelli* Gould, 1869, Cape York, north Queensland, Australia. Genus formerly subsumed in *Lichmera*, or even in *Meliphaga*. Some similarities with *Phylidonyris*. Monotypic.
Distribution. NE Queensland (Cape York Peninsula S to Aurukun in W, and in E extending farther S along coast to Cooktown and Shiptions Flat), in NE Australia,



Descriptive notes. 14–17 cm; male 14–20 g, female 12–13.5 g. Has top and side of head grey, heavily speckled paler grey on lores, around eye and on anterior ear-coverts, with prominent bright yellow tuft on rear ear-coverts, and short bright yellow moustachial stripe extending back from patch of bright blue-grey skin at gape; gorget of lanceolate feathers on chin, throat and upper breast largely white, finely streaked grey-brown, more broadly on breast; hindneck, side of neck and upperbody dark brown, diffusely streaked black; uppertail black-brown with fine olive-yellow edges; upperwing largely black-brown, short white

wingbar across tips of median secondary coverts, bold greenish-yellow edges and whitish tips on greater coverts, narrow greenish-yellow fringes on tertials and broad greenish-yellow edges on secondaries and primaries (prominent panel on folded wing); underbody below gorget white, some bright yellow streaks at side of upper breast, and scattered brown spots and streaks on lower breast grading to more diffuse brown streaking on flanks and undertail-coverts; undertail dark grey; underwing pink-buff, merging to dark grey trailing edge and tip; iris red-brown, orbital ring light grey; bill black, pale blue-grey base and gape; legs blue-grey. Sexes alike. Juvenile is like adult but ear-tuft smaller, moustachial stripe reduced to a few yellow streaks, lacks obvious gorget (feathers not lanceolate), chin to upper breast appear pale yellowish with brownish streaking, upperparts warmer brown and only faintly streaked, upperwing browner, reduced median wingbar but contrastingly blackish primary coverts, underbody duller, off-white (yellow wash on some) and less coarsely and more sparsely marked, iris dark brown, orbital ring dark grey, bill dark grey with pale grey base but pale grey to cream gape, and legs darker grey; immature like adult but gorget pale yellow (not white), and retains some brownish juvenile plumage in upperbody and upperwing-coverts. **VOICE.** Calls loud. Main call said to be a series of rapid staccato notes or a rattle (like sound of machine-gun); also utters loud scolding notes or a metallic scolding "churr". Song a clear, sharp whistle or a liquid, high-pitched somewhat metallic whistle of 4 notes, "blink-blink-blink-blink". Other calls include drumming noise like sound made by string being twanged on wooden box.

Habitat. Mainly tropical dry open forests and woodlands dominated by eucalypts, sometimes mixed with paperbarks (*Melaleuca*), *Lophostemon* or *Banksia*, and with understorey varying from open and grassy to dense and shrubby; also tropical heathland, e.g. of tropical *banksia* (*Banksia dentata*). Sometimes found in paperbark woodlands, including swamp-woodland; occasionally in or at edges of rainforest or mangroves. From riparian flats and coastal foredunes to slopes and escarpments of sandstone ranges.

Food and Feeding. Mainly nectar; also arthropods (insects). Forages in crowns of low flowering trees or in shrubs (including *Eucalyptus*, *Melaleuca*, *Lophostemon suaveolens*, *Banksia*, *Grevillea*), among foliage and branches; sometimes in flowering mistletoes (*Loranthaceae*). Nectar taken directly from flowers, as are some small insects, by probing and gleaning; occasional sallies for flying insects. Seen to forage with many other species, mainly other honeyeaters (of at least six species), also with Olive-backed Sunbirds (*Cinnyris jugularis*).

Breeding. Not well known. Breeding recorded in wet season, with eggs in Jan and fledglings Jan and Apr, and in dry season, with unspecified breeding Apr–Jun, possibly Jul; may nest at any time when conditions suitable. Possibly nests in small groups, e.g. of 3–4 or up to ten active nests, timing possibly synchronous within groups. Nest a frail, deep and rather open cup made of interwoven fine grass, rootlets or plant fibres, bound with spider web, lined with fine grass, one nest had external diameter 7 cm, depth 7.6 cm, internal diameter 3.8 cm, depth 5.1 cm; either suspended by rim or supported on horizontal, terminal branchlets or, less often, in fork, usually poorly concealed, 0.45–2 m (mean 0.76 m) above ground in low open shrub or tree, once in tangle of vines running over ground; often at edge of swamp or bank of watercourse, sometimes above water. Clutch said to be always 2 eggs, but no quantitative data; no information on incubation and nestling periods.

Movements. Apparently resident, with local movements (described as locally nomadic), probably in response to flowering of trees; thought to move locally between forests and adjacent clearings. Vagrants occasionally recorded W of main range in S.

Status and Conservation. Not globally threatened. Restricted-range species: present in Cape York EBA. Fairly common; no measures of abundance.

Bibliography. Barrett *et al.* (2003), Beruldsen (1979, 1990), Beruldsen & Uhlenhuth (1995), Blakers *et al.* (1984), Forshaw & Muller (1978), Gannon (1962), Garnett & Crowley (1997), Higgins *et al.* (2001), Johnson & Hooper (1973), MacGillivray (1912, 1914, 1917, 1918), McLean (1995), Officer (1967), Pizzey (1980), Pizzey & Knight (1997), Schodde & Mason (1999), Stattersfield *et al.* (1998), Storr (1984), White (1922).

Genus *FOULEHAIO* Reichenbach, 1852

142. Wattled Honeyeater

Foulehaio carunculatus

French: Méliphage foulehaio **German:** Schuppenkopf-Honigfresser **Spanish:** Mielero Foulehaio
Other common names: Carunculated/Samoan Wattled Honeyeater; Viti Levu Wattled Honeyeater (*procerior*)

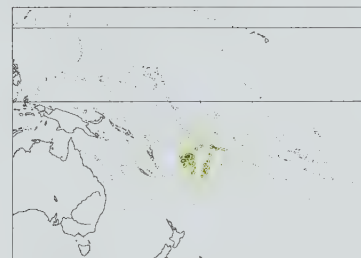
Taxonomy. *Certhia carunculata* J. F. Gmelin, 1788, Tongatapu, Tonga. Three subspecies recognized.

Subspecies and Distribution.

F. c. carunculatus (J. F. Gmelin, 1788) – Wallis and Futuna Is; E Fiji (Lau Group); Samoa (Savai'i, Upolu and offshore islets, including Nu'utele, Namua, Fanuatapu, Manono and Apolima); American Samoa (Tutuila and associated islets, and Manua Is); and Tonga (Vava'u Group, Ha'apai Group and Tongatapu Group).

F. c. taviunensis (Wiglesworth, 1891) – Vanua Levu, Taveuni and associated islets (including Mathuata, Nggamea, Rambi and Yangganga), in NC Fiji.

F. c. procerior (Finsch & Hartlaub, 1867) – W & C Fiji: Yasawa and Mamanuca Groups, Viti Levu, Vatulele, Beqa, Lomaiviti Group (including Ovalau), and Yasayasa Moala Group.



Descriptive notes. 19–21 cm; male 34 g and female 28 g (nominate), 25.2–45.4 g (*procerior*). Nominata race is largely drab to dark olive above, diffusely mottled or faintly streaked blackish on top of head and neck, mantle, back and scapulars, with bare yellow skin extending narrowly from gape and meeting yellow fleshy wattle on lower anterior ear-coverts, bordered below by sparsely feathered (variable) patch of black at base of bill extending back to wattle; feathered yellow stripe originating below eye (above wattle) curves up over and behind rear ear-coverts, enclosing small patch of dusky olive-grey on upper ear-

coverts; rump and uppertail-coverts brownish-grey to olive-grey; upperwing and tail dark olive-brown to dark brown, with yellow-olive edges on wing-coverts and remiges (contrasting olive-yellow panel on folded wing), and yellow-olive edges on tail; underside slightly paler and greyer than upperparts, olive-grey with yellow tinge, slightly greyer on chin and throat, diffuse and faint darker mottling or scaling on chin to breast and flanks; thighs light grey-brown, undertail light grey-brown, underwing off-white to buff-white with broad light grey-brown trailing edge and tip; iris dark brown to blue-grey, orbital ring yellow-orange; bill black, gape orange-yellow; legs slate-grey to blue-grey, soles yellow. Sexes alike in plumage, male slightly larger than female; female possibly generally more yellowish, especially below, but confirmation needed. Juvenile is like adult but duller and darker, with smaller wattle, also less olive above, with top of head and neck strongly barred or scaled with dark olive-brown, upperparts brownish with faint olive wash, and paler and less strongly olive below, chin to breast much more strongly mottled grey, merging to more yellow-olive on belly, vent and flanks and light buff-brown undertail-coverts; immature plumage, if present, undescribed. Races differ in extent of yellow and black on face and darkness of plumage: *procerior* is much darker than nominate, with yellow on face confined to narrow bare submoustachial stripe bordered above and more narrowly below by black feathering, greyish-olive ear-coverts narrowly edged at rear by small patch of yellowish-olive, upperparts darker olive and more strongly mottled and scaled darker (blackish-olive), and anterior underbody (particularly breast) more strongly mottled or scaled darker, also iris apparently darker; *taviunensis* is intermediate between previous and nominate. **VOICE.** Noisy, with variety of loud, vibrant, typically chiming or melodious vocalizations, usually in varied series; one of first birds to call in dawn chorus, and sometimes heard at night. A common call is a ringing "kee-kow", "ee-aa-oo" or "ke-too, ke-too", repeated often; and song described as "ti-ti-tui-tui-tur-twee" or gurgling whistled "churwee-churwee-churde-twee-twur". Loud bubbling alarm calls characteristic, typically given in response to predator, such as Common Barn-owl (*Tyto alba*); said to give soft liquid sucking notes in response to perched predator, such as goshawk (*Accipiter*), and loud, rolling bell-like call when predator in flight. Other calls include: whistling "ki-ki-ki-ki-ki"; varied musical or squawking whistles (possibly describing song); scolding and churring notes; brief, moderately high-pitched "cheew"; and subdued "kluk" intermittently during foraging. Duetting reported: birds usually on same branch, and maximum of 1 m apart, repeat loud, mellow, antiphonal patterns (somewhat more complex in Samoa than in Fiji); also duet in unison.

Habitat. Wide range of habitats, including mangroves (from seaward to landward edges), open coastal forest, casuarina forest, lowland, foothill and tall and low montane forest (including stunted moss forest on highest peaks), forest edge, and modified and artificial landscapes, including secondary vegetation (especially with coconuts), mixed and pure plantations of introduced pines (*Pinus*) and coconut plantations, sugar-cane crops; common in gardens in cities, towns and villages. In analysis of habitat use on Tutuila (American Samoa), appeared to depend on relatively undisturbed native forest despite use of wide range of habitats, and appeared to discriminate less among conditions within native forest than between native and non-native habitats; in non-native habitats, most abundant in plantations surrounded by native forest and with no introduced birds, and virtually absent from village habitats where abundance of introduced birds greatest. In Vava'u Group (Tonga), increased in abundance in less disturbed habitats, and much more common in mature forest, or submature/disturbed mature forest, than in villages, open plantations or wooded plantations/early successional forest. In Samoa, numbers in partly logged forest only slightly lower than those in unmodified forest; in another study, relative abundance high in forest, cleared forest and cultivated land, but low in urban habitat. Some variation between populations apparent. In Fiji, largely confined to mature forest and absent from coconut plantations and secondary vegetation on Taveuni, whereas most abundant in coastal coconut plantations on Lakeba. Preferred habitat on small offshore islands in Samoa varied: most abundant in tall, protected forest in interior on Nu'utele; slightly more abundant in successional forest than in plantation forest on Manono; and most abundant in native ridge forest and scarce in *Cocos*-dominated vegetation of the beach on Namua. In Samoa abundant at all altitudes; in Fiji, from near sea-level to 1450 m on Viti Levu and at 420–1060 m (commonest at high altitudes) on Taveuni; in Vava'u Group, in Tonga, absent or scarce on many small islands.

Food and Feeding. Primarily nectar, but also takes many arthropods (mainly insects, including caterpillars, and spiders), more so when breeding, and some soft fruits and berries; occasionally

small lizards, including geckos (Gekkonidae). Nectar taken from wide range of flowering shrubs, trees and palms, e.g. in American Samoa from small flowers of nutmeg (*Myristica inutitilis*) to the large crimson blooms of coral tree (*Erythrina variegata*), including asi (*Syzygium inophylloides*) and *Barringtonia* species, also from cultivated plants (including banana and coconut palms). In Fiji and Samoa, forages mainly in canopy and subcanopy, less often in lower storeys; occasionally forages on ground. Highly active, constantly flitting between flowering trees and shrubs, probing flowers and often hanging to do so; searches along branches and through foliage to glean arthropods; also sallies for flying arthropods, including moths (Lepidoptera). Bold, conspicuous. Usually in small groups of 3–4 individuals, but often singly or in twos (possibly pairs), and can congregate in small noisy flocks of 8–10 birds, and sometimes larger numbers (e.g. several dozen), in flowering plants (particularly in non-breeding periods). Aggressive, chasing and fighting with conspecifics and other species, and often displaces or chases *Myzomela*; attempts to defend nectar sources from Red-vented Bulbul (*Pycnonotus cafer*); reported as driving off mynas (*Acridotheres*) and Spotted Doves (*Streptopelia chinensis*).

Breeding. Breeds all year in Samoa, possibly with peaks in mid-summer and mid-winter, nest-building recorded Jan–Feb, dependent young mid-Jun and juveniles Feb and Oct, and specimens with definite indications of breeding Apr, Jun–Jul and Dec–Jan; in Tonga, eggs Aug, nestlings Jun and Aug, and fledglings May and Nov; throughout year in Fiji, with peaks Feb–Apr, Jun–Jul and Sept–Oct, and most pairs appear to raise two or more broods in a year. Territorial when breeding, driving larger species away from nest vicinity and physically attacking smaller birds (including *Myzomela cardinalis*). Nest rather fragile and cup-shaped, made of woven fine grass, vine tendrils, casuarina needles, other fibres and rootlets, often with spider web draped over exterior, in wet forest outside of nest sometimes heavily draped with green and moss-like liverworts; typically suspended by rim from horizontal fork in branch of shrub or tree 1–15 m above ground and well hidden in dense foliage; of 13 nests on 'Eua (Tonga), mean height 3 m and nine of the nests in *Citrus* tree; sometimes uses site of previous nest, even building over remnants of earlier one. Clutch normally 1 egg, sometimes 2, on Fiji said to be usually 2–3; no information on incubation and nestling periods; both parents feed nestlings and fledglings, the latter dependent for fairly long time.

Movements. No information; probably resident, with some local movements or dispersal to exploit flowering plants. On Tutuila, a broad, low increase in numbers through much of the hot wet season (roughly Dec–Apr) and a higher peak at some sites in Dec–Jan; changes probably relate mainly to local movements and concentrations of birds to exploit seasonally abundant food sources. In Samoa, recorded as apparent visitor on two (of seven) small offshore islands off Upolu, 0.7 km and 1.3 km over water from nearest populations. Specimen record from Kadavu, in SW Fiji, and may occur there occasionally.

Status and Conservation. Not globally threatened. Restricted-range species: present in Fiji EBA and in Samoan Islands EBA, and in Wallis and Futuna Secondary Area and in Tonga Secondary Area. Widespread and generally common or abundant over most of range. Estimated population in American Samoa 550,000 birds; considered the commonest landbird in American Samoa, and on Tutuila mean abundance at survey sites ranged from 0.25 to 18.88 birds per 8-minute survey; in survey of seven small offshore Samoan islands, the most abundant species on five islands. Tutuila population apparently reduced, after hurricanes, but recovering. Little-understood variation in distribution and abundance on islands throughout range, and absent from many islands where it may otherwise be expected to occur, including larger islands, e.g. in Fiji on Gau and Totoya (in Yasayasamoala Group), Vatoa (in Lau Group) and Ringgold Is. and on Kadavu (where replaced by *Xanthotis provocator*), and absent N & S outliers of Tonga. Possibly suffering adverse impact from introduced bird species in American Samoa: considered more common around villages in Manu'a Is, where no introduced birds present, than on Tutuila, where introduced Red-vented Bulbul, Common Myna (*Acridotheres tristis*) and Jungle Myna (*Acridotheres fuscus*) are common. Often attacked by Red-vented Bulbul in Fiji, although is also aggressive to that species (initiating aggressive interactions more than being recipient of them); no clear evidence that introduced species have restricted distribution of this or other honeyeater species. Nevertheless, in non-native forest found to be more abundant on Manono (Samoa) than in similar habitats on the large islands of Upolu and Tutuila, where introduced bird species are present.

Bibliography. Banks (1984), Beckon (1993), Beichle (2008), Beichle & Baumann (2003), Bellingham & Davis (1988), Blackburn (1971), Brown & Child (1975), Clapp & Sibley (1966), Clunie (1972, 1984), Craig (2005), David & Gosselin (2002b), Dhondt (1976), Diamond (1972b), Engbring & Ramsey (1989), Evans *et al.* (1992), Freifeld (1999), Freifeld, Solek & Tualalelei (2004), Freifeld, Steadman & Sailer (2001), Gill (1987, 1988, 1990, 1995), Gorman (1975), Holyoak (1979), Langham (1987, 1989), Layard (1876a), Mayr (1932, 1945b), Morgan & Morgan (1965), Pernetta & Watling (1978), duPont (1976), Pratt *et al.* (1987), Reed (1980), Rinke (1984, 1986, 1987, 1991), Rinke *et al.* (1992), Schönwetter & Meise (1981), Steadman & Franklin (2000), Steadman & Freifeld (1998), Steadman *et al.* (1999), Tarburton (1992, 2001), Watling (2001), Webb *et al.* (1999), Whitmee (1875).

Genus *GYMNOMYZA* Reichenow, 1914

143. Giant Honeyeater

Gymnomyza viridis

French: Méléphage vert **German:** Grünhonigfresser **Spanish:** Mielero Gigante
Other common names: Giant Forest/Giant Green Honeyeater

Taxonomy. *Tatara ? viridis* E. L. Layard, 1875, Taveuni, Fiji. Formerly placed in genus *Leptornis* or *Amoromyza*, both now defunct, and in past suggested as being most closely related to *Melidectes*. Races differ vocally, and may better be treated as two separate species. Two subspecies recognized.

Subspecies and Distribution. *G. v. viridis* (E. L. Layard, 1875) – Vanua Levu and Taveuni, in N Fiji. *G. v. brunneirostris* (Mayr, 1932) – Viti Levu, in W Fiji.

Descriptive notes. 25–31 cm. Large, robust honeyeater with moderately long, slender, and slightly decurved bill. Nominate race is wholly drab olive to dark olive (often appearing yellowish-olive in field), with faintly paler yellow-olive eyering and lores; above, tips and concealed inner webs of remiges and rectrices brownish-olive, contrasting slightly with upperparts; underwing pale grey-olive with darker olive-grey trailing edge and tip; iris grey to dark brown; bill and legs bright yellow. Sexes alike in plumage, male slightly larger than female. Juvenile undescribed (though see following). Race *brunneirostris* differs from nominate in olive-brown to blackish-brown bill, legs and feet; slightly shorter bill and longer tail, plumage also subtly paler and brighter olive, juvenile of this race has yellowish bill with brownish tip. **VOICE.** On Viti Levu (race *brunneirostris*), call described as repeated, ringing “keekow”, “kee-yow”, “keetoo” or “eekou”,



a characteristic yodelling cacophony that reverberates through forest and can be heard more than 1 km away; calling can begin several hours before dawn and continues until well after dark, though less often during middle of day (e.g. from 02:15 each morning in Aug–Sept; from 04:00 until after dawn during Jun–Jul). Much quieter on Vanua Levu and Taveuni (nominate race), with variety of calls (described as more like those of *Foulehaio carunculatus* but louder), including “keetoo” similar to that on Viti Levu, and loud melodious whistling gurgles with rapid mellow notes; said never to produce loud cacophonous yodelling heard on Viti Levu, but birds on Taveuni described as producing a remarkable volume of sound.

Habitat. Mainly large areas of contiguous mature primary forest, including hill and montane forest and stunted, mossy montane rainforest on highest peaks of Viti Levu; less often at forest edge, in degraded forest bordering mature forest, or in isolated tall trees at edge of secondary forest in grassland; occasionally in flowering or fruiting trees in agricultural areas close to mature forest. Appears intolerant of heavily logged forest without remaining tracts or patches of mature forest. Normally in hills and mountains; recorded at 460–1030 m (rarely lower) on Taveuni and from 80 m to 1310 m on Viti Levu.

Food and Feeding. Mainly nectar (including from wild banana, coconut palms, and pandanus), also arthropods (including insects and their caterpillars, and spiders); small berries, soft fruit; occasionally lizards. Usually forages in outer canopy or subcanopy of tall forest, occasionally lower (most often middle levels), including on ground. Active, leaping about in canopy or understorey; said to creep up tree trunks, but confirmation needed. Forages actively for arthropods, including by gleaning. Shy and retiring, heard more often than seen, but sometimes perches in open. Sociable and pugnacious; usually seen singly or in twos (possibly pairs), but in Fiji sometimes in noisy flocks at food sources. Aggressive to some other species, such as Collared Lory (*Phigys solitarius*), in flowering trees.

Breeding. Little known. Breeding thought to occur at least Jun–Oct, and one juvenile recorded late Aug. One nest found, a fairly substantial basket or cup made of rootlets (probably of epiphytes), external diameter c. 20–25 cm, suspended from leafy branch c. 18–20 m above ground in outer foliage of large canopy tree. No information on clutch size or eggs, nor on incubation and nestling periods; only single dependent juveniles ever observed, and thought that fledglings dependent for a long period, possibly 2–3 months or more.

Movements. No information; apparently resident. It is suggested that its dispersal ability is weak. **Status and Conservation.** Not globally threatened. Restricted-range species: present in Fiji EBA. Fairly common in suitable habitat. Studies of calling birds on Viti Levu suggested an island population of c. 142,000 calling individuals; another study of territory size suggested an island population of 60,000 pairs. Populations on all three islands considered reasonably large (apparently not uncommon), and appear not to be declining significantly. Occurs in nearly all protected areas with good forest, and is protected under Fijian law. Does, however, require large areas of contiguous rainforest, and past and present loss and degradation of mature forests are an ongoing threat. Although industrial logging has stopped on Viti Levu and Taveuni, forests on all three islands are being slowly degraded by logging for domestic use and agricultural expansion.

Bibliography. Anon. (2007a), Beckon (1993), Blackburn (1971), Brown & Child (1975), Butchart & Stattersfield (2004), Clunie (1984), Diamond (1972b), Gorman (1975), Holyoak (1979), Langham (1984, 1989), Masibalavu & Dutton (2006), Mayr (1932, 1944b, 1945b), Orenstein (1979), Pernetta & Watling (1978), duPont (1976), Pratt *et al.* (1987), Stattersfield & Capper (2000), Stattersfield *et al.* (1998), Watling (1982a, 2001).

144. Mao
Gymnomyza samoensis

French: Méléphage mao **German:** Maohonigfresser **Spanish:** Mielero Mao
Other common names: Black-breasted/Mao Honeyeater

Taxonomy. *Merops samoensis* Hombron and Jacquinot, 1841, Upolu, Samoa. Relationships not known; formerly placed in genus *Leptornis* or *Amoromyza*, both now defunct, and has been suggested as being closest to *Melidectes*. Few specimens from American Samoa (Tutuila; now extinct) on average slightly larger and somewhat darker, especially on head, than other populations, but differences too trivial to warrant naming of geographical races. Monotypic. **Distribution.** Savai'i and Upolu, in Samoa.



Descriptive notes. 28–31 cm. Large dark honeyeater with long, gently decurved bill. Appears wholly dark at distance; head, neck and breast sooty black to olive-black, conspicuous olive streak from below eye across upper ear-coverts; largely dusky olive-brown or dark brown upperbody and underbody, varyingly washed olive-green, with rump and uppertail-coverts slightly paler than rest of upperparts, and undertail-coverts slightly paler and browner than rest of underbody; uppertail and upperwing dark olive-brown, olive-green outer edges of rectrices, greater coverts and remiges (olive-green wash on folded wing); iris brownish-grey

to brown; bill black; legs black to blackish-grey, soles yellow. Sexes alike in plumage, male larger than female. Juvenile is like adult, but head and underbody less strongly black. **VOICE.** Considered noisy. Call described as a loud cat-like wailing “mee-aa-oo” or a series of low, hoarse, nasal mewling notes, at times rising in pitch, followed by clearer high-pitched phrases and developing into loud, upslurred yelps before subsiding again; given in bouts lasting for up to 1 minute or more (one call comprising at least 55 notes), and heard most often in morning and evening. Other calls include nasal, downslurred “yaaw”; loud, mechanical-sounding “chlip”; and short squeaky notes.

Habitat. Native forest and forest edges, and cultivated land with remnants of rainforest, e.g. in steep valleys, in foothills and montane areas; greatest densities in craters at high altitude in least disturbed forest. Also seen in cinder cone, in heathland scrub, and on steep slopes along rivers. Reported as visiting coconut trees near coast (probably in periods of stress after cyclones), and apparently was more widespread in lowlands in the past. Recorded at 760 m and above 900 m, and said to be commoner on the very tops of peaks; found in remaining rainforest at up to 1500 m. Recently found to be present in upland areas with disturbed forest next to cattle farms and plantations.

Food and Feeding. Nectar, arthropods (mainly insects) and small fruit. Forages usually in crowns of trees, or in subcanopy; seen foraging in coral trees (*Erythrina*), the blossoms of which contain nectar and many insects; said to forage also on moss-covered branches. Forages also in *Albizia chinensis* and *Paraserianthes falcata*; searches intensively in rotten wood of dead branches of these large trees, digging into the soft wood and probing with bill, sometimes while hanging head downwards; observed to extract and swallow insect larvae. Inconspicuous, heard more often than seen. Usually in pairs, partners seeming to stay close together. Competes with many other species at flowers of *Erythrina*, where it is dominant, attacking all other species except Samoan Starling (*Aplonis atrifusca*); in presence of a group of latter species, performs song flights as an indirect sign of territoriality.

Breeding. Nest high up, in fork of tree, with 2–3 eggs. No other information.

Movements. Sedentary, with some local movements.

Status and Conservation. ENDANGERED. Restricted-range species: present in Samoan Islands EBA. Rare. Total population small (estimate of 1000–2500 individuals), fragmented and apparently declining, and small subpopulations may not be viable. Formerly occurred on Tutuila, in American Samoa, but now extinct; last collected in 1924, sight records in 1933, and last unconfirmed report in 1977; status on Tutuila, however, not certainly known, and may have occurred only as a visitor from Samoa. Thought to have been formerly widespread in forests in Samoa, from coasts to mountains, but range dramatically reduced and the species appears to have become rarer within its current range. Decline largely attributed to loss of forest habitat, and degradation of remaining habitat, with Samoan forests now open and patchy, and so supporting fewer birds and becoming more vulnerable to weed invasion. Apparently dependent on remaining patches of primary forest, but remaining areas of upland forest threatened by slash-and-burn cultivation, farmers using roads from logged lowland forests to gain access to formerly inaccessible land; forest quality further reduced by invasion of aggressive exotic trees, spread of which is aided by cyclones and by the planting. Cyclones a significant threat; during the two most powerful recent cyclones, in 1990 and in 1991, forest canopy cover was reduced from 100% to 27%, and populations of present species were reduced, e.g. disappeared from lowland forests in O Le Pupu-pu'e National Park (on Upolu) between 1982 and 1991 following these two cyclones. Fires in low-rainfall forests, hunting (despite national bans on hunting native birds and bats that have been in place for more than ten years) and introduced rats (*Rattus*) may also pose a threat to the species. Occurs in some proposed and existing protected areas, but these have suffered damage from cyclones and O Le Pupu-pu'e National Park is threatened by logging and cattle-farming. Local peoples often shot this species when they saw it near villages, as it was considered a bird of ill omen.

Bibliography. Anon. (2006b, 2007a), Ashmole (1963), Banks (1984), Beichle (2008), Beichle & Baumann (2003), Bellingham & Davis (1988), Butchart & Stattersfield (2004), Collar *et al.* (1994), Craig (2005), Freifeld *et al.* (2001), Lovegrove *et al.* (1992), Mayr (1932, 1944b, 1945b), Muse & Muse (1982), Orenstein (1979), Park *et al.* (1992), duPont (1976), Reed (1980), Stattersfield & Capper (2000), Stattersfield *et al.* (1998), Tarburton (2001), Watling (1982a, 2001), Whitmee (1875).

145. Crow Honeyeater

Gymnomyza aubryanus

French: Méléphage toulou **German:** Rotgesicht-Honigfresser **Spanish:** Mielero Cuervo
Other common names: Red-faced Honeyeater

Taxonomy. *Leptornis Aubryanus* J. Verreaux and Des Murs, 1860, New Caledonia.

Previously placed in genus *Leptornis* and *Leptomyza*, both now defunct. Relationships unclear, and study needed; formerly suggested as being most closely related to *Melidectes*. Monotypic.

Distribution. New Caledonia.



Descriptive notes. 35–42.5 cm; male 211–284 g, two females 152 g and 159 g. Very large and distinctive, corvid-like honeyeater, with long, pointed and decurved bill, long rounded wings and fairly long neck, and long graduated tail. Plumage is glossy black, with sparsely feathered blackish lores, large yellow to orange-red fleshy orbital ring (broken at rear of eye) and yellow wattles at rear edge of orbital ring; remiges and rectrices glossy brownish-black; feathers of head, hindneck, throat, breast and belly have pale yellowish shafts, giving finely streaked appearance in close view; iris dark brown; upper mandible and tip

of lower mandible black to grey-black, yellowish to orange base of lower mandible and gape (contrary to statements that lower mandible simply blue-black); legs pale yellow to yellow-orange (reported also as blue-grey). Sexes alike in plumage, male noticeably larger than female; female said also to be less strongly black. Juvenile is largely undescribed, has tuft of yellow feathers on ear-coverts. **Voice.** Quiet outside breeding season. During breeding season the first species to sing in morning, roughly an hour before sunrise; song a loud, melodious ringing note. Also gives crow-like call “wa-wa” (possibly in alarm or agitation), a low sibilant cry during foraging, and harsh croak in flight.

Habitat. Mainly dense, humid, primary rainforest, usually on ultrabasic soils; recorded also in dry forests (at Pouémbout), which may refer to niaouli (*Melaleuca leucadendra*) savanna woodland or to the highly threatened sclerophyll forest (which covers less than 3% of New Caledonia’s land area), also in isolated stands of stunted forest within maquis, up to 2 km from more extensive stands of forest. To 1000 m, with recent records from 100 m to 850 m.

Food and Feeding. Diet insects, including beetles (Coleoptera) and small flies (Diptera), large spiders (Araneae), and nectar from flowers. Forages in canopy or middle storey, often in flowering trees; hangs and clambers about the ends of branches to reach flowers. Inconspicuous and shy; usually seen singly or in twos (probably pairs), but formerly reported also in small parties. Once seen to displace a New Caledonian Cuckoo-shrike (*Coracina analis*).

Breeding. A nest under construction in Sept (1982) and another on which bird thought to have been sitting in mid-Oct. First nest cup-shaped and thick-walled, c. 20 m above ground, apparently supported in fork of several thin branches. Estimated territory size 0.5–0.75 km². No other information.

Movements. No information. Probably sedentary.

Status and Conservation. ENDANGERED. Restricted-range species: present in New Caledonia EBA. Rare. Estimated total population small, between 1000 and 3000 individuals in 2000–2002, and this probably an overestimate. Population thinly distributed, fragmented, and thought to be in continuing decline. Most recent records scattered in S of Grande Terre, mainly in C mountains from Mt Humboldt, through Rivière Bleue Park (c. 18 known pairs in study area within park, with estimated total of 160 pairs) to Mt Dzumac, with a few records in N (on Mt Panié and Pouémbout). Appears to be localized and uncommon even in preferred habitat, and reasons for absence from apparently suitable habitat not known, but suggesting an unknown specialization. Loss and degradation of forest from logging, nickel-mining and fires likely to pose some threat. Cause of apparent continuing decline in Rivière Bleue Park not certainly known, but no successful nests or juvenile birds have been seen here. Although decline possibly due, at least partly, to predation by introduced rats (*Rattus*), the related and smaller *G. viridis* of Fiji appears to be unaffected by rats.

Bibliography. Anon. (2007a), Butchart & Stattersfield (2004), Collar *et al.* (1994), Delacour (1966), Doughty *et al.* (1999), Ekstrom *et al.* (2002), Hannecart & Létocart (1983), Layard & Layard (1882), Mayr (1944b, 1945b), Myers (2004), Ross (1988), Stattersfield & Capper (2000), Stattersfield *et al.* (1998), Stokes (1980), Vuilleumier & Gochfield (1976).



PLATE 51

Family MELIPHAGIDAE (HONEYEATERS) SPECIES ACCOUNTS

Genus *MELITHREPTUS* Vieillot, 1816

146. Black-chinned Honeyeater

Melithreptus gularis

French: Méliophage à menton noir

Spanish: Mielero Barbinegro

German: Schwarzkinn-Honigschmecker

Other common names: Black-throated Honeyeater; Golden-backed Honeyeater (*laetior*)

Taxonomy. *Haematops gularis* Gould, 1837, interior of New South Wales, Australia.

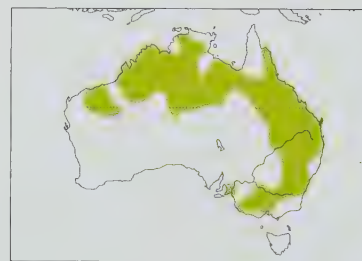
Forms a superspecies with *M. validirostris*. Race *laetior* often treated as a separate species, but intergradation with nominate over broad zone in E Australia (Queensland S to NC New South Wales); further research needed. Additional proposed races are *normantoniensis* (from Normanton, in NW Queensland) and *carpentarianus* (Homestead, on Campaspe R. in E Queensland), both regarded as intergrades, and *parus* (Exmouth Gulf, in Western Australia), synonymized with *laetior*. Two subspecies recognized.

Subspecies and Distribution.

M. g. laetior Gould, 1875 – W & N Western Australia E to NW & N Queensland (around S & E Gulf of Carpentaria and S Cape York Peninsula), thence S to NC New South Wales.

M. g. gularis (Gould, 1837) – N & E Queensland (from S Cape York Peninsula) S to N foothills of Great Divide in N & NC Victoria; SE South Australia (Fleurieu Peninsula and S Mt Lofty Ranges).

Descriptive notes. 14–16.5 cm; 18.5–23.2 g, male 20.5–22.5 g, one female 19 g (nominate), male 15–20 g and female 16.1–20.2 g (*laetior*). Nominative race has neat black cap covering most of top and side of head and neck, arc of bare bright blue skin over top of eye, and conspicuous white crescent extending from rear edge of blue orbital arc across nape; malar area and side of throat white, black chin grading to grey-brown on middle of throat; upperbody largely olive-green, narrow olive-buff band on uppermost mantle, yellow-olive rump and uppertail-coverts; uppertail and upperwing largely brown, grey tinge on secondary coverts; breast pale brownish-grey, grading to off-white on belly, vent and undertail-coverts, and with grey-buff flanks; undertail grey-brown, underwing creamy buff with brown trailing edge and tip; iris brown, sometimes reddish-brown;



bill and gape grey-black to black; legs orange-rufous. Sexes alike in plumage, male slightly larger than female. Juvenile is like adult but duller and browner overall, cap brown, bare skin above eye dull blue, band on nape off-white, upperbody olive-brown, grading to olive-green on lower rump and uppertail-coverts, chin blackish, grading to brown on centre of throat and brownish-grey on breast, and to white from belly to undertail-coverts, iris dark brown, bill initially wholly orange but gradually develops darker patches, upper mandible quickly becomes orange-brown, legs orange; immature like adult, sometimes a few brown

juvenile feathers retained on crown, nape and rump, and bill takes c. 12 months to become completely black. Race *laetior* is patterned like nominate, but upperbody largely golden yellow-olive, with narrow bright yellow band across uppermost mantle and bright yellow rump, underparts off-white, with grey wash across breast and flanks, and bare skin above eye pale jade-green to straw-yellow. Voice. Noisy, calling often, loudly and throughout year, more so when breeding; voice clear and ringing. Song rich, complex and varying, described as strong, shrill piccolo notes, repeated 2–4 times, sometimes for 10–15 minutes; pair-members often sing in reply to one another. Both sexes also give loud, harsh, grating, croaking or rollicking “chee-chee”, “creep-creep-creep” and “chip-chip-chip, chur-chur-chur-chur”, sometimes in flight; and loud, single or double, whistling or bell-like note. Other calls include single harsh note; cheeps and chirrups when gathering nest material; soft, deep, guttural notes; warbling; and undescribed distress call.

Habitat. Mainly open eucalypt forests and woodlands. In E & S Australia, mainly in forests and woodlands dominated by box and ironbark eucalypts, e.g. mugga ironbark (*Eucalyptus sideroxylon*), grey ironbark (*Eucalyptus paniculata*), grey box (*Eucalyptus moluccana*), white box (*Eucalyptus albens*); less often in other mixed open eucalypt forests or woodlands of smooth-barked gums, stringybarks, ironbarks and tea-trees (*Leptospermum*), or such associations interspersed with clumps of other trees, such as *Banksia*, *Callitris* or *Casuarina*. In N, found in tall open woodlands of stringybark eucalypts or bloodwoods (*Corymbia*), or riparian associations dominated by paperbarks (*Melaleuca*), eucalypts or acacias, or combinations of these. In arid and semi-arid regions, often in riparian woodlands dominated by river red gum (*Eucalyptus camaldulensis*) or coolibah (*Eucalyptus*

coolabah), sometimes with dense thickets of paperbarks and *Callistemon*, or shrubby understorey of *Acacia*. Occasionally in gardens.

Food and Feeding. Mainly nectar and invertebrates (mostly insects); sometimes honeydew, and very occasionally seeds. Forages mostly in trees (mainly *Eucalyptus*), occasionally in understorey shrubs (e.g. *Astroloma*), saplings or creepers; in canopy among outermost flowers, foliage and twigs, occasionally on branches and trunks; very occasionally forages on ground. Probes flowers for nectar; if flower long and tubular, may steal nectar by piercing base of flower before probing. Obtains insects by gleaning foliage or flowers, or from beneath bark of trees, sometimes by pulling at bark; occasionally takes flying insects in air by sallying. Often hangs upside-down to reach flowers. Usually in pairs or in small groups of up to twelve or so individuals; occasionally forages with other species of honeyeater, particularly in flowering trees; once seen in mixed-species feeding flock of 40–45 honeyeaters of six genera.

Breeding. Race *laetior* not well known but mainly Jan–Aug, occasionally to early Oct (one clutch late Mar, nestling mid-Jun); for nominate race recorded in all months except May but mainly austral spring, with estimated start of clutches Jan–Feb and Aug–Sept in NE and eggs Jun–Dec in New South Wales. Often breeds co-operatively, but also solitarily. Nesting material collected by both sexes, and nest sometimes built by more than two individuals; nest cup-shaped, usually of fibrous bark woven together with hair, wool or fur, and occasionally spider webs, cocoons or grass, usually lined with wool, hair or fur, external diameter 7 cm, depth 7–6 cm, internal diameter 5–1 cm, depth 5–3 cm; usually suspended in crown of tall tree (mainly *Eucalyptus*), less often in shrub, usually in uppermost branches, well concealed by foliage, 1–25 m (mean 8–4 m) above ground. Clutch usually 2–3 eggs; no information on incubation and nestling periods; nestlings and fledglings fed by both parents and by any auxiliaries present. Nests parasitized by Pallid Cuckoo (*Cuculus pallidus*).

Movements. Mainly resident; sometimes considered nomadic, and changes in numbers or apparent movements reported at many sites where considered resident, but many such movements probably local. Increases in numbers often associated with flowering of trees. Occasionally undertakes longer movements, hundreds of kilometres beyond normal range. Vagrants of race *laetior* recorded in Cooper Creek Drainage Basin (SW Queensland) and in NE South Australia.

Status and Conservation. Not globally threatened. Rather uncommon. No estimates of total population, but recorded densities of up to 0.01–1.03 birds/ha.

Bibliography. Anon. (1976), Aumann (1991), Badman (1989), Barrett *et al.* (2003), Blakers *et al.* (1984), Boekel (1980b), Brooker *et al.* (1990), Campbell (1900), Carruthers (1968), Cody (1991b), Colston (1974), Cooney *et al.* (2006), Cooper & McAllan (1995), Elsworth (1997), Ford, H.A. (1979, 1980), Ford, H.A. & Paton (1975, 1977), Ford, J.R. (1986, 1987b), Ford, J.R. *et al.* (1980), Gibson (1986), Gilbert (1919, 1923, 1937), Gosper (1986, 1992), Griffioen & Clarke (2002), Harrison (1969), Haywood (2006), Higgins (1999), Higgins *et al.* (2001), Hindwood (1937b, 1944), Hobbs (1961), Horton (1975), Howe (1928), Immelmann (1961), Johnstone *et al.* (1977), Keast (1968a, 1968b, 1985a), Lavery *et al.* (1968), Ley *et al.* (1997), Mac Nally & Timewell (2005), MacGillivray (1914, 1929), Martin *et al.* (2003), Morgan (1922), Morris *et al.* (1981), North (1907), Officer (1971), Parker (1969), Paton (1980, 1985b), Pizzey (1980), Rowley (1976), Schodde (1976), Schodde & Mason (1999), Storr (1977, 1984), Terrill & Rix (1944), Timewell & Mac Nally (2004), Traill *et al.* (1996), Warham (1957), Wheeler (1967a, 1967b), Woinarski & Tidemann (1991).

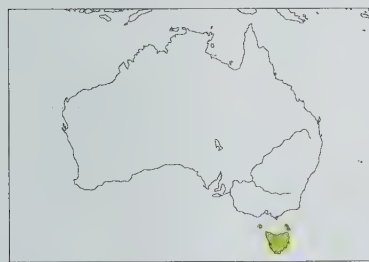
147. Strong-billed Honeyeater

Melithreptus validirostris

French: Méléphage à bec fort **German:** Starkschnabel-Honigschmecker **Spanish:** Mielero Picudo
Other common names: Black-capped Honeyeater

Taxonomy. *Haematops validirostris* Gould, 1837, Van Diemen's Land = Tasmania. Forms a superspecies with *M. gularis*. Birds from King I (in Bass Strait) described as race *kingi*, but differences from those elsewhere in range appear too trivial to warrant naming of geographical races. Monotypic.

Distribution. Islands in Bass Strait (King I, Flinders I) and Tasmania.



Descriptive notes. 15 cm; male 23–30 g, female 17–25 g. Has neat black cap covering top and side of head and hindneck, arc of bare light blue to blue-green or pale green skin over top of eye, and broad white (sometimes smudged grey-brown) crescent-shaped band across nape; sharply demarcated white malar area grades into off-white on sides of chin and throat, with small black patch in centre of chin and mid-line of throat; upperparts largely olive-grey, mottled olive-green, rump and uppertail-coverts brighter and more uniformly olive; uppertail dull olive; upperwing mostly grey-brown, dark brown primary coverts and

rest of remiges, faint olive tinge on edges of primary coverts (in fresh plumage); underbody light brownish-grey, undertail brownish-grey, underwing brownish-buff with broad brown trailing edge and tip; iris red-brown; bill and gape black; legs brown to dirty pink. Sexes alike in plumage, male larger than female. Juvenile is patterned like adult, but with duller, brown-black cap, lemon-yellow malar area and band across nape, olive-green mottling extending from mantle to hindneck, distinct olive edges and tips on primary coverts, bill brown, grading to orange-buff at tip, gape orange-buff and swollen, iris dark brown to reddish-brown, bare skin over eye initially absent, then develops small light blue patch, orbital ring conspicuous orange-buff, legs orange to dark pink. **VOICE.** Noisy. Continuous loud short, sharp “cheep” notes, as single or double notes, or in rattling cadence; soft “cheep” as contact call when nesting, but not at other times. Other calls include harsh, aggressive “churr” in alarm or when defending breeding territory, and sharp whistle when raptor detected nearby.

Habitat. Mainly mature, wet sclerophyll forests, including stands of mountain ash (*Eucalyptus regnans*) or alpine ash (*Eucalyptus delegatensis*), especially in gulleys supporting an understorey either of sclerophyllous shrubs or of cool temperate rainforest; common also in dry sclerophyll forest dominated by eucalypts, on drier slopes and mountain ridges, including those with understorey of sclerophyllous shrubs, grass or sedges, particularly during winter. Sometimes in cool temperate rainforest dominated by antarctic beech (*Nothofagus cunninghamii*), Huon pine (*Dacrydium franklinii*), celery-top pine (*Phyllocladus aspleniifolius*) or blackwood (*Acacia melanoxylon*); subalpine eucalypt forest or woodland; low coastal scrub or heathland; closed wet scrub beside wetlands or in gulleys and dominated by *Acacia*, *Leptospermum*, *Melaleuca* and *Banksia*, some-

times with emergent eucalypts; and buttongrass (*Gymnoschoenus sphaerocephalus*) sedgeland with scattered emergent eucalypts. Sometimes in parks and gardens.

Food and Feeding. Usually invertebrates (mainly insects), sometimes also nectar and fruit. Forages in canopy, subcanopy and understorey of trees and shrubs. Mostly probes or gleans bark, including pendent bark, of large branches and trunks of rough-barked or smooth-barked eucalypts, or among foliage and twigs; occasionally feeds at flowers, and very occasionally among leaf litter on ground, and sometimes makes aerial sallies. Often forages in manner of an Australasian treecreeper (Climacteridae), moving up and down trunks of trees, searching crevices, and pulling off pieces of loose or pendent bark to expose prey. Techniques include several unique within genus: flaking, in which bird flicks off small pieces of bark, or brushes aside loose substrate with sideways sweeping motion of bill; prying, in which it uses bill or head to lever off strips of bark; and pulling, by grasping, pulling and tearing to remove strips of bark. Active and confiding. Mostly in small flocks, but sometimes in congregations of up to 40, once of 70, individuals; often forages with *M. affinis*.

Breeding. Season primarily late winter to mid-summer, Jul to mid-Jan, with eggs recorded Aug–Dec and nestlings mid-Aug to early Sept. Occasionally breeds co-operatively, but no details. Nest a small, deep cup, usually made of strips of bark (sometimes encrusted with lichen), sometimes also grass, leaves, wool and spider web, usually lined with soft bark fibres, plant down, wool, hair, fur or paper, sometimes unlined, external diameter 10–2 cm, depth 8–9 cm, internal diameter 6–4 cm, depth 3–8 cm; usually suspended by rim in eucalypt tree or sapling, or in other tree or shrub in understorey, occasionally in crown of tree-ferns, usually in outer foliage or in outer branches and twigs at top of nest plant, 2–11 m (mean 4–6 m) above ground. Clutch 3–4 eggs, usually 3; incubation probably by both sexes, and both also feed and defend nestlings; no information on duration of incubation and nestling periods. Nests parasitized by Pallid Cuckoo (*Cuculus pallidus*).

Movements. Resident; some local movements from wet sclerophyll forest into dry sclerophyll during winter. Sometimes considered nomadic, especially after young fledged, but this probably describing local movements.

Status and Conservation. Not globally threatened. Restricted-range species: present in Tasmania EBA. Widespread in Tasmania. No estimates of total population, but recorded at densities of up to 2.5 birds/ha.

Bibliography. Barrett *et al.* (2006), Blakers *et al.* (1984), Cale (1994), Campbell, A.G. (1903), Campbell, A.J. (1900), Dove (1907, 1916), Fielding (1979), Green (1989, 1995), Green & McGarvie (1971), Griffioen & Clarke (2002), Henderson & Green (1982), Higgins (1999), Higgins *et al.* (2001), Keast (1968a, 1968b), Littler (1910), Mellor & White (1913), Mollison (1974), North (1907), Noske (1983), Ratkowsky & Ratkowsky (1980), Ridpath & Moreau (1966), Schodde & Mason (1999), Sharland (1925, 1958), Slater (1994), Taylor *et al.* (1997), Thomas (1979, 1980, 1986), Waite (1976).

148. Brown-headed Honeyeater

Melithreptus brevirostris

French: Méléphage à tête brune **German:** Braunkopf-Honigschmecker **Spanish:** Mielero Cabecipardo
Other common names: Short-billed/Least Honeyeater, Large-billed/Long-billed Honeyeater

Taxonomy. *Meliphaga brevirostris* Vigors and Horsfield, 1827, Sydney region (Parramatta), New South Wales, Australia.

Races intergrade where they abut: *pallidiceps* intergrades with nominate in broad hybrid zone inland of Great Divide in Victoria, and with *leucogenys* in narrow zone in South Australia (extending S from about Port Augusta and S Flinders Ranges to Yorke Peninsula). Proposed race *augustus* (described from Port Augusta) relates to latter intergrading population. Five subspecies recognized.

Subspecies and Distribution.

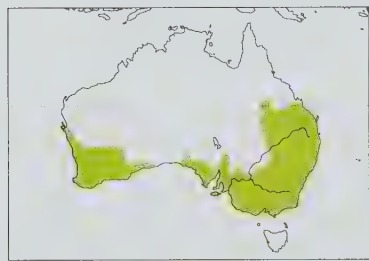
M. b. leucogenys Milligan, 1903 – S Western Australia (from Peron Peninsula E to W Nullarbor Plain); also S South Australia (Eyre Peninsula).

M. b. pallidiceps Mathews, 1912 – inland plains and W slopes of Great Divide in S Queensland, W & C New South Wales and N Victoria, extending W into S South Australia.

M. b. brevirostris (Vigors & Horsfield, 1827) – E slopes of Great Divide New South Wales and both slopes in Victoria, extending W into SE South Australia.

M. b. magnirostris North, 1905 – Kangaroo I (South Australia)

M. b. wombeyi Schodde & Mason, 1999 – Otway Ranges and S Gippsland, in S Victoria.



Descriptive notes. 11.5–14 cm; male 12–16 g and two females 14.1 and 17 g (nominate), male 11–14.2 g and female 12–16 g (*pallidiceps*), male 11–14.5 g and female 11–15 g (*leucogenys*), male 17–19.3 g and female 15.7–20.5 g (*magnirostris*), male 17.5–20 g and female 16.5–18 g (*wombeyi*). Nominata race has dull brown cap covering top and side of head and hindneck, bare creamy-yellow skin around eye (broadest above and behind eye), and buff crescent-shaped band across nape (normally not reaching bare skin around eye); off-white chin and throat; upperbody dull olive-green, brighter on rump and uppertail-coverts; uppertail brown

with narrow olive-green edges; upperwing brown, diffuse buff edges on coverts, fine brownish-grey to off-white edges on remiges; underbody buff-white with pale rufous wash, strongest on flanks and undertail-coverts; undertail brown; underwing brown, off-white patch across bases of remiges; iris reddish-brown; bill black, gape grey; legs light brown to brownish-grey, more orange on feet, especially soles. Sexes alike in plumage, male slightly larger than female. Juvenile is patterned like adult, but with pale crescent on nape inconspicuous, mostly brown upperparts, light olive outer edges of tertials and secondaries (visible on folded wing), bill orange-yellow with dark brown tip and culmen, gape conspicuous and orange, bare skin around eye turquoise. Races differ in size, in darkness of plumage and in extent of grey-brown scalloping on crown: *pallidiceps* is significantly smaller than nominate, paler overall, with cap strongly scaled brownish-grey (can appear uniformly brownish-grey when very fresh); *leucogenys* also is smaller and paler than nominate, with cap paler and more uniform (but darker and less scaly than previous), and with distinct orange tinge in bare skin around eye; *magnirostris* is larger than nominate, with noticeably longer bill, darker cap, more diffuse white nuchal band, slightly darker underbody; *wombeyi* is larger and darker than others, with almost black-brown cap, diffuse napeband (much as previous), darker olive upperparts, darker below, with throat, breast and

anterior flanks brownish-grey, grading to buff on belly and to brownish-grey with buff wash on undertail-coverts. Voice. Noisy, calling often. Main call a repeated sharp, unmusical and moderately high-pitched "chip", "click", "chick" or "kt", as contact call during feeding or from flocks in flight; also an animated staccato "chip-chip-chip...", starting with separate notes, accelerating, then decelerating and ending with separate "chip" notes; flat hard trill in alarm. Other calls include trilling, rattling, twittering, grating, rasping and chuckling sounds.

Habitat. Mostly dry, open *Eucalyptus* forests and woodlands, often with well-developed shrubby understorey of *Callitris*, *Casuarina*, *Melaleuca*, *Banksia* or *Acacia*. Also other *Eucalyptus* forests, including wet sclerophyll forests in gulleys, riparian or littoral forests or woodlands, and mallee eucalypt woodland or shrubland. Less often in open forests or woodlands dominated by other trees such as *Acacia*, *casuarina* or *Callitris*, sometimes mixed with eucalypts, including low coastal *Banksia-Eucalyptus* woodland, mallee shrubland dominated by broombush (*Melaleuca uncinata*) or of mallee eucalypts mixed with other shrubs such as sugarwood (*Myoporum platycarpum*), belah (*Casuarina cristata*), *Senna*, *Dodonaea* or *Eremophila*; or occasionally in open heathland of *Banksia*, *Leptospermum*, *Melaleuca*, *Casuarina* or *Dryandra*. In temperate, subtropical and semi-arid zones, from coasts to tree-line in subalpine areas.

Food and Feeding. Arthropods (especially insects, also spiders), nectar and manna, lerp and honeydew; known also to prey on eggs of other small birds. In South Australia, 65% of food eaten was insects and 35% nectar. In Victoria, ate manna, honeydew and lerp for most of year and nectar from mistletoe (e.g. of genus *Amyma*) and other plants during spring (when little manna or lerp available), e.g. of 142 foraging observations at one site, 52% of feeding on manna from manna gum (*Eucalyptus viminalis*), 18% on honeydew from psyllids, 23% on nectar, and 7% on insects collected from foliage or aerially. Forages mainly in canopy of trees (especially mature *Eucalyptus*), including sometimes in mistletoes (e.g. of genus *Amyma*), less often in shrubs (e.g. *Acacia*, *Adenanthos*, *Correa*, *Draandra*, *Grevillea*) and saplings in middle storey and understorey. Searches mainly on bark of branches, among foliage and twigs, and outermost flowers. Insects taken by gleaning, occasionally by salting in air. Probes flowers for nectar, rotating bill rapidly around base of style; sometimes hangs upside-down to probe pendulous flowers; sometimes steals nectar by piercing bases of tubular flowers. Lerp, manna and honeydew taken by gleaning and probing. Proportions of time or feeding observations directed at different food types, and of substrates and foraging method used (which correlated with food type), vary among studies; of 146 observations of foraging in N New South Wales, 89.7% in foliage, 8.2% among flowers, 1.4% on branches, and 0.7% on trunks (and not seen to forage on ground or aerially), whereas, of 375 observations of foraging in Mt Lofty Ranges (South Australia), 20% in foliage, 25% on twigs and 55% on branches (and not recorded as feeding on trunks of trees or in saplings). Height of foraging can also vary seasonally, e.g. in wet mountain ash (*Eucalyptus regnans*) forests in Victoria, foraged mainly in canopy during summer, taking nectar only in peak flowering season, and mainly in understorey in winter, when nectar of *Correa lawrenceana* available. Active and vocal. Mostly in small flocks of 5–15 individuals, but up to 20 sometimes gather in flowering eucalypts.

Breeding. Season mainly late winter to mid-summer, but breeding recorded in all months except May, most records of breeding and nearly all those of eggs late Aug to mid-Jan; usually double-brooded. Regularly breeds co-operatively, but often solitarily. Both sexes collect nesting material, but possibly only female builds; nest a small, neat and deep cup, usually of strips of stringybark or grass, woven with hair, fur, wool, spider web and egg sacs, often lined with hair, fur, wool, feathers including down, or plant down, external diameter 5.7–7.6 cm, depth 4.4–7.6 cm, internal diameter 4.4–5.1 cm, depth 3.8–5.1 cm; usually suspended in outer foliage in top of tree, especially eucalypt, or tall shrub, sometimes in sapling, 0.7–2.4 m (mean 6.6 m) above ground. Clutch usually 3 eggs, sometimes 2; incubation by both sexes and, at least sometimes, auxiliaries, no information on duration; chicks fed by both parents and by any auxiliaries present, nestling period once more than 11 days and once 15 or more days. Nests parasitized by Pallid (*Cuculus pallidus*) and Fan-tailed Cuckoos (*Cacomantis flabelliformis*), by Shining Bronze-cuckoo (*Chrysococcyx lucidus*) and probably by Horsfield's Bronze-cuckoo (*Chrysococcyx basalis*). From 11 eggs in six nests, overall success 0.17 young fledged per nest; of 29 nests for which outcome known, 20 (69%) fledged at least one young. **Movements.** Generally resident, with local movements within large home ranges in response to availability of food. Described as migratory or nomadic in some areas, although such claims may be referring to local movements, e.g. near Canberra groups wander over area of 5–8 km², and near Kellerberrin (Western Australia) groups ranged up to 3.1 km along well-vegetated road verges. Other seasonal patterns may result from movements between habitats, e.g. around Sydney (New South Wales) moves from forest to spend autumn and winter in coastal heathland. In some areas where present throughout year, recorded more often in autumn or winter than at other times, possibly because birds form mobile and conspicuous flocks outside breeding season; in other areas occur throughout year but irregularly, with no seasonal trends. Possibly migratory in some parts, especially in SE New South Wales, being recorded apparently on passage, sometimes with known migratory species such as *M. lunatus*.

Status and Conservation. Not globally threatened. Widespread and locally common; rare in extreme SW Western Australia (including on Swan R Plain). No estimates of total population; recorded densities of up to 3.76 birds/ha.

Bibliography. Anon. (1976), Barrett *et al.* (2003), Baxter (1995), Blakers *et al.* (1984), Boehm (1948, 1957), Campbell (1900), Carpenter & Matthew (1997), Cody (1991b), Collins (1980), Cooper, R.M. & McAllan (1995), Cooper, R.P. (1975a), Davies (1982), Ford, H.A. (1976, 1977, 1979, 1980, 1981b, 1983, 1985b), Ford, H.A. & Paton (1976c, 1977), Ford, H.A., Bridges & Noske (1985), Ford, H.A., Noske & Bridges (1986), Ford, J.R. (1971), Frith (1969), Gall & Longmore (1978), Griffioen & Clarke (2002), Halse (1978), Halse *et al.* (1985), Higgins (1999), Higgins *et al.* (2001), Hobbs (1961), Howe (1917), Hyem (1937), Jones (1952), Keast (1968a, 1968b), Keast & Condon (1968), Lamm & Wilson (1966), Ley *et al.* (1997), Lord (1956), Loyn (1980, 1985a, 1985b, 1985c), Mac Nally & Timewell (2005), Masters & Milhinch (1974), Matthew & Carpenter (1993), McGilp & Parsons (1937), McLean *et al.* (2005), Milligan (1903), Morris *et al.* (1981), North (1907), Noske (1983), Officer (1971), Osborne & Green (1992), Pascoe & Saxon (1992), Paton (1980), Pizzey (1980), Possingham & Possingham (1997), Recher & Holmes (1985), Recher *et al.* (1985), Reilly (1991a), Rix (1976), Saunders & de Rebeira (1991), Saunders & Ingram (1995), Schodde & Mason (1999), Serventy & Whittell (1976), Smith (1984), Stanley & Lill (2002c), Storr (1984), Terrill & Rix (1944), Timewell & Mac Nally (2004), Tzaros (1996), White (1918), Whitlock (1911), Woinarski (1989b), Woinarski, Cullen *et al.* (1989).

149. White-throated Honeyeater

Melithreptus albogularis

French: Méliphage à menton blanc

German: Weißkinn-Honigschmecker

Spanish: Mielero Goliblanco

Other common names: Grey/White-chinned Honeyeater

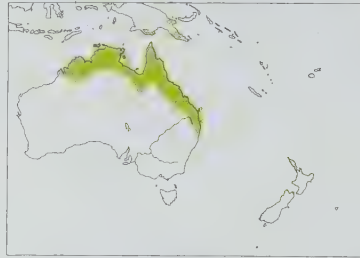
Taxonomy. *Melithreptus albogularis* Gould, 1848, Port Essington, Northern Territory, Australia. Closest to *M. lunatus* and *M. affinis*, the three species characterized by tapering white napeband, uniformly citrine dorsum, white breast to vent, slender sepia-toned feet, and black of head extending

to side of breast. Races intergrade where they abut in Burdekin–Endeavour rivers region of NE Australia. Birds in New Guinea currently included in nominate race, but racial identity requires confirmation. Two additional proposed races, *subalbugularis* (from Derby, in N Western Australia) and *schoddei* (Clarke Range, in E Queensland), are synonymized with, respectively, nominate race and *inopinatus*. Two subspecies recognized.

Subspecies and Distribution.

M. a. albogularis Gould, 1848 – disjunctly in S, NE & SE New Guinea (S Trans-Fly from Kurik E to Oriomo R; middle reaches of Markham R; upper Musa R, lower Pongau R and Oro Bay and, S of Owen Stanley Range, Bereina E to Kupiano); Western Australia (from Kimberley and Broome) and Top End of Northern Territory (S to Barkly Tableland) E to NE Queensland (Cape York Peninsula S to Burdekin–Mitchell Drainage Basin), including numerous offshore islands.

M. a. inopinatus Schodde, 1989 – E Queensland (from Burdekin–Mitchell Drainage Basin) S on E slopes of Great Divide and adjacent coast to NE New South Wales (S to Macleay R).



Descriptive notes. 11.5–14.5 cm; male 10–13 g and female 9–12.5 g (nominate), male 12–15 g and female 10–15 g (*inopinatus*). Nominate race has neat black cap covering top and side of head and hindneck, arc of bare white to pale bluish-white skin over eye (report of orange-red arc in New Guinea considered to be in error), long narrow white crescent-shaped band across nape; black of lower hindneck extends down to side of upper breast (appearing as small black spur in some postures); upperparts largely olive-green, slightly brighter on rump and uppertail-coverts; uppertail mostly olive-yellow with duller

centre when closed, browner with olive sides when spread; upperside largely olive-brown, remiges with olive-green outer edges (conspicuous panel on folded wing); chin, throat and underbody (except side of upper breast) white; undertail grey-brown, underwing off-white with broad brown trailing edge and tip; iris reddish-brown; bill and gape black; legs pink with dark brown tinge. Sexes alike in plumage, male larger than female. Juvenile is patterned much like adult, but top of head and neck pale brown, side of head contrastingly dark brown, only rudimentary off-white napeband, arc over eye pale blue, underbody pale brown (with uppertail-coverts much as adult), and outer greater coverts have paler brown edges and tips, bill black-brown with large pale orange base of lower mandible, gape swollen and pale orange, and iris dull brown. Race *inopinatus* is larger than nominate, and ground colour of upperparts, especially rump, slightly duller citrine-olive, with weaker yellow tinge. Voice. Varies. Most common call in Australia a rapid high-pitched shrill piping "t-tee, t-tee, t-tee..." or "p'pit, p'pit, p'pit..." repeated at short intervals in bursts at even pitch (labelled song); in New Guinea, most common call high-pitched "see-see-see..." (possibly also referring to song). Flight call a sharp "tip", "dip" or mournful "weep"; alarm call a flat hard trill, "si-si-si...". Other calls include harsh rasping "sheep-sheep" or "tserp, tserp" as contact when feeding; soft mewling notes, also said to be for contact when feeding; and single piping whistle.

Habitat. In Australia, mainly open eucalypt forests and woodlands with either grassy or shrubby understorey, and often mixed with paperbarks (*Melaleuca*), *Grevillea*, *Lophostemon* and *Livistona* palms; less often in low riparian eucalypt woodland, e.g. dominated by bloodwoods (*Corymbia*) or river red gum (*Eucalyptus camaldulensis*), with shrubby understorey (often including *Grevillea*), or dense riparian and littoral paperbark forests; often in riparian associations in semi-arid regions, and only occasionally in adjacent dry woodland or savanna. Occasionally in vine scrubs or monsoon forests, though mainly at ecotone between latter and open forest; rarely, in patches of cypress-pines (*Callitris*) or mangrove associations. Sometimes in parks and gardens. In Northern Territory, significantly more abundant in riparian than in non-riparian vegetation; associated with riparian zones in high-rainfall areas, with abundant *Melaleuca* and *Bambusa*, but also occupies riparian zones with much grass cover but little cover of *Pandanus*, *Melaleuca* or rainforest vegetation and relatively distant from rivers. In New Guinea, inhabits savanna woodland, mainly eucalypt-dominated associations, less often those dominated by paperbarks, occasionally extending into rainforest edge; lowlands and foothills, from sea-level mainly to 450 m, but to 800 m on Sogeri Plateau.

Food and Feeding. Invertebrates (mainly insects, also spiders) and nectar (e.g. of *Eucalyptus*, *Melaleuca*, *Grevillea*). Forages at all levels, mainly in outer foliage and at flowers in upper crowns of trees; occasionally on branches or trunks of trees, in shrubs in understorey, and in mistletoe (*Loranthaceae*). Probes flowers for nectar; arthropods usually gleaned from foliage or from flowers when probing for nectar; sometimes hang-gleans or sally-hovers to take food from outer foliage, and seldom sallies in air. Of 90 feeding observations in Kakadu National Park (Northern Territory), 71% involved gleaning, 8% probing, 12% flutter-chasing, and 8% sallying (2% sally-striking in air, 3% sally-striking at hard substrates, 3% sally-hovering). Very active and vocal. Forages singly, in pairs, and in small, loose flocks of up to c. 20 individuals; often with *M. lunatus*, and once seen in mixed feeding flock of c. 100 birds of ten species.

Breeding. Few observations from New Guinea, nestlings mid-Oct and fledglings in Oct and Apr, suggesting breeding in middle to late dry season and towards end of wet season (and possibly bimodal); in Australia, breeding recorded Apr–Oct in N, in all months except Feb (mainly winter to mid-summer) in E, and eggs Jul–Jan in New South Wales. Usually solitary, but some evidence of occasional co-operative breeding. Nest cup-shaped, typically made of bark (usually of paperbark), bound with spider web, sometimes grass also used and, less often, leaves, feathers, spider egg sacs, down or synthetic fibres, external diameter 5.7–6.4 cm, depth 5.1–5.7 cm, internal diameter 4.4–6.4 cm, depth 3.8 cm; usually suspended from thin, sometimes horizontal, fork or among hanging foliage, sometimes in outer branches, in tall tree (often *Eucalyptus* or *Melaleuca*), 1.4–20 m (mean 7.5 m) above ground. Clutch usually 2 eggs; incubation period at least 13 days; chicks fed by both sexes, nestling period at least 14 days; fledglings fed by both parents. Nests parasitized by Pallid (*Cuculus pallidus*) and Brush Cuckoos (*Cacomantis variolosus*).

Movements. Resident; local movements reported near edge of range (which sometimes described as nomadic). Some seasonal patterns in occurrence may result from movements between habitats, e.g. in N Queensland (Cape York Peninsula) said to move from woodland to heathland between seasons. Movements often associated with flowering events.

Status and Conservation. Not globally threatened. Common in Australia. No estimates of total population, but recorded densities range from less than 0.01 birds/ha to 2.1 birds/ha. The only member of genus occurring outside Australia.

Bibliography. Barrett *et al.* (2003), Beehler *et al.* (1986), Blakers *et al.* (1984), Boekel (1976), Brooker *et al.* (1990), Campbell (1900), Campbell & Barnard (1917), Clapp (1979b, 1980b), Coates (1900), Colston (1974), Cooney *et al.* (2006), Dow (1980b), Finch (1983), Franklin & Noske (1998, 1999, 2000a), Frith, D.W. & Frith (1995), Frith, H.J. & Hitchcock (1974), Gill, H.B. (1970), Gosper (1992), Griffioen & Clarke (2002), Hannah *et al.* (2007), Higgins (1999), Higgins *et al.* (2001), Johnstone (1983), Johnstone *et al.* (1977), Keast (1968a, 1968b, 1985a, 1985b), Lavery (1986), Le Souëf (1902a), Longmore (1978), MacGillivray (1914, 1918), Mayr & Rand (1937), McKean (1985), Mees (1982), Morris *et al.* (1981), North (1907), Officer (1971), Pizzey (1980), Porter

(1982), Roberts & Ingram (1976), Sage (1994), Schodde (1976, 1989), Schodde & Mason (1999), Sedgwick (1947), Storr (1953, 1977, 1984), Storr *et al.* (1975), Tidemann & Wilson (1992), Tubb (1945), Vernon (1968), Warham (1957), Watson *et al.* (1962), Woinarski (1993), Woinarski & Tidemann (1991), Woinarski, Brock *et al.* (2000), Woinarski, Connors & Franklin (2000), Woinarski, Fisher *et al.* (2001), Woinarski, Tidemann & Kerin (1988).

150. White-naped Honeyeater

Melithreptus lunatus

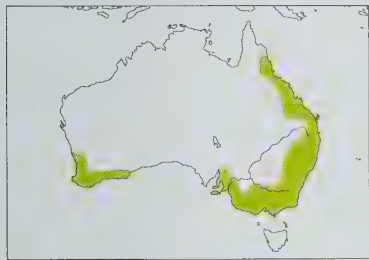
French: M  liphage    lunule **German:** Mondstreif-Honigschmecker **Spanish:** Mielero Nuquiblanco
Other common names: Lunulated/Black-capped Honeyeater; Western White-naped/Western Lunulated Honeyeater (*chloropsis*)

Taxonomy. *Certhia lunata* Vieillot, 1802, Nouvelle Hollande = region of Sydney, New South Wales, Australia.

Closest to *M. albugularis* and *M. affinis*, the three species characterized by tapering white napeband, uniformly citrine dorsum, white breast to vent, slender sepia-toned feet, and black of head extending to side of breast. May form a superspecies with *M. affinis*. Nominata race possibly exhibits clinal variation in size, being slightly larger in S of range. Two subspecies recognized.

Subspecies and Distribution.

M. l. chloropsis Gould, 1848 – SW Western Australia (N to Swan R Plain and Wheatbelt in W).
M. l. lunatus (Vieillot, 1802) – E & SE Australia, from N Queensland (wet tropics) S, extending W to inland slopes of Great Divide and adjacent inland plains, to Victoria and to SE South Australia (including Kangaroo I).



Descriptive notes. 10.5–15.5 cm; male 11.5–25 g and female 11.5–15 g (nominata), two males 15 g and 16 g (*chloropsis*). Nominata race has black cap covering top and side of head and hindneck, arc of bare bright orange-red skin above eye, short white crescent-shaped band across nape; upperbody and uppertail olive-green, tail with brown sides edged with olive; upperwing mostly olive-brown, olive-green tips of coverts and olive-green outer edges of remiges (olive panel on folded wing); chin and throat white, black mark on upper chin; underbody white, dark grey-brown wash on side of breast and flanks, undertail light

brown, underwing white with brown trailing edge and tip; iris brown; bill and gape black; legs brown to black, often tinged orange, especially on feet. Sexes alike in plumage, male larger than female. Juvenile is patterned as adult but much duller overall, top of head and hindneck brown, contrastingly darker black-brown mask, light brown to pale orange arc of bare skin over eye, narrower and diffuse off-white to yellowish-buff napeband, upperparts mostly brown (except for olive-green uppertail-coverts), outer greater coverts, primary coverts and alula initially with narrow olive-buff fringes at tips, underbody off-white, bill dull orange with grey-black distal half of upper mandible (area of black increasing with age), gape swollen and orange. Race *chloropsis* is slightly larger than nominate (with significantly longer bill and tarsus), arc of bare skin over eye chalky white, sometimes faintly tinged pale blue or green-blue (not red). **VOICE.** Sometimes noisy, and during breeding season continual noisy aerial chases. Most common call a half-whistled, half-hissed, churring “sherp-sherp-sherp...” or “tserp-tserp-tserp...”, given frequently throughout day. Other calls include short single note with upward inflection, given often during foraging or in flight; short, high-pitched, rather plaintive insect-like “chip”, “tsip”, “tsit” or “twit”, uttered continually as contact during foraging and while in flight during migration; and “joe-joe-joe”, to advertise territory. Alarm call a tense quiet “pew-pew-pew...” or repeated staccato notes.

Habitat. Mainly open eucalypt forests and woodlands, especially dry sclerophyll forest or woodland, with patchy or moderately well-developed understorey of shrubs such as *Acacia*, *Banksia*, casuarina or heath; also tall wet sclerophyll forest, often with well-developed understorey of *Acacia*, and occasionally dense subcanopy of rainforest. Sometimes in riparian woodland of casuarinas; open or coastal *Banksia* shrubland; heathland with low scattered emergent eucalypts; or alpine herbfields. Found in urban gardens and streets in some areas. Occasionally in plantations of exotic pines.

Food and Feeding. Arthropods (mainly insects, some spiders) and nectar (including of *Eucalyptus*, *Banksia*, *Grevillea*); occasionally manna, honeydew and lerp. In South Australia, estimated ratio of nectar to insects (latter probably including lerp and honeydew) in diet 24:76. Forages at all heights, mainly in canopy, mostly in trees (particularly *Eucalyptus*), less often in shrubs (including *Banksia*, *Grevillea*, *Callistemon*, *Astroloma*) or mistletoe (e.g. *Lysiana*, *Amyema*); searches mainly in foliage, particularly outer foliage, on twigs and flowers in crowns of tall eucalypts, less often on branches or trunks; occasionally on ground. Mean foraging height at site in E Australia 9.6 m (with 79% of observations above 4 m), and at site in W Australia 7.7 m (91% above 5 m). At five sites in E Australia, more than 70% of foraging observations among foliage; in W Australia all foraging in foliage at one site, but at two other sites most foraging on branches and trunks (less than 40% of observations involved foliage). At site in E Australia, two phases of foraging activity, first in early morning, characterized by much nectar-feeding and little foraging for insects, and second during rest of day, with slight increase in rates of insect-eating and corresponding reduction in nectar consumption. Insects taken by gleaning from foliage or probing bark, and occasionally by sallying; probes flowers for nectar with rapid circular motion. Often acrobatic, sometimes standing erect or hanging upside-down. Forages singly, in pairs, or in small loose flocks of twelve or more individuals, but can gather in large numbers in areas with abundant flowering plants; also in flocks of hundreds or even thousands on migration. Often forages with other meliphagids, including *M. brevirostris* and *Lichenostomus chrysops*; can be aggressive to other foliage-gleaners.

Breeding. Recorded in all months, but season mainly late winter to early summer, Aug–Jan (eggs Jul–Jan); usually double brooded. Regularly breeds co-operatively and semi-colonially, but also nests solitary. Nest probably built by female alone, sometimes accompanied by other birds, open and cup-shaped or purse-shaped, sometimes deep, usually woven from grass, bark or spider web, sometimes with feathers, moss, plant down, lichen or leaves matted into structure, lined with plant down, fine grass, rootlets, small leaves, feathers, hair, fur, bark, wool or moss, sometimes unlined, external diameter 5.1–6.4 cm, depth 3.5–7.6 cm, internal diameter 3.8–4.4 cm, depth 3.8–4.4 cm; usually suspended by rim among outer foliage high above ground, sometimes in low branches, usually in tree or sapling (especially *Eucalyptus*) but sometimes in pendulous foliage of mistletoe, 0.2–4.0 m (mean 9.5 m) above ground. Clutch 2–3 eggs, mean 2.67; incubation probably by female only, period usually c. 14 days, once c. 10 days; chicks fed by both sexes, and by auxiliaries if present, nestling period c. 14–16 days. Nests parasitized by Pallid (*Cuculus pallidus*) and Fan-tailed Cuckoos (*Cacomantis flabelliformis*). From 24 eggs in ten nests, 0.7 young fledged per nest; of 45 nests at which outcome known, 30 (67%) fledged at least one young.

Movements. Partly migratory and partly sedentary. Over much of range resident, with local movements (often described as locally nomadic), although these populations often subject to some regular seasonal influx and exodus movements, and other areas visited irregularly. Migration apparently confined to populations on and E of Great Divide, from S Queensland or N New South Wales S to Victoria (recorded throughout year in most of this range, and such populations assumed to be at least partly resident), consists of exodus from high altitudes and movement along Great Divide and adjacent slopes and scarps; many birds return to same area year after year. Migrates in monospecific flocks or in flocks with *Lichenostomus chrysops* or, occasionally, *Anthochaera carunculata*; seen on passage in flocks of up to 100 individuals, and thousands may pass over a given point during one day (e.g. hundreds of thousands of honeyeaters, mainly of present species, moving N along coast at Mallacoota, in E Victoria); flocks usually smaller and more dispersed on S passage. On migration, follows valleys and timbered ridges, or lines of trees.

Status and Conservation. Not globally threatened. Common. No estimates of total population but recorded densities of up to 5 birds/ha and, exceptionally, 12.1 birds/ha. In counts along a 200-km transect through C Victoria, mean densities 0.57 birds/ha in summer, 0.57 in autumn, 0.47 in winter, and 0.38 in spring, with maximum recorded density 3.9 birds/ha; at another site in C Victoria maximum 12.1 birds/ha, yet few birds present for ten months of the year in which this density recorded. After experimental removal of *Manorina melanophrys* from sites near Melbourne (S Victoria), present species moved in to vacated sites in order to forage on psyllids. Reports of this species from Kent Group, in Bass Strait, assumed to be referable to misidentified *M. validirostris* or *M. affinis*.

Bibliography. Abbott (1981), Abbott & van Heurck (1985), Anon. (1976), Barrett *et al.* (2003), Blakers *et al.* (1984), Campbell (1900), Campbell & Barnard (1917), Colston (1974), Cooney *et al.* (2006), Cooper (1975a), Dow (1980b), Ford (1977, 1979, 1980, 1985b), Ford & Forde (1976), Ford & Paton (1976c, 1977), Ford, Bridges & Noske (1985), Ford, Noske & Bridges (1986), Frith (1969), Gosper (1992), Griffioen & Clarke (2002), Harrison (1969), Higgins (1999), Higgins *et al.* (2001), Hindwood (1944, 1948, 1956b), Hyem (1937), Johnstone & Storr (2004), Keast (1968a, 1968b, 1968c, 1985a), Kikkawa *et al.* (1965), Lang (1927), Lavery (1986), Ley *et al.* (1997), Liddy (1966), Loyn (1980, 1985a, 1985b, 1985c), Loyn *et al.* (1983), Mac Nally (1994, 1997), Marchant (1986, 1992), Matthiessen (1973), McGilp (1922), McGoldrick & Mac Nally (1998), McLean *et al.* (2005), Mees (1964c), Morris *et al.* (1981), North (1907), Noske (1983), Officer (1971), Orton & Sandland (1913), Osborne & Green (1992), Paton (1980, 1988), Paton & Ford (1977), Paton & Turner (1985), Paton *et al.* (1994), Pizzey (1980), Possingham & Possingham (1997), Purchase (1985), Recher & Davis (1998), Recher & Holmes (1985), Recher *et al.* (1985), Reilly (1991b), Rix (1976), Rooke & Knight (1977), Saunders & Ingram (1995), Schodde & Mason (1999), Sedgwick (1973a, 1988a), Serventy & Whittell (1976), Shields *et al.* (1985), Smith (1984), Stokes (1974), Storr (1984), Terrill & Rix (1944), Watson (1955), Woinarski, Cullen *et al.* (1989), Wolstenholme (1929), Wooller & Calver (1981b).

151. Black-headed Honeyeater

Melithreptus affinis

French: M  liphage    t  te noire **Spanish:** Mielero Carinegro
German: Schwarzkopf-Honigschmecker
Other common names: Black-capped/King Island Honeyeater

Taxonomy. *Eidopsarus affinis* Lesson, 1839, Nova Wallia meridionalis = Tasmania.

Closest to *M. albugularis* and *M. lunatus*, the three species characterized by tapering white napeband, uniformly citrine dorsum, white breast to vent, slender sepia-toned feet, and black of head extending to side of breast. May form a superspecies with *M. lunatus*. Birds on King I described as race *alisteri*, but no constant differences apparent between them and populations from mainland Tasmania and Flinders I. Monotypic.

Distribution. Islands in Bass Strait (King I and Furneaux Group), and Tasmania.



Descriptive notes. 14 cm; male 14–17.5 g, female 15.1 g. Small honeyeater with short and only slightly downcurved bill, and rather short tail. Has black hood marked only with arc of bare white or cream skin over eye, and with black of lower neck extending down in thin spur onto side of white breast; lower hindneck olive-brown, upperbody olive-green, brighter on rump and uppertail-coverts, contrasting with olive-brown to greyish-brown uppertail and upperwing (angle of wing slightly darker brown); remiges finely edged pale olive-grey, and wing-coverts fringed pale olive-brown; below, including lower throat, white, with pale

greyish-buff wash on lower underbody; undertail pale grey-brown, underwing pale greyish-buff with broad brown trailing edge and tip; iris blackish-brown; bill and gape grey-black; legs grey to brown. Sexes alike in plumage, male larger than female. Juvenile is similar to adult, but with olive-brown cap and hindneck, rudimentary napeband (a few buff-yellow feathers at side of nape), black-brown mask (lores, ear-coverts, malar area and chin) enclosing blue-tinged arc of bare skin above eye, warm brown upperbody grading to olive on uppertail-coverts, upperwing slightly paler and greyer than adult, much more conspicuous olive fringes on coverts, throat buff-yellow, merging into creamy on underbody, bill grey-black with buff-orange tip, nostrils and base of lower mandible, and buff-orange gape initially swollen. **VOICE.** Noisy. Main vocalization a repeated sharp piping “pee” of 2 or more notes; given throughout year, especially during nest-building period, and often in flight. Other calls include harsh churring “shirp-shirp-shirp...”; soft “chip” said to be given at nest-site.

Habitat. Mostly dry sclerophyll forests dominated by *Eucalyptus* and with sparse to dense understorey of shrubs, heath, sedges or grass, usually preferring areas of denser growth; also regularly in mature wet sclerophyll forest. Less often in open eucalypt woodlands or, very occasionally, subalpine forest, coastal heathlands or low scrubland; rarely, in cool temperate rainforest of antarctic beech (*Nothofagus cunninghamii*), in buttongrass (*Gymnoschoenus sphaerocephalus*) sedgeland with scattered emergent eucalypts, or in cleared treeless areas. Sometimes in parks and gardens. Preference for mature and denser dry and wet forests; in logged areas, usually found where mature trees retained. Mostly below 1000 m; sometimes in alpine and subalpine zones to c. 1200 m.

Food and Feeding. Predominantly arthropods (mainly insects, also spiders); some nectar and fruit. Forages mostly among foliage of saplings or crowns of trees; also among twigs in canopy, on bark of trunks and larger branches of trees or saplings, and sometimes in understorey, herb layer or among leaf litter on ground. Foraged at higher level in breeding season (median height 15 m) than in non-breeding season (11 m). Mostly gleans from foliage, sometimes hanging upside-down, and occasionally from bark of branches; very occasionally feeds at flowers; seldom sallies in air. Usually in twos (more commonly during breeding season, and which probably pairs) or in small flocks

of up to 20 individuals, latter comprising several mated pairs, unattached adults and immatures from previous breeding season. Sometimes with *M. validirostris*.

Breeding. Season late Sept to Feb, mainly Nov–Jan, with eggs recorded Dec. and nestlings Sept–Nov and Feb; usually double-brooded. Loosely colonial, and recorded as breeding co-operatively, but also nests solitarily. Nest built by both sexes, a deep cup, sometimes pointed at base and with thick bulging sides, made usually of bark, sometimes with some grass, twigs, leaves, fibres, wool, hair, moss or lichen, often bound with spider web or silk, lined with feathers, fur, wool or thistle down. external diameter 7–7.6 cm, depth c. 8–8 cm, internal diameter 4.4–5.1 cm, depth 4.4–5.7 cm; usually suspended from horizontal branch or hanging twigs and well concealed among foliage or twigs in crown of tree or sapling (especially *Eucalyptus*), 2.1–30 m (mean 14.1 m) above ground. Clutch usually 3 eggs, re-lays if clutch lost; incubation by both sexes or by female alone, period recorded as less than 21 days and as c. 16 days; chicks fed by both sexes, no information on duration of nestling period; fledglings fed by both parents. Nests parasitized by Pallid (*Cuculus pallidus*) and Fan-tailed Cuckoos (*Cacomantis flabelliformis*) and by Horsfield’s Bronze-cuckoo (*Chrysococcyx basalis*).

Movements. Resident. Some local movements (sometimes described as locally nomadic) by part of population after breeding, in winter, though extent of these not known. Flocks may move irregularly, sometimes appearing at trees that are flowering unseasonally.

Status and Conservation. Not globally threatened. Restricted-range species: present in Tasmania EBA. Common and widespread in Tasmania (except SW); locally common on King I; common and widespread on Flinders I (and probably elsewhere in Furneaux Group). No estimates of total population: recorded densities of up to 1.94 birds/ha. Tends to be significantly more numerous in mature and denser forests (either unburnt or unlogged); in one study in dry sclerophyll forest, density significantly greater in mature forest of 12 years or older than in young regrowth up to 6 years old or old regrowth 6–12 years old; in another study in recently logged forest, mean density higher where more mature trees retained and canopy more continuous than at three sites where few mature trees retained and canopy more open.

Bibliography. Anon. (1977). Barrett *et al.* (2003). Blakers *et al.* (1984). Brent (1905). Campbell, A.G. (1903). Campbell, A.J. (1900). Dove (1907, 1916). Green (1969, 1989, 1995). Green & McGarvie (1971). Griffioen & Clarke (2002). Henderson & Green (1982). Higgins (1999). Higgins *et al.* (2001). Hingston (1994). Keast (1968a, 1968b, 1970). Leonard (1978). Littler (1910). McGarvie & Templeton (1974). Mellor & White (1913). Napier (1967). North (1907). Noske (1983). Officer (1971). Pattemore (1980). Ratkowsky & Ratkowsky (1977, 1978). Recher *et al.* (1971). Rounsevell *et al.* (1977). Schodde & Mason (1999). Sharland (1958). Slater (1994). Taylor *et al.* (1997). Thomas (1979, 1980). Wilson (1981).

Genus *ENTOMYZON* Swainson, 1825

152. Blue-faced Honeyeater

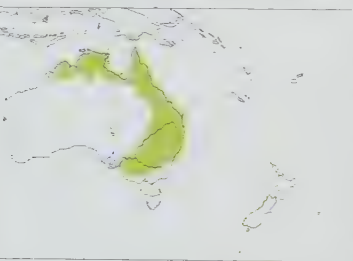
Entomyzon cyanotis

French: Méléphage à oreillons bleus German: Blauohr-Honigfresser Spanish: Mielero Cariatul Other common names: White-quilled Honeyeater

Taxonomy. *Gracula cyanotis* Latham. 1801. Nova Hollandia = Sydney, New South Wales, Australia. Closely allied to *Meliphaga*; allied also to *Manorina*. Race *griseigularis* formerly referred to by name *hartertii*, but holotype of latter (from Cooktown, in N Queensland) is intergrade between S New Guinea/N Australian population and nominate race of E Australia. Proposed race *apsleyi* (Melville I, in Northern Territory) synonymized with *albigensis*. Three subspecies recognized.

Subspecies and Distribution.

E. c. griseigularis van Oort, 1909 – S New Guinea (Trans-Fly and Digoel region, from Merauke E to Wassi Kussa R) and N Australia (Cape York Peninsula, in N Queensland).
E. c. albigensis Gould, 1841 – N Western Australia (Kimberley Division) E across Top End of Northern Territory (including Melville I) to extreme NW Queensland (Nicholson–Leichhardt rivers, on S Gulf of Carpentaria).
E. c. cyanotis (Latham, 1801) – E Australia from base of Cape York Peninsula S (in Queensland E of Thomson–Barcoo Drainage Basin) to NC & NW Victoria (mainly along Murray R and N foothills of Great Divide) and in SE South Australia.



Descriptive notes. 26–32.3 cm; male 80–135 g, female 84–119 g. Distinctive, large, sturdy and full-chested honeyeater with strong, decurved bill, broad rounded wings and moderately long tail. Nominative race has black head, neck and bib, marked with large bright blue bare patch around eye (darker blue on lower rear quarter), narrow white crescent across nape; white malar stripe continues and broadens along side of neck to meet white underbody, and separates black of side of head and neck from bib (which grades from black on chin to grey-black on upper breast); otherwise, mostly golden olive-green above,

uppertail broadly tipped white when fresh (except in centre); upperwing with slightly paler outer webs on inner primaries and bases of outer primaries (diffuse paler panel on folded wing), brown tips on outer primaries (visible on folded wing), brown inner webs of secondaries and inner primaries (visible only in flight), diffuse brown tips on greater primary coverts, small dark patch at bend of folded wing; white below, undertail grey with broad white tip; underwing largely grey (darkest on coverts), basal primaries pink-buff forming rounded patch; iris cream; bill black, pale blue base; legs dark grey. Sexes alike in plumage, male larger than female. Juvenile is similar to adult but duller, with dark areas of head, neck and breast grey (not black), upperparts with olive-brown

tinge, bill brown with cream tip and yellow base and gape, facial skin also yellow (sometimes a small area of blue in front of eye), iris grey-brown to creamy brown, and legs dark blue-grey; immature like adult, but up to 6 months old facial skin mostly yellow with varying areas of green or greenish-yellow, then becoming mostly greenish, and gradually obtaining adult coloration at c. 16 months old. Race *griseigularis* is significantly smaller than nominate but similar in plumage, though pink-buff patch on underwing slightly larger; *albigensis* is similar in size to nominate, but underwing patch white (not pinkish) and larger, conspicuous on both upperwing and underwing in flight, also facial skin more yellowish or greenish, and iris orange-yellow. VOICE. Often noisy; one of first birds to call in morning, and calls throughout day, and often in flight. Main call a repeated, querulous piping “woik” or “queet”, each note rising at end; also as loud “weet! weet! weet!” at day-break. Other calls include harsh squeaks, mewling or scolding; a “hwit hwit” call; and soft chirping during feeding of mate or nestlings.

Habitat. Mostly open forests and woodlands, particularly riparian associations. Mainly dry, open sclerophyll woodlands or forests, including open savanna woodland, typically dominated by *Eucalyptus* (sometimes mixed with *Callitris* or casuarina, but rarely in pure stands of these), with grassy understorey or with secondary layer of smaller trees and a sclerophyllous understorey ranging from sparse to dense and heathy, and with varying grassy ground layer; also commonly in open paperbark (*Melaleuca*) woodland with grassy understorey, and often in riparian woodlands and forests such as riverine forests of river red gum (*Eucalyptus camaldulensis*), sometimes mixed with coolibah (*Eucalyptus coolabah*), or of weeping paperbark (*Melaleuca leucadendra*). Also commonly in mixed woodland dominated by broadleaf species such as *Excoecaria parvifolia* and *Bauhinia*. Regularly in modified habitats, including partly cleared agricultural land or orchards, and commonly in parks, gardens and golf courses of some cities and towns. Sometimes in mixed stands or woodlands of *Pandanus* and eucalypts or grevilleas, or thickets of *Pandanus*, or at edges of patches of monsoon rainforest in N Australia; also sometimes in mangroves, coastal heathlands, low open coastal *Banksia* forest and wet sclerophyll forest; in New Guinea, also in tall scrub. Sea-level to 850 m, rarely to 1000 m.

Food and Feeding. Mainly arthropods (mostly insects, some spiders) and nectar (often of eucalypts), but also fruit (from native and exotic plants); known to take small lizards at times. Forages at flowers (predominantly of *Eucalyptus*, *Melaleuca* or *Grevillea*), on trunks and branches of trees, in foliage (including dead leaves) of trees and shrubs, and aerially; occasionally on ground. Often in palms; in N Australia searches *Pandanus spiralis* for arthropods, choosing these trees over others in area. Probes flowers for nectar; catches arthropods by gleaning and probing, and also by sallying, mostly sally-hovering and sally-striking in air, and by flutter-chasing, in which bird moves rapidly through vegetation in pursuit of disturbed prey. Hangs and clambers about in variety of positions. Sometimes forages around houses or other structures, and from rubbish bins; seen to probe under eaves and from pipes. Active, noisy, gregarious and aggressive, though sometimes described as wary. Usually in small parties (of up to seven individuals), less often singly or in twos (possibly pairs); sometimes in larger groups of up to 30 or so. Often associates loosely with other species, and seen to forage with *Philemon citreogularis*; also chases other species foraging in same tree or nearby.

Breeding. Few records from New Guinea, in Feb and Jun, and probably breeds in wet season and early dry season; in Australia recorded in all months, mainly winter–spring, with most records of eggs, nestlings or fledglings Sept–Nov, and possibly earlier in N Australia (middle to late dry season) than in S; usually two broods. Normally solitary; one observation of possible group nesting and a few records of communal breeding, with up to four attendants. Both adults bring nesting material, nest a neat rounded cup of strips of bark and, less often, leaves, sticks and cocoons, lined with fine bark, grasses, plant down and wool, average external diameter 15.2 cm, depth 17.8 cm, internal diameter 10.2 cm, depth 6.4 cm; sometimes builds large pendulous bark nest (one 54 cm long); material from old nests reused or material stolen from nest of other species, or nest of other taken over; nest supported by sides or base, rarely suspended by rim from fork of branch, usually wedged into fork (especially where bark debris has collected), or built on top of grass-tree (*Xanthorrhoea*) or palm, on palm fronds near main stem, or occasionally on top of stump or post or in hollow spout, site 1.5–15 m (average 6.9 m) above ground; often nests in or on old domed stick nest of Australasian babblers (*Pomatostomus*), entrance to which often enlarged and own nest built inside, or builds nest in depression on top or side of babbler nest; occasionally builds on old nest of other species, including *Philemon corniculatus*, *Philemon argenticeps* and *Philemon citreogularis*, *Manorina melanoccephala*, *Anthochaera carunculata*, and Magpie-lark (*Grallina cyanoleuca*). Clutch 2 eggs, rarely 3 (records of 4–7 eggs in nests thought to involve more than one female); incubation by female only, period 16–17 days; chicks fed by both adults and by any helpers present, nestling period (in captivity, for two young) 23 days and 24 days; both parents and any helpers feed fledglings, which remain with adults for at least several weeks, but fledglings also seen to forage independently when only one day out of nest. Nests parasitized by Common Koel (*Eudynamis scolopacea*) and Pallid Cuckoo (*Cuculus pallidus*).

Movements. Probably resident in New Guinea, where described as locally nomadic. Appears to be largely resident throughout Australian range, especially in N; some local movements, possibly more extensive S of Tropic of Capricorn. No evidence for suggestion that species is migratory. Numbers at specific locations often fluctuate, and only a visitor at some sites, indicating some movement; seasonal occurrence at a few sites and apparent limited movement of small numbers reported from W slopes of Great Divide in S Queensland–N New South Wales, possibly E & NE towards coast. Vagrant or occasional at various sites at edge of normal range, and sometimes well beyond it.

Status and Conservation. Not globally threatened. Common in most of range. No estimates of total population, but recorded densities of 0.02–0.67 birds/ha in Australia. Populations around Logan Reserve, in SE Queensland, said to have declined in mid-1980s but increased again by early 1990s. At least formerly considered a pest in orchards. Early claim of this species’ presence in Aru Is not supported by contemporary sources.

Bibliography. Atchison (1992). Aumann (1991). Barrett *et al.* (2003). Belchambers *et al.* (1994). Blakers *et al.* (1984). Brooker *et al.* (1990). Campbell (1900). Clancy & Lane (1994). Coates (1990). Colston (1974). Cooney *et al.* (2006). Dawson *et al.* (1991). Deignan (1964). Emison *et al.* (1987). Ford, J.R. (1978a), Franklin (1997), Franklin & Noske (1999, 2000a), Frith & Hitchcock (1974). Gannon (1962), Garnett & Bredl (1985), Gosper (1986, 1992), Griffioen & Clarke (2002), Hannah *et al.* (2007). Higgins (1999). Higgins *et al.* (2001). Keast (1968a, 1985a), Le Souëf (1902a), McFarland (1988, 1994b), McKean (1985), McLean (1995), Morris *et al.* (1981), Nielsen (1961), North (1907), Porter & Henderson (1983), Rand (1938, 1942a), Roberts (1955), Sage (1994), Schodde & Mason (1999), Secomb (1995), Storr (1977, 1984), Traill *et al.* (1996), Verbeek *et al.* (1993), Woinarski (1990, 1993), Woinarski, Press & Russell-Smith (1989), Woinarski, Tidemann & Kerin (1988).



Genus *PHILEMON* Vieillot, 1816

153. Dusky Friarbird

Philemon fuscicapillus

French: Polochion sombre **German:** Morotailederkopf **Spanish:** Filemón Sombrio
Other common names: Morotai Friarbird

Taxonomy. *Tropidorhynchus fuscicapillus* Wallace, 1862, Morty Island = Morotai, north Moluccas. Forms a superspecies with *P. subcorniculatus*, *P. moluccensis*, *P. plumigenis*, *P. buceroides*, *P. cockerelli*, *P. eichhorni* and *P. albitorques*. Formerly suggested that all may belong to a single species, or that present species may be conspecific with first three of these. Monotypic.
Distribution. Morotai, Halmahera and, probably, Bacan, in N Moluccas.



Descriptive notes. 30 cm. Large, rather drab honeyeater with moderately long, heavy and gently decurved bill with slight protuberance (casque) at base of bill. Plumage is plain grey-brown above, darker brown on top of head and neck, upperwing faintly tinged olive; large area of pale pink bare skin on lores and broadly around eye (sparsely covered with bristles), dense and hair-like dark blackish-brown malar stripe that merges into similarly coloured ear-coverts, and dull greyish-white chin and throat faintly washed yellow on lower throat; underbody paler grey-brown than upperparts, with faint yellow wash on breast; underwing

grey-brown; iris red; bill black; legs grey-black to black. Sexes alike in plumage, male probably larger than female. Juvenile and immature undescribed. **VOICE.** No details; calls that appear to be made by this species very similar to those of *P. buceroides*.

Habitat. On Halmahera, recent records in primary forest and logged forest, and not recorded in mangroves; in 1945–1950, observed in coconut plantations and secondary growth. Recent records on Halmahera below 120 m and possibly up to 510 m.

Food and Feeding. Little information. Forages in canopy of tall trees; inconspicuous and infrequently observed. Usually seen singly, occasionally in twos (probably pairs); formerly observed in small parties.

Breeding. Male with fairly enlarged gonads in Apr, and two juveniles in May. No other information.

Movements. Probably resident, with some local movements.

Status and Conservation. **VULNERABLE.** Restricted-range species: present in Northern Maluku EBA. No estimates of population, but apparently uncommon; very few confirmed recent records and current population thought to be small, although considered widespread and common in 1945. Considered Vulnerable owing to potential or real decline of population from earlier levels, and ongoing loss and degradation of habitat. All recent records are from Halmahera (but no specimen records for this island); 26 museum specimens are from Morotai, all collected before 1950; no definite records for Bacan, and occurrence there needs confirmation. Currently, much forest in N Moluccas still intact, with estimated 89% of total area of Morotai, Halmahera and Bacan still forested at start of 1990s; all forests, however, under increasing threat from continued clearing, particularly in lowlands, for settlements, agricultural crops and plantations, and timber-harvesting; irrigation schemes and mining operations also pose threats.

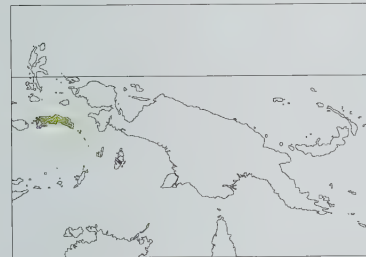
Bibliography. Anon. (2007a), van Bemmelen (1948), Butchart & Stattersfield (2004), Coates & Bishop (1997), Collier *et al.* (2001), Diamond (1982), Lambert (1994), Poulsen & Lambert (2000), Stattersfield & Capper (2000), White & Bruce (1986).

154. Seram Friarbird

Philemon subcorniculatus

French: Polochion de Céram **German:** Seramlederkopf **Spanish:** Filemón de Seram
Other common names: Grey-necked Friarbird, Grey-necked Honeyeater

Taxonomy. *Merops subcorniculatus* Hombron and Jacquinot, 1841, Seram, Moluccas. Forms a superspecies with *P. fuscicapillus*, *P. moluccensis*, *P. plumigenis*, *P. buceroides*, *P. cockerelli*, *P. eichhorni* and *P. albitorques*. Formerly suggested that all may belong to a single species, or that present species may be conspecific with first three of these. Monotypic.
Distribution. Seram, in S Moluccas.



Descriptive notes. 35 cm; four birds 172–223 g. Large to very large honeyeater with rather long, decurved bill with small protuberance at base of upper mandible, and long tail with rather square-cut tip. Plumage is plain olive-brown above with some olive-yellow; large bare patch over lores and broadly around eye varying in colour from blackish-brown to brown or yellowish-brown; narrow dense and hair-like dark brown malar stripe curving up in crescent over rear ear-coverts; slightly elongated and rather shaggy tuft on rear crown, patch of soft silvery grey on hindneck merging into darker grey on lower anterior side of neck bordering

rear ear-coverts; pale brown below, paler than upperparts, with strong yellowish wash on chin, throat and breast; iris brown (possibly varying to red-brown to crimson); bill and casque grey-black; legs greenish-grey or blackish-grey. Sexes alike in plumage, male probably larger than female. Juvenile is much browner and less olive-toned above than adult, with yellow tips on sides of upper back and scapulars (slightly barred effect), grey-brown below, with yellow tips or wash on side of breast, bill

initially more slender and less decurved, without casque. **VOICE.** One of first birds to call in morning, starting before dawn and continuing until sunrise; said to call less often during day. Main call a single explosive “pprow” or “prrrt”, repeated at intervals, and a characteristic sound on Seram; also described as loud “gock” or “geck”. Also single loud, somewhat nasal and rather unmusical notes, repeated at intervals of 2–3 seconds. Small groups sometimes very noisy, with calling and countercalling.

Habitat. Widespread, from lowland mangroves and coconut plantations on coast to primary and disturbed lower montane forests, including forest edge. Sea-level to 1100 m.

Food and Feeding. Poorly known. Seen singly, in twos (possibly pairs) and small groups, mainly in upper levels of forest; noisy and conspicuous.

Breeding. Active nests in Aug (contents unknown). Nest built very high in tall tree. Seen to attack vigorously a pair of Moluccan Red Lories (*Eos bornea*) that was inspecting potential nesting hole in tree; reason for attack not known.

Movements. No data; presumably resident, with local movements.

Status and Conservation. Not globally threatened. Restricted-range species: present in Seram EBA. Widespread and very common in Seram; no estimates of population. Recorded at densities of 0–18 birds/ha below 180 m and 0–21 birds/ha above 300 m in unlogged forest, and at 0–24 and 0–16 birds/ha at corresponding elevations in logged forest. Common in Manusela National Park.

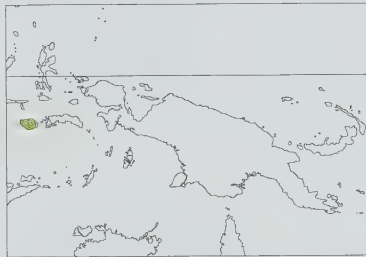
Bibliography. Bowler & Taylor (1989a, 1989b, 1993a, 1993b), Coates & Bishop (1997), Diamond (1982), Isherwood *et al.* (1998), Marsden (1998), Stattersfield *et al.* (1998), Stresemann (1914a), Verbeelen (1996), White & Bruce (1986).

155. Black-faced Friarbird

Philemon moluccensis

French: Polochion des Moluques **German:** Burulederkopf **Spanish:** Filemón Moluqueño
Other common names: Buru/Moluccan/Moluccas Friarbird

Taxonomy. *Merops moluccensis* J. F. Gmelin, 1788, Buru, Moluccas. Forms a superspecies with *P. fuscicapillus*, *P. subcorniculatus*, *P. plumigenis*, *P. buceroides*, *P. cockerelli*, *P. eichhorni* and *P. albitorques*. Previously suggested that all may belong to a single species, or that present species may be conspecific with first three of these, or with *P. plumigenis* alone. Monotypic.
Distribution. Buru, in S Moluccas.



Descriptive notes. 31–37 cm. Large to very large honeyeater with long, heavy and slightly decurved bill with no protuberance at base of upper mandible. Plumage is plain grey-brown above, tinged olive when fresh (fading paler and browner with wear), with silvery white to silvery grey side of crown and supercilium (continuing diffusely behind ear-coverts and down side of neck), short silvery tuft on hindneck and side of neck, and large blackish bare patch covering lores and most of side of head; narrow dense and hair-like dark brown malar stripe joining small but sparsely feathered dark brown patch on rear ear-coverts, interrupted by narrow silvery patch on lower anterior ear-coverts; off-white and finely dusky-streaked chin to centre of upper breast (feathers of throat and centre of upper breast slightly lanceolate); rest of underbody pale brown, paler than upperparts, at least sometimes diffusely mottled darker, and becoming paler still on vent and undertail-coverts; underwing pale rufous with darker trailing edge and tip; iris crimson or red; bill black, tinged bluish-black basally; legs bluish-grey to grey-black or black-brown. Sexes alike in plumage, female slightly smaller than male. Juvenile poorly known, differs from adult in having pale yellowish wash or streaking on side of lower throat and side of breast, and narrow greenish-yellow outer edges on remiges (indistinct and diffuse pale panel on folded wing). **VOICE.** Reported as giving wide range of vocalizations; calls thought to be of present species, and not of its visual and vocal mimic the Black-eared Oriole (*Oriolus bournoniensis*), include loud fluid “yio-wheea” and variants, short “ka wha”, and hard “kawah”. Thought to duet.

Habitat. All wooded habitats: lowland and montane primary forest, monsoon forest, secondary forest and woodland, mangroves, heavily disturbed and selectively logged forest, agricultural land and coconut plantations. In recent surveys, found possibly to prefer open areas with some remnant old trees, possibly also at lower altitudes or in valleys; almost certainly more common in logged forest than in primary or secondary forest. Sea-level to 1760 m.

Food and Feeding. Poorly known. Occurs singly and in twos (possibly pairs), mainly in middle to upper levels of habitats; noisy, aggressive and conspicuous.

Breeding. No information.

Movements. No information; presumed resident.

Status and Conservation. Not assessed. Thought not to be globally threatened. Restricted-range species: present in Buru EBA. Conservation status of this species not certain, as frequently treated as conspecific with *P. plumigenis*; the two combined are not globally threatened. Present species is common, with total population estimated at 920,000 individuals. Nevertheless, it is confined to a single island, which could place it at risk in the future.

Bibliography. Coates & Bishop (1997), Diamond (1982), Hartert (1900c), Jepson (1993a), Jones *et al.* (1990), Marsden *et al.* (1997), Poulsen & Lambert (2000), Rheindt & Hutchinson (2007a), Stattersfield *et al.* (1998), Wallace (1863), White & Bruce (1986).

156. Tanimbar Friarbird

Philemon plumigenis

French: Polochion des Tanimbar **German:** Tanimbarlederkopf **Spanish:** Filemón de las Tanimbar

Taxonomy. *Tropidorhynchus plumigenis* G. R. Gray, 1858, Kai Islands, Moluccas. Forms a superspecies with *P. fuscicapillus*, *P. subcorniculatus*, *P. moluccensis*, *P. buceroides*, *P. cockerelli*, *P. eichhorni* and *P. albitorques*. Formerly suggested that all may belong to a single species, or that present species may be conspecific with first three of these. Usually treated as race of *P. moluccensis*, but this arrangement inconsistent biogeographically and morphologically with present

On following pages: 157. Helmeted Friarbird (*Philemon buceroides*); 158. New Britain Friarbird (*Philemon cockerelli*); 159. New Ireland Friarbird (*Philemon eichhorni*); 160. White-naped Friarbird (*Philemon albitorques*); 161. Silver-crowned Friarbird (*Philemon argenteiceps*); 162. Noisy Friarbird (*Philemon corniculatus*); 163. New Caledonian Friarbird (*Philemon diemenensis*); 164. Timor Friarbird (*Philemon inornatus*); 165. Brass’s Friarbird (*Philemon brassi*); 166. Little Friarbird (*Philemon citreogularis*); 167. Grey Friarbird (*Philemon kisserensis*); 168. Meyer’s Friarbird (*Philemon meyeri*); 169. White-streaked Friarbird (*Melitograis gilolensis*).

treatment of other taxa within the superspecies, as *P. subcorniculatus* and *P. moluccensis* (of, respectively, Seram and Buru) are more similar to each other than either is to present species. Proposed race *timorlaeensis* (Timorlaut, in Tanimbar Is) considered synonymous with *plumigenis*. Monotypic.

Distribution. Kai Is (Kai Kecil and Kai Besar) and Tanimbar Is (Larat and Yamdena), in E Banda Sea.



Descriptive notes. 31–37 cm. Large to very large honeyeater with long, heavy and slightly decurved bill with slight protuberance at base of upper mandible. Plumage is plain grey-brown above, tinged olive when fresh (fading paler and browner with wear), remiges with olive outer edges, short silvery tuft on hindneck and side of neck; large blackish bare patch covering lores and most of side of head, and narrow dense and hair-like dark brown malar stripe joining small patch on rear ear-coverts; dark brown chin to breast, grey tips on throat feathers, pale yellow streaking or wash on breast; rest of underbody mid-brown, under-

wing pale rufous with darker trailing edge and tip; iris crimson or red; bill black, tinged bluish-black basally; legs grey-black or black-brown. Sexes alike in plumage, male probably larger than female. Juvenile undescribed. Voice. Very vocal. In Kai Is main call a loud, bugling antiphonal duet in which first bird gives loud upslurred “seew”, second bird immediately following with bubbling bugling call lasting c. 1 second, or a series of more musical notes seesawing back and forth and up and down in pitch; one pair appeared to call in duet for c. 25 seconds. Single “seew” and some calls like those of a drongo (*Dicrurus*) also reported.

Habitat. All wooded habitats, including forest and mangroves and also in agricultural land; in Tanimbars, recorded at edge of primary semi-evergreen forest, in secondary woodland and within selectively logged forest. Sea-level to above 250 m on Kai Besar.

Food and Feeding. Poorly known. Occurs singly and in twos (possibly pairs), mainly in middle to upper levels of habitats; noisy, aggressive and conspicuous.

Breeding. No information.

Movements. Resident.

Status and Conservation. Not assessed. Thought not to be globally threatened. Restricted-range species: present in Banda Sea Islands EBA. Conservation status of this species not certain, as frequently treated as a race of *P. moluccensis*; the two combined are not globally threatened. Present species is generally common in Kai Is and Tanimbar Is.

Bibliography. Bishop & Brickell (1999), Coates & Bishop (1997), Diamond (1982), Hartert (1901), Lewis (1993), Rheindt & Hutchinson (2007a), Stattersfield *et al.* (1998), Wallace (1863), White & Bruce (1986).

157. Helmeted Friarbird

Philemon buceroides

French: Polochion casqué **German:** Helmlederkopf **Spanish:** Filemón de Yelmo

Other common names: (Helmeted) Leatherhead, (Little) Friarbird, Monsoon/Mangrove Friarbird; Cape York Friarbird (*yorki*); Melville (Island) Friarbird (*gordoni*); Sandstone Friarbird (*ammitophilus*); Timor (Helmeted) Friarbird (*buceroideis*); New Guinea Friarbird (New Guinea races and *yorki*)

Taxonomy. *Philedon buceroides* Swainson, 1838. “New Holland”; error = Timor.

Forms a superspecies with *P. fuscicapillus*, *P. subcorniculatus*, *P. moluccensis*, *P. plumigenis*, *P. buceroides*, *P. cockerelli*, *P. eichhorni* and *P. albitroques*. Formerly suggested that all may belong to a single species. Taxonomy of present species unsettled, and further study required; species as currently constituted may be polyphyletic; limits of races uncertain, and molecular analyses needed, combined with examination of birds at equivalent states of plumage wear, and vocalizations. Races fall into two groups: those from Lesser Sundas (n nominate and *neglectus*) and CN Australia (*gordoni* and *ammitophilus*) form one group, and those of New Guinea and associated islands (*aruensis*, *jobiensis*, *novaeguineae*, *subtuberosus* and *tagulanus*) and NE Australia (*yorki*) form another; groups often treated as two separate species. In N Australia, races *gordoni* and *ammitophilus* occupy different habitats and appear to be allopatric; possibly represent two separate species. Other proposed races are *sumbanus* (from Sumba, in Lesser Sundas) and *plesseni* (Lomblen, in Lesser Sundas), both merged with *neglectus*; *pallidiceps* (Wetar, in Lesser Sundas), synonymized with nominate; *brevipennis* (Utakwa R, in S New Guinea), *fretensis* (Hall Sound, in SE New Guinea) and *trivialis* (Collingwood Bay, on N coast of SE New Guinea), all subsumed in *novaeguineae*; and, in Australia, *confusus* (from Cairns, in N Queensland), treated as synonym of *yorki*. Ten subspecies currently recognized.

Subspecies and Distribution.

P. b. neglectus (Büttikofer, 1891) – Lombok, Sumbawa, Moyo, Sangeang, Komodo, Rinca, Flores, Besar, Adonara, Lomblen, Pantar, Alor and Sumba, in Lesser Sundas.

P. b. buceroides (Swainson, 1838) – Sawu, Roti, Semau, Timor, Atauro and Wetar, in E Lesser Sundas.

P. b. gordoni Mathews, 1912 – N Northern Territory (Tiwi Is and coastal Arnhem Land), in N Australia.

P. b. ammitophilus Schodde *et al.*, 1979 – subcoastal sandstone plateaux of Arnhem Land (S to Katherine Gorge and Mataranka), in Northern Territory.

P. b. novaeguineae (S. Müller, 1843) – West Papuan Is (Waigeo, Kofiau, Salawati, Batanta, Misool), and NW & S New Guinea (Vogelkop E to Geelvink Bay and, in S, E to Milne Bay and, in SE, on N coast E from Kumusi R).

P. b. jobiensis (A. B. Meyer, 1874) – Yapen I (in Geelvink Bay) and N New Guinea from Mamberamo R E to S coastal Huon Gulf (around Salamaua).

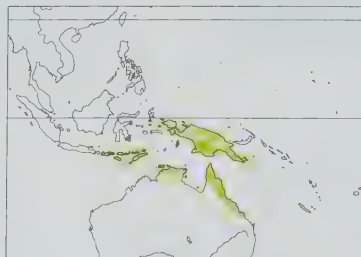
P. b. aruensis (A. B. Meyer, 1884) – Aru Is.

P. b. subtuberosus E. J. O. Hartert, 1896 – Trobriand Is (Kaileuna, Kiriwina and Kitava) and D’Entrecasteaux Archipelago (Goodenough, Fergusson and Normanby), off SE New Guinea.

P. b. tagulanus Rothschild & E. J. O. Hartert, 1918 – Tagula I, in Louisiade Archipelago (off SE New Guinea).

P. b. yorki Mathews, 1912 – islands in CW & S Torres Strait, and coastal NE Queensland (S to Weipa, on W Cape York Peninsula, and, in E, to Broad Sound, including some offshore islands), in NE Australia.

Descriptive notes. 32–36 cm; male average 120.6 g and female 107.1 g (nominate), male average 101.2 g and female 90.7 g (*gordoni*), male 100–131 g and female 96–112 g (*ammitophilus*), male 127–179 g and female 120–155 g (*jobiensis*), male 133–146 g and female 98–125 g (*yorki*), 110–145 g (*novaeguineae*). Large to very large honeyeater (the largest on mainland Australia) with heavy and slightly decurved bill, and distinctive backward-sloping and somewhat rounded but varying prominent casque at base of upper mandible. Nominate race is plain grey-brown above and below, with fine white spotting or scaling on rump and uppertail-coverts in fresh plumage; silvery off-white to pale grey-brown top of head and short, upcurled and somewhat “combed” tuft on upper hindneck;



(small bump at base of upper mandible), less developed tuft of feathering on hindneck, brown wash on upperbody, narrow brown tips on secondary and greater primary coverts, indistinct and diffuse greenish-yellow panel on folded wing (narrow edges of secondaries), narrow greenish-yellow edges and fine buff-white tips on rectrices, uniformly off-white chin to upper breast (lacks streaked gorget), slightly duller facial skin, and brownish-red or grey iris; immature like adult but distinctive, casque gradually attains adult shape and size over first year, gorget washed pale yellow, in fresh plumage upperbody and side of breast messily scalloped or barred white (effect reduced with wear), and retains juvenile wing and tail (tips of upperwing-coverts paler, more distinct than in juvenile). Races differ only slightly, mainly in overall size and in size and prominence of casque, probably also subtly in darkness of plumage, “nominate group” tending to have rather pale plumage and “*novaeguineae* group” slightly darker (but plumage markedly affected by wear and fading over year, and examination of range of specimens in equivalent stages of wear required, but such material not available), possibly also in amount and exact distribution of bare skin on head (but available data incomplete); *neglectus* is apparently similar to nominate, but darker overall (and with slightly different vocalizations); *gordoni* has casque small but still obvious; *ammitophilus* has casque very small; *novaeguineae* and *aruensis* have casque well developed; *jobiensis* virtually lacks casque (also, eyes of this race and *novaeguineae* described as sometimes red-brown to brown or grey-brown, but confirmation needed); *subtuberosus* and *tagulanus* have casque of intermediate size; *yorki* has large and prominent casque, pale throat and neck, and silvery crown. Voice. Noisy, with range of rather harsh warbling calls. In New Guinea, heard all day, and often at night, and calling loudest and most frequent in morning; song the most characteristic bird sound of New Guinea and Wallacea lowlands; in Australia, calls most often in early morning or after rain. In New Guinea, song loud and rollicking but monotonous, of phrases of 2–6 (usually 3–4) loud nasal slurs, such as “keeyo-keoway” or “kowee ko keeyo”, repeated up to a dozen times and becoming progressively somewhat louder, pauses of less than 1 second between repetitions. In Wallacea, song described as varying, loud, nasal and coarsely musical 3-note phrases lasting c. 1.5 seconds and repeated at short intervals (race *neglectus*); and a series of 2–3 hoarse, nasal and low-pitched disyllabic “ahga, ahga” phrases lasting 1–2 seconds and repeated at intervals of 10–20 seconds, sometimes monotonously and sometimes with increases in volume; and variant described as “aa, ahga” lasting c. 1 second (nominate race). Other vocalizations include hissing throaty “kurr-rk”, slowly repeated 8–10 times during foraging (bringing no response from mate), and fainter variant sometimes given by bird on nest; mournful and downslurred “poor devil, poor devil”, repeated many times, at regular intervals, by incubating bird, and as location call at dawn and dusk; diagnostic “watch out, watch out”, with stress on first syllable, possibly given only by male; metallic “chilane chilane”, with second syllable stressed and slightly higher than first; and monotonous “chank chank chank”. Other vocalizations reported from New Guinea include repeated single notes, e.g. high-pitched and slurred “quiew” or clear, liquid disyllabic phrase “widow” or disyllabic “wuwu” or “wurri”; also rasping “rrrrrrrr...”. Duetting, both in unison and antiphonally, reported (perhaps most often in late afternoon and early morning, and apparent increase before nesting); at one nest, either member of pair initiated duet, with contribution of one bird at higher pitch; when duet antiphonal, partners together utter phrase, one contributing 2–3 notes, the other 1–2 notes, the two may start or finish together or not.

Habitat. Varies slightly among races in Australia. Race *ammitophilus* mainly on sandstone plateaux and escarpments in sites supporting monsoon forest and broadleaf scrub dominated by *Allosyncarpia ternata*; also in flowering riparian paperbark (*Melaleuca*) forest in valleys, open eucalypt forest or woodlands near escarpments, and ecotone between monsoon forest and open eucalypt forest with flowering *Eucalyptus*, where mostly in near-coastal forests, woodlands and mangroves; *gordoni* occurs coastally, mainly in mangroves, but also in monsoon forests, open eucalypt forests and woodlands with grassy or shrubby understorey, and paperbark swamps, acacia forests, and urban gardens. In Queensland, *yorki* mainly in open forests and woodlands or swamp-forests dominated by eucalypts and paperbarks; also lowland tropical forest, deciduous vine scrubs, mangroves, gallery forest and heathland, and in urban parks and gardens; rarely, at edges of higher-altitude closed forest on tablelands, forests of hoop pine (*Araucaria cunninghamii*) on ridges or in valleys, or stands of casuarinas and *Pandanus* on coral strands. In New Guinea, recorded in all wooded habitats and even scattered tall trees: in mangroves, freshwater swamps, primary rainforest, including riparian vegetation, forest edge, tall secondary growth, open *Eucalyptus* forest and savanna, tall trees in grassland, and modified habitats such as cultivation, plantations (including of teak), gardens, orchards, roadside vegetation and towns, villages and cities. Inhabits undisturbed forest to an altitude of c. 750 m but disturbed habitats up to 1450 m; thought to be recent colonizer of Wau Valley, at 1100 m, and confined to disturbed habitats and forest edge (though one of the numerically dominant birds in valley). In Bintuni Bay, in NW New Guinea, recorded in mangroves and freshwater swamp-forests dominated by *Metroxylon*, *Pandanus* and *Intsia*, in a wide zone of vegetation dominated by the brackish-water palm *Nypa fruticans* lying between these two associations, and in moist lowland rainforests. In examination of vegetation succession (from gardens to forest) resulting from slash-and-burn agriculture in lowland New Guinea, recorded in all except the most recently established garden plots (with much grass cover), and tended to be more abundant in less disturbed plots. In Wallacea, recorded in all wooded habitats, including mangroves, lowland and montane rainforest, semi-evergreen rainforest and monsoon forest, savanna *Eucalyptus* woodland (with grassy understorey) and other open woodlands (e.g. of *Acacia*, *Zizyphus* and *Tamarindus*), swamp-forest, riparian vegetation, coastal scrub, and modified habitats such as agricultural land, plantations of coconuts, candlenuts and bananas, village gardens, and in and around settlements; other habitats include seasonal montane forest dominated by *Eucalyptus urophylla* on Adonara, and closed swamp-forest with diverse range of trees (including *Terminalia*) to 25 m tall on Lomblen; while considered forest-dependent on a range of Wallacean islands, usually recorded in all or most described habitats, with tendency to be more common in forest. In both Wallacea and New Guinea occurs from sea-level to 1600 m, more often in lowlands or mid-montane altitudes to c. 1000 m; in New Guinea locally as high as 2170 m, e.g. 1800 m (Jimi, Kaironk and Simbai Valleys) and 1980 m (Rakamanda, in Enga Province); in Wallacea from sea-level to 1200 m on Lombok, rare above 1000 m on Sumbawa, to 700 m (occasionally 1500 m) on Flores, to above 950 m on Sumba, to 700 m on Timor, to 930 m on Atauro; in Australia mainly coasts and coastal plains, less often adjacent foothills, ranges and tablelands.

Food and Feeding. Mainly nectar, fruit and seeds, also invertebrates (insects, including large mantids and insect larvae, and spiders); rarely, lizards (once, in New Guinea, c. 25 cm in length), and eggs of other birds. Fruits include those of figs (*Ficus*), in New Guinea also of *Psychotria*. Said to feed also on sap exuding from burnt sugar cane. Forages at all levels, mostly in canopy, less often in subcanopy or shrub layer; very occasionally on ground. When in mixed-species flocks, moves quickly through trees, foraging mostly in foliage in or just below upper canopy. Main technique is probing in flowers, of wide variety of trees (e.g. *Schefflera* in Australia and New Guinea, *Sesbania* in Wallacea, also *Metroxylon* in New Guinea), as well as mistletoes (Loranthaceae); also gleans from foliage of inner and outer canopy, from branches and among flowers and fruits, and sallies for insects, including sally-striking for flying insects and sally-hovering at foliage; seen to search for spiders under loose bark. In New Guinea, observed to sally-hover while picking ants (Formicidae) from ant nests, then return to perch to eat them. When feeding on *Syzygium* in New Guinea, moved from one flower cluster to the next by hopping along branches or flying between branches; perched on or beside clusters, and fed on only a few individual flowers before moving to next cluster. Noisy, conspicuous and aggressive, but can be wary. Usually seen singly, in twos (possibly pairs) and in small groups; regularly in parties of up to 20 at sources of abundant food, particularly flowering or fruiting trees, and group of at least 100 individuals once seen in fruiting tree in W New Guinea. Sometimes forage with other species in flowering trees, including *P. argenteiceps*, and one seen in mixed-species feeding flock with ten other species of honeyeater. Pugnacious in defence of food sources and aggressive to smaller bird species in flowering trees, but tolerates its visual mimic the Brown Oriole (*Oriolus szalayi*).

Breeding. Most data from Australia, where breeding recorded in all months except May and Jul, mainly Sept–Feb; on Flores two peaks of laying, in Feb–May and Oct–Dec (only one record in Dec), with few records in Jun (breeding activity declines in Dec–Mar wet season), also nest-building and active nests recorded Aug–Sept on Sumba and nestlings in late Mar on Roti; in New Guinea appears to nest throughout year except early dry season. Nest a large, deep, loosely constructed open cup, made of strips of bark or bark fibre or, less often, sticks, leaves, vine tendrils, sometimes with grass, a few leaves, wool or cobweb added, lined with fine plant stems, fine tendrils and broken leaves; often materials from nests of other species used or material taken from old nests of its own reared; external diameter 15–23 cm, depth 15–18 cm, internal diameter 9–15 cm, depth 8–15 cm; usually suspended from thin fork or in clump of foliage, often also supported, at end of horizontal branch in live tree, particularly *Eucalyptus* or *Melaleuca* (or in mistletoe in these), less often in shrub or mangrove, often close to or over water, 1.5–18 m (mean 7.3 m) above ground; nest of previous year also reused; in New Guinea (few reports) some nests described as pendulous and often in crown of tall tree (2.5–23 m up), also in mangrove; in Australia, apparent nesting association with Spangled Drongo (*Dicrurus bracteatus*), Australasian Figbird (*Sphecotheres vieilloti*) and Metallic Starling (*Aplonis metallica*), possibly for mutual protection (records of up to five figbird nests and a drongo nest in same tree as nest of present species); in New Guinea, twice reported as nesting in same tree as Brown Oriole (nests 8–9 m apart), once in same tree as White-bellied Cuckoo-shrike (*Coracina papuensis*), and reported as nesting in same tree as Hooded (*Cracticus cassicus*) and Black-backed Butcherbirds (*Cracticus mentalis*). In Australia clutch 3–4 eggs, occasionally 5 (mean 3.69 in Queensland), in New Guinea said to be 2–3 eggs (but one brood of four seen); incubation period at two nests 17–19 days; chicks possibly brooded by both parents (confirmation needed), fed by both but at some nests possibly fed only by female, nestling period once more than 15 days in Australia, once c. 17–18 days in New Guinea. Fledglings fed by both parents for at least 2–3 weeks after fledging. Nests parasitized by Common Koel (*Eudynamis scolopacea*) and Pallid Cuckoo (*Cuculus pallidus*).

Movements. Apparently resident throughout much of range, with some local movements (hence claims of nomadism). In Australia, movement from mangroves into Darwin area in autumn–winter, and, in Torres Strait, occasional or regular visitor to some smaller islands. Also appears at sites when *Melaleuca* or *Eucalyptus* in flower. Although described as migratory around L Kutubu, in E New Guinea, moving away during wet season (May to early Sept), extent of such movements not known. **Status and Conservation.** Not globally threatened. In Wallacea, generally widespread and common to abundant, including on Sumbawa, Moyo, Sangeang and Adonara; uncommon on Roti and Atauro. Generally common to abundant in New Guinea; density at Port Moresby 0.53 birds/ha. Locally common to uncommon in Australia; recorded densities of 0.1–5.8 birds/ha at various sites in Northern Territory. In New Guinea, this species is thought to have expanded its range into cultivated mid-mountain valleys only recently; this process continuing. Possible reports of this species on Morotai (off N Halmahera) not confirmed.

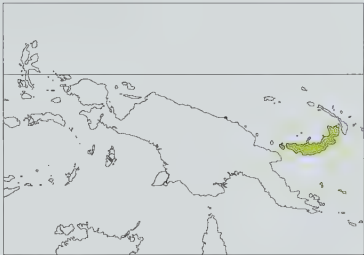
Bibliography. Anon. (1978a), Barrett *et al.* (2003), Beehler (1978a, 1978b, 1978c), Beehler & Dumbacher (1996a), Beehler, Pratt & Zimmerman (1986), Beehler, Sengo *et al.* (1995), Bell (1969, 1984b), Beruldsen (1979), Bishop (1992), Blakers *et al.* (1984), Bowman *et al.* (1990), Brown & Hopkins (1996), Campbell (1900), Clapp (1981, 1982a, 1982b, 1986a), Clapp & Haera (1982), Coates (1990), Coates & Bishop (1997), Coates & Peckover (2001), Colston (1974), Cooney *et al.* (2006), Deignan (1964), Diamond (1972a, 1972b, 1982), Diamond & Terborgh (1968), Draffan *et al.* (1983), Ertfemeijer *et al.* (1991), Finch (1980b, 1983), Ford, J.R. (1978a, 1987a), Forshaw & Muller (1978), Gannon (1962), Gilliard (1950b), Gilliard & LeCroy (1966, 1967a, 1968), Greenwood (1966), Griffiths & Clarke (2002), Gyldestolpe (1955b), Hartert (1930), Hicks (1992), Higgins (1999), Higgins *et al.* (2001), Holmes & Noske (1990), Hoogerwerf (1964, 1971), Ingram (1976), Iova (1993), Johnstone *et al.* (1996), Jones, D.N. (1983), Jones, M.J. *et al.* (1990), Keast (1968a, 1985a), Kikkawa (1982), Kikkawa *et al.* (1981), Lavery (1986), Le Souëf (1903), Linsley *et al.* (1999), MacGillivray (1910b), Mack (1998), Mack & Alonso (2000), Mack & Wright (1996), Mackay (1980), Marshall (1934a, 1934b), Mayr (1944a), Mayr & Rand (1937), McLean (1995), Mees (1975, 1982, 2006), Miller (1937), Murray (1988b), Myers & Bishop (2005), Nielsen (1996), North (1907), Noske (1996), Noske & Franklin (1999), Noske & Saleh (1996), Parker (1971a), Rand & Gilliard (1967), Richards & Suryadi (2002), Ripley (1964), Rothschild *et al.* (1932b), Sage (1994), Salomonsen (1966a), Schodde & Hitchcock (1968), Schodde & Mason (1999), Schodde & Tidemann (1986), Schodde *et al.* (1979), Schönwetter & Meise (1981), Smith (1949), Stein (1936), Storr (1977, 1984), Tolhurst (1990, 1991, 1992), Trainor (2002b, 2002c, 2005a, 2005b), Trainor & Soares (2004), Tubb (1945), Verheijen (1964), Verhoeve & Holmes (1999), Wahlberg (1988, 1992), Watson *et al.* (1962), White & Bruce (1986), Wieneke (1992), Woinarski (1993), Woinarski & Fisher (1995b), Woinarski, Press & Russell-Smith (1989), Woinarski, Tidemann & Kerin (1988), Wood (1966).

158. New Britain Friarbird

Philemon cockerelli

French: Polochion de Nouvelle-Bretagne **Spanish:** Filemón de Nueva Bretaña
German: Cockerell-Lederkopf
Other common names: Bismarck/New Britain Friarbird, New Britain Leatherhead

Taxonomy. *Philemon cockerelli* P. L. Slater, 1877, New Britain.
Forms a superspecies with *P. fuscicapillus*, *P. subcorniculatus*, *P. moluccensis*, *P. plumigenis*, *P. buceroides*, *P. eichhorni* and *P. albitorques*. Formerly suggested that all may belong to a single species. Treated as a race of *P. buceroides* by some authors. Two subspecies recognized.
Subspecies and Distribution.
P. c. umboi E. J. O. Hartert, 1926 – Umboi, in Bismarck Archipelago.
P. c. cockerelli P. L. Slater, 1877 – New Britain and Duke of York Is, in Bismarck Archipelago.



erets; uppertail narrowly tipped off-white (white reduced or lost with wear), and secondaries and inner primaries have faint and diffuse olive suffusion on outer edges; pale brownish-grey chin and throat bordered below by slightly darker gorget across upper breast, with indistinct dusky mottling or streaking on lower throat to upper breast; rest of underbody very pale grey-brown, undertail brownish-grey; underwing largely whitish, some brownish-grey mottling on coverts, and silvery dark brownish-grey trailing edge and tip; plumage becomes much paler brown with wear; iris dark brown; bill black; legs blue-grey. Sexes alike in plumage, male larger than female. Juvenile is like adult, but wing and tail washed with olive, collar duller, greyish-white, and side of breast brownish-grey with yellowish wash or streaks. Races are very similar: *umboi* differs from nominate only in slightly larger size and heavier bill. **VOICE.** One of noisiest birds on New Britain, vocalizations ranging from rasping sounds to bugle-like notes intermixed with bursts of laughter-like sounds. Can start to call as early as 03:00 hours, often giving monotonous “tok tok tok” until dawn. Song consists of repeated bubbling or rollicking phrases, such as “chowei tow-tow”. Other vocalizations include repeated, disyllabic nasal whistle, “cruu” or “cluu”; harsh “shhiaw”, repeated, sometimes rapidly; hoarse “caw” almost like that of a crow (*Corvus*); and “chong”. Often duets in unison, two birds repeatedly giving same song pattern in synchrony or nearly so.

Habitat. Most wooded habitats, from lowland to mid-montane rainforest, forest edges, tall secondary forest, recently cleared and disturbed areas, coconut plantations, and gardens. Lowlands to c. 1600 m, most commonly in lowlands and hills to c. 1150 m on New Britain and c. 760 m on Umboi; in Nakanai Mts, in W New Britain, seen from c. 1200 m to 1450 m.

Food and Feeding. Diet includes nectar and arthropods. Frequents upper levels of vegetation, mainly canopy. Seen to forage in flowering trees and epiphytes, such as mistletoes (Loranthaceae), probably for nectar; also takes insects by gleaning and, occasionally, by sallying. Noisy and conspicuous. Usually singly or in twos (probably pairs), sometimes in small flocks of up to seven individuals; in Nakanai Mts, one associated with mixed-species flock.

Breeding. Appears to breed in late dry season to wet season on N coast and in middle of dry season on S coast: eggs recorded late Sept to early Feb, active nests Feb and mid-Oct, nest-building mid-Apr and fledged young early Jul. Nest a substantial cup made of dry stems of vines and grass, lined with dry strips of palm frond, exterior sometimes covered with green thick-leaved vines, suspended between strong branches and possibly in fork of branch, concealed by foliage, usually more than 10 m above ground in tree. No information on clutch size, nor on incubation and nesting periods.

Movements. No information. Probably resident, with some local movements.

Status and Conservation. Not globally threatened. Restricted-range species: present in New Britain and New Ireland EBA. Common to abundant in lowlands of New Britain, but less common in mountains. No estimates of global population.

Bibliography. Ap-Thomas & Ap-Thomas (1977), Beehler (1978b), Bishop & Jones (2001), Coates (1990), Coates & Peckover (2001), Diamond (1972b), Eastwood (1995b), Eastwood *et al.* (1997), Finch & McKean (1987), Fletcher (2000a), Gilliard & LeCroy (1967b), Hartert (1926b), LeCroy & Peckover (1983), Mayr & Diamond (2001), Orenstein (1976), Schönwetter & Meise (1981), Stattersfield *et al.* (1998), Storer & Eastwood (1991).

159. New Ireland Friarbird

Philemon eichhorni

French: Polochion de Nouvelle-Irlande **Spanish:** Filemón de Nueva Irlanda
German: Eichhornlederkopf
Other common names: Eichhorn's/Helmeted(!) Friarbird

Taxonomy. *Philemon eichhorni* Rothschild and E. J. O. Hartert, 1924, hills of south-west New Ireland, Bismarck Archipelago.

Forms a superspecies with *P. fuscicapillus*, *P. subcorniculatus*, *P. moluccensis*, *P. plumigenis*, *P. buceroides*, *P. cockerelli* and *P. albitorques*. Formerly suggested that all may belong to a single species. Monotypic.

Distribution. New Ireland, in N Bismarck Archipelago.



small blackish bare patch covering lores, area around eye and anterior malar area; tail tipped white, more broadly at outer corners; chin and throat silvery white, finely dark-streaked; underbody pale brown, much paler than upperparts, with greyish-white spotting or scaling (except on belly), undertail brown with greyish-white tip; iris light brown to dark brown; bill black; legs greyish-blue to blue-grey or slate-grey. Sexes alike, male probably larger than female. Juvenile is like adult, but pale edges on some feathers of upperparts giving variably scaly appearance, and throat washed with yellow. **VOICE.** Typical song a 3-note whistled “pu-du-leet”, each note increasing in pitch. No other information. **Habitat.** Montane forest, from 750 m to at least 2200 m; also said to disappear below 900 m.

Food and Feeding. No information.

Breeding. No information.

Movements. Considered resident.

Descriptive notes. 33–35 cm; male 139–147 g, two females 153 g and 177 g. Large, rather drab honeyeater, with long neck, and fairly long, heavy and gently decurved bill (with no protuberance at base of upper mandible). Plumage is plain dull dark brown above, with strongly contrasting, prominent and somewhat fluffy silvery grey collar on hindneck and side of neck meeting pale brownish-grey chin and throat; large dark grey to blackish-brown bare patch covering lores and most of side of head, and narrow dense and hair-like dark brown to blackish malar stripe running below bare facial patch and continuing onto rear ear-coverts; uppertail narrowly tipped off-white (white reduced or lost with wear), and secondaries and inner primaries have faint and diffuse olive suffusion on outer edges; pale brownish-grey chin and throat bordered below by slightly darker gorget across upper breast, with indistinct dusky mottling or streaking on lower throat to upper breast; rest of underbody very pale grey-brown, undertail brownish-grey; underwing largely whitish, some brownish-grey mottling on coverts, and silvery dark brownish-grey trailing edge and tip; plumage becomes much paler brown with wear; iris dark brown; bill black; legs blue-grey. Sexes alike in plumage, male larger than female. Juvenile is like adult, but wing and tail washed with olive, collar duller, greyish-white, and side of breast brownish-grey with yellowish wash or streaks. Races are very similar: *umboi* differs from nominate only in slightly larger size and heavier bill. **VOICE.** One of noisiest birds on New Britain, vocalizations ranging from rasping sounds to bugle-like notes intermixed with bursts of laughter-like sounds. Can start to call as early as 03:00 hours, often giving monotonous “tok tok tok” until dawn. Song consists of repeated bubbling or rollicking phrases, such as “chowei tow-tow”. Other vocalizations include repeated, disyllabic nasal whistle, “cruu” or “cluu”; harsh “shhiaw”, repeated, sometimes rapidly; hoarse “caw” almost like that of a crow (*Corvus*); and “chong”. Often duets in unison, two birds repeatedly giving same song pattern in synchrony or nearly so.

Habitat. Most wooded habitats, from lowland to mid-montane rainforest, forest edges, tall secondary forest, recently cleared and disturbed areas, coconut plantations, and gardens. Lowlands to c. 1600 m, most commonly in lowlands and hills to c. 1150 m on New Britain and c. 760 m on Umboi; in Nakanai Mts, in W New Britain, seen from c. 1200 m to 1450 m.

Food and Feeding. Diet includes nectar and arthropods. Frequents upper levels of vegetation, mainly canopy. Seen to forage in flowering trees and epiphytes, such as mistletoes (Loranthaceae), probably for nectar; also takes insects by gleaning and, occasionally, by sallying. Noisy and conspicuous. Usually singly or in twos (probably pairs), sometimes in small flocks of up to seven individuals; in Nakanai Mts, one associated with mixed-species flock.

Breeding. Appears to breed in late dry season to wet season on N coast and in middle of dry season on S coast: eggs recorded late Sept to early Feb, active nests Feb and mid-Oct, nest-building mid-Apr and fledged young early Jul. Nest a substantial cup made of dry stems of vines and grass, lined with dry strips of palm frond, exterior sometimes covered with green thick-leaved vines, suspended between strong branches and possibly in fork of branch, concealed by foliage, usually more than 10 m above ground in tree. No information on clutch size, nor on incubation and nesting periods.

Movements. No information. Probably resident, with some local movements.

Status and Conservation. Not globally threatened. Restricted-range species: present in New Britain and New Ireland EBA. Common to abundant in lowlands of New Britain, but less common in mountains. No estimates of global population.

Bibliography. Ap-Thomas & Ap-Thomas (1977), Beehler (1978b), Bishop & Jones (2001), Coates (1990), Coates & Peckover (2001), Diamond (1972b), Eastwood (1995b), Eastwood *et al.* (1997), Finch & McKean (1987), Fletcher (2000a), Gilliard & LeCroy (1967b), Hartert (1926b), LeCroy & Peckover (1983), Mayr & Diamond (2001), Orenstein (1976), Schönwetter & Meise (1981), Stattersfield *et al.* (1998), Storer & Eastwood (1991).

159. New Ireland Friarbird

Philemon eichhorni

French: Polochion de Nouvelle-Irlande **Spanish:** Filemón de Nueva Irlanda
German: Eichhornlederkopf
Other common names: Eichhorn's/Helmeted(!) Friarbird

Taxonomy. *Philemon eichhorni* Rothschild and E. J. O. Hartert, 1924, hills of south-west New Ireland, Bismarck Archipelago.

Forms a superspecies with *P. fuscicapillus*, *P. subcorniculatus*, *P. moluccensis*, *P. plumigenis*, *P. buceroides*, *P. cockerelli* and *P. albitorques*. Formerly suggested that all may belong to a single species. Monotypic.

Distribution. New Ireland, in N Bismarck Archipelago.

Descriptive notes. 32 cm; 82–116 g. Large, dark honeyeater with long, rather heavy and decurved bill (with no protuberance at base of upper mandible). Plumage is plain dark brown to blackish-brown above, with silvery white forehead speckled with black, grading into fine silver and dark streaks on crown, supercilium (curving down behind eye) and rear malar area; dark brown nape and rear ear-coverts continuous with narrow dense and hair-like dark brown malar stripe extending from bill; strongly contrasting and prominent collar of silvery grey and slightly upcurled feathers on hindneck, grading into blackish and silvery white mottled side of neck;

Status and Conservation. Not globally threatened. Restricted-range species: present in New Britain and New Ireland EBA. No estimates of global population; considered common within preferred altitudinal range. Very poorly known species.

Bibliography. Beehler (1978b), Beehler & Alonso (2001), Coates (1990), Coates & Peckover (2001), Hartert (1925), Mayr & Diamond (2001).

160. White-naped Friarbird
Philemon albitorques

French: Polochion à nuque blanche **German:** Manuslederkopf **Spanish:** Filemón Nuquiblanco
Other common names: Admiralty (Island)/Manus Friarbird

Taxonomy. *Philemon albitorques* P. L. Selater, 1877, Admiralty Islands, Bismarck Archipelago. Forms a superspecies with *P. fuscicapillus*, *P. subcorniculatus*, *P. moluccensis*, *P. plumigenis*, *P. buceroides*, *P. cockerelli* and *P. eichhorni*. Formerly suggested that all may belong to a single species. Monotypic.

Distribution. Manus, in Admiralty Is. in N Bismarck Archipelago.



Descriptive notes. 34–37 cm. Large to very large, rather neat and clean-looking honeyeater with medium-length, heavy and slightly decurved bill with only small protuberance at base of upper mandible. Plumage is distinctive, rich brown above, slightly darker on wing and tail and slightly richer chestnut-brown and finely streaked blackish on top of head, with conspicuous white and rather downy collar on hindneck and side of neck, continuous with white of chin and throat; large mostly blackish bare patch covering lores and area around eye, merging to more pinkish-black on anterior lores at base of bill; narrow dense and hair-like dark brown malar stripe ending on rear ear-coverts; white to off-white below, with varying faint buff wash on flanks and upper breast, feathering on throat sparse (sometimes exposing pinkish skin beneath); underwing buff with dark trailing edge and tip; iris dark brown; bill black, pinkish tinge at base of lower mandible, gape dull brownish-orange; legs blue-grey. Sexes alike, male probably larger than female. Juvenile undescribed. **VOICE.** Song characteristic, heard often, a repeated rollicking phrase of 2–5 loud and rapid notes, “chick-ou cou”, “cou, cou” or “tchau-kaka”, the first 2–3 notes descending in pitch, the rest on similar pitch. Most common call described as loud “chauka” from single bird or “chaukapowe” by birds apparently disputing territories. Also loud screech like that of a parrot (Psittacidae); loud fowl-like cacklings; and quieter single harsh nasal notes. Duetting noted, first bird uttering a “chook ook” phrase, other a harsh “arrrrk”, and finished by a frenzied “choong” from first bird.

Habitat. Abundant in all disturbed habitats, including forest edge, town gardens and around villages, and other human habitation; less common in secondary forest and mangroves, and uncommon in other closed forests. Lowlands.

Food and Feeding. Takes nectar from flowering trees; presumed also to eat invertebrates. Noisy, active and conspicuous. Usually seen singly or in twos (probably pairs) or small groups; pugnacious, and highly aggressive in defence of flowering trees.

Breeding. Active nests recorded mid-Mar, early Aug and early Nov, and nest being built in mid-Jul. Nest a bulky cup made of plant material, usually placed moderately high in outer fork of slender branch; one described as flask-shaped, suspended from branch overhanging river and close to active nest of Variable Goshawk (*Accipiter novaehollandiae*); another basket-shaped, in outer fork of branch 5 m above ground. No other information.

Movements. Probably resident, with local movements. Birds seen on Patamu, a small islet c. 500 m off Manus.

Status and Conservation. Not globally threatened. Restricted-range species: present in Admiralty Islands EBA. Common to very common within tiny global range. Suggested that population may have increased greatly in association with human colonization, settlement and clearing on Manus, and that this increase detrimental to Manus Fantail (*Rhipidura semirubra*), which now considered Vulnerable.

Bibliography. Buckingham *et al.* (1995), Coates (1990), Coates & Peckover (2001), Eastwood (1995a), Fleischer (2000a), Gregory (1995c), Hicks & Hicks (1991), Mackay (1977), Mayr & Diamond (2001), Stattersfield *et al.* (1998).

161. Silver-crowned Friarbird
Philemon argenteiceps

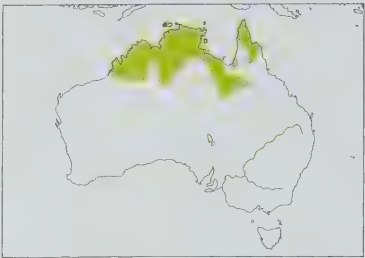
French: Polochion couronné **German:** Weißscheitel-Lederkopf **Spanish:** Filemón Coronado

Taxonomy. *Tropidorhynchus argenteiceps* Gould, 1840, between King Sound and Port King George IV, Kimberley Division, Western Australia. Nominative race varies clinally in both size and colour, becoming slightly larger from N to S and darker from arid areas to more humid ones. In Northern Territory, proposed races *melvillensis* (from Melville I) and *alexis* (from Alexandria) represent such clinal variation, and both are merged with nominate. Two subspecies recognized.

Subspecies and Distribution.
P. a. argenteiceps (Gould, 1840) – N Western Australia (Kimberley Division, mainly N & E of Fitzroy R, including many offshore islands) E through Top End of Northern Territory (S to upper reaches of drainage basins of Victoria, Roper, McArthur and Nicholson rivers, and on many offshore islands, including Melville I, Groote Eylandt and Sir Edward Pellew Group) to NW Queensland (SE head of Gulf of Carpentaria and N Selwyn Range).

P. a. kempi Mathews, 1912 – Cape York Peninsula (S to E of line from Weipa to Innisfail), in NE Queensland.

Descriptive notes. 25–32 cm; male 70–106 g and female 59–88.5 g (nominate), three males 90–97 g (*kempi*). Medium-sized tropical friarbird with robust, gently decurved bill and large, rounded and laterally compressed casque near base of upper mandible. Nominative race is pale brown-grey above, with silvery white forehead, crown and nape, and short tuft of dark-based silvery feathers on hindneck and side of neck (typically appearing as if combed or ruffled); black bare patch on lores and most of side of head tapers to a point on side of nape; chin to upper breast silvery white, gorget of lanceolate and finely dark-streaked feathers on lower throat and upper breast; lower breast and anterior flanks pale brownish-grey, grading to light grey or whitish on rest of underbody; undertail and underwing brown-grey; iris red-brown, red or crimson; bill and casque black; legs grey-black to black. Sexes alike in plumage, male larger than female. Juvenile has only rudimentary casque (appears as slight



kempi is like nominate, but with significantly smaller casque and slightly smaller bill. **VOICE.** Very noisy, calls and song described as harsh and discordant warbles, squawks and guttural croaking; one of first species to call in dawn chorus, and groups in flowering trees almost deafening at times. Diagnostic song consists of harsh repeated phrases, described as “more tobacco, uh, more tobacco, uh”; apparently given only by male, but female interrupts at a fixed point of song with a disyllabic call. Both members of pair utter deep guttural “grok, grok” during nest-building.

Habitat. Mostly open tropical *Eucalyptus* forests and woodlands, sometimes also with paperbarks (*Melaleuca*) and *Grevillea*, and usually with grassy ground layer but sometimes with shrubby understorey or, on sandstone plateaux, with figs (*Ficus*) in understorey; often in riverine or other riparian woodlands or forests of paperbarks, sometimes with eucalypts co-dominant, and acacias and *Pandanus* in understorey. Sometimes in mixed woodlands of combinations of *Excoecaria*, *Bauhinia*, *Eucalyptus*, *Grevillea*, *Terminalia*, *Atalaya* and boabs (*Adansonia*), with grassy understorey and scattered shrubs; also *Acacia* forest, monsoon forest and mangroves. Often in urban parks and gardens. Mainly in coastal and subcoastal zones and adjacent ranges and plateaux, occasionally extending inland into semi-arid and arid zones.

Food and Feeding. Mainly nectar, from wide variety of plants; also invertebrates (insects, spiders), as well as fruit (especially figs) and some seeds. Forages at all heights, from canopy down to lower strata close to ground, in trees and shrubs. Searches mainly at flowers, particularly of *Eucalyptus* and mistletoes (Loranthaceae), less often on others (e.g. *Grevillea*, *Melaleuca*, *Banksia* and *Lophostemon*), on inner and outer foliage (including dead leaves) of trees, trunks and large branches, foliage and branches of shrubs, and in air. In Kakadu National Park, in Northern Territory, tended to forage at higher levels in vegetation in wet season compared with dry season, and proportional use of substrates also differed seasonally. Obtains nectar by probing flowers. Collects invertebrates by gleaning, probing and sallying, including sally-striking in air and from foliage, branches and trunks, sally-hovering to snatch prey from foliage, and flutter-chasing. Active, sometimes hanging upside-down to reach flowers. Gregarious, usually in small flocks of 4–25 or more individuals, or in twos (probably pairs); rarely seen singly. Gathers at sources of abundant food, such as flowering trees; sometimes forages in loose association with other species, especially other honeyeaters and lorikeets (Psittacidae), and often seen with *P. citreogularis*; large mixed-species flocks in NE Australia.

Breeding. Season Sept–Mar, rarely Jul (nominate); peak around Darwin (Northern Territory) in Sept, after peak of nectar production in woodlands of region, suggesting that other food such as large insects perhaps important for breeding. Female gathers material and builds, sometimes accompanied by male (single report of two birds building); nest a deep, though often thin-walled, bowl made of strips of bark and bark fibre and spider web, sometimes dry grasses, vine tendrils and plant fibre, lined with coarse grass, external diameter 12.7–13 cm, depth 9.7–17.8 cm, suspended firmly by rim in thick horizontal fork, usually high in tree, among dense outer foliage toward end of horizontal or drooping limb, 2.8–15 m (mean 6.9 m) above ground. Clutch usually 2–3 eggs, probably mostly 2; incubation by female, from second egg in 2-egg clutches, period 16 days; chicks fed and tended by both adults, female usually doing more of the work, no information on duration of nestling period. Nests parasitized by Common Koel (*Eudynamis scolopacea*).

Movements. Apparently resident, or partly so, combined with at least local movements. While widely described as nomadic or dispersive, true extent of movements not known. Possibly partly migratory in some regions, e.g. more common Sept–Jan around Mt Isa (Queensland), and, at least formerly, almost entirely absent from Larrimah area (Northern Territory) during dry season. Vagrant at some sites at edge of usual range (e.g. farther S in NE Queensland), over wide span of months. Movements often correlated with flowering of food trees, and seasonal flowering can result in seasonal occurrences.

Status and Conservation. Not globally threatened. Common. No estimates of total population. At various sites in Northern Territory, recorded densities of 0.05–3.93 birds/ha. Range in NE Australia may be contracting.

Bibliography. Aumann (1991), Barrett *et al.* (2003), Beruldsen (1979), Blakers *et al.* (1984), Boekel (1980a), Braithwaite *et al.* (1984), Brooker *et al.* (1990), Campbell (1900), Colston (1974), Crawford (1972), Deignan (1964), Ford, J.R. (1978a), Franklin (1997), Franklin & Noske (1998, 1999, 2000a), Frith & Davies (1961), Frith & Hitchcock (1974), Griffioen & Clarke (2002), Higgins (1999), Higgins *et al.* (2001), Immelmann (1961), Johnstone & Burbidge (1991), Johnstone & Starr (1968a, 1985a), Lavery (1986), Longmore (1991a), McKean (1985), McLean (1995), Nielsen (1996), North (1907), Noske (1996), Noske & Franklin (1999), Sage (1994), Schodde (1976), Schodde & Mason (1999), Storr (1977, 1984), Storr *et al.* (1975), Thomas (1947), Thompson (1983), Warham (1957), Woinarski (1990, 1993), Woinarski & Fisher (1995a, 1995b), Woinarski & Tidemann (1991), Woinarski, Fisher *et al.* (2001), Woinarski, Press & Russell-Smith (1989), Woinarski, Tidemann & Kerin (1988).

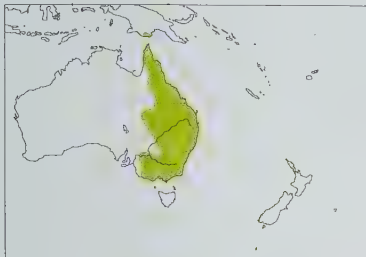
162. Noisy Friarbird
Philemon corniculatus

French: Polochion criard **German:** Lärnlederkopf **Spanish:** Filemón Chillón
Other common names: (Bald) Friarbird

Taxonomy. *Merops corniculatus* Latham, 1790, Nova Hollandia = Endeavour River, Queensland, north-east Australia.

Forms a superspecies with *P. diemenensis*. Proposed race *elliotti* (from Watson River, in N Queensland) is based on an intergrade between nominate and *monachus*; *clamans*, described from Wallaroo Gorge (Carnarvon Range, in SE Queensland), is synonymized with *monachus*. Two subspecies recognized.

Subspecies and Distribution.
P. c. corniculatus (Latham, 1790) – S New Guinea (Wassi Kussa R E to Oriomo R) and NE Australia (NE Queensland from about Weipa–Iron Range S, extending inland to middle reaches of Mitchell R and Staaten R and upper Norman R, to Mackay).
P. c. monachus (Latham, 1801) – E & SE Australia from CE Queensland (Mackay region) S, extending inland to c. 144–145° E, to CS Victoria (Gippsland).



Descriptive notes. 30–35 cm; male 88–136 g and female 85–103 g (*monachus*), male 87–93 g and two females 87 g and 94 g (nominate). Large friarbird, adult with mostly bare head, and sturdy and gently decurved bill with prominent upright casque at base of upper mandible. Nominate race is dark grey-brown above, with narrow white tip of tail, and mostly bare dull black head and neck with narrow light brown to cream supercilium, and very sparse and fine blackish feathering on lores and anterior malar area; often a dense patch of dark brown feathers in centre of nape and ruff of light grey-brown fluffy feathering on lower hindneck (both areas can

be bare, as most of rest of head); brown-feathered chin merges to off-white and finely brown-streaked upper throat, and has prominent silvery white and finely dark-streaked gorget of long, curving lanceolate feathers across lower throat and centre of upper breast; rest of breast and anterior flanks brown-grey, merging to off-white on rest of underbody; undertail brown-grey, white tip and narrow white inner edges of outer rectrices; underwing brown-grey with white scaling on coverts; iris red, varying from crimson to red-brown (appears to change to red with stress, and cannot be used reliably as age character); bill and triangular casque at base black; legs black-brown or black. Sexes alike in plumage, but male on average slightly larger than female. Juvenile has only rudimentary casque (a small bump at base of upper mandible), is browner above than adult, with more extensive (but still sparse) dark feathering on head and neck, large ruff of fluffy brown to grey-brown feathering on nape, darker brown supercilium, duller buff-white tail tip, indistinct brown tips on upwearing-coverts, narrow white tips on primaries, throat washed lemon-yellow (no obvious gorget, feathers not lanceolate), underbody slightly paler overall, iris greyish, and legs grey-black; immature similar to adult, but casque smaller, upperbody boldly but coarsely scalloped white, gorget washed pale yellow, side of breast and flanks coarsely barred pale yellow to off-white, also retain most of juvenile wing and tail, with brown tips on wing-coverts, white tips on primaries and duller tail tip. Race *monachus* is greyer, less brown, above and slightly darker below than nominate, and has significantly longer wing and tail. **VOICE.** Can be very noisy, almost deafening when in large numbers; considered one of noisiest birds in savanna of S New Guinea. Wide variety of typically loud, harsh and discordant vocalizations, though song can be more melodic. Song given often, but varies, e.g. “chokka-lock” or “four o’clock”, first note (“chokka”) sounding disyllabic owing to inflection, and sometimes seemingly followed by bill-clacks, songs also described as repeated, rolling “ya-kob” or “ch-will”; repeated “yodel chuck” while advancing slowly towards nearby conspecific probably also song. Often duets, described as antiphonal but some may be given in unison (but with birds starting and finishing independently). Song by male to defend nest-site or attract a female; and sings when defending feeding territories, often in duets, in response to intruders. When foraging, utters “chok”, “chup” or “weep” note. Alarm and threat calls appear to vary: described as babbling and querulous notes of varying pitch, loud cries, and possibly “kow-kow-kow”; alarm calls given when mobbing predators or potential predators, e.g. Square-tailed Kite (*Lophoictinia isura*). Other calls (perhaps different renditions of previous ones) include in Australia “chok-chok”, “tobacco, tobacco” and garrulous chattering, in New Guinea also single high nasal note and scolds birds of prey when pursuing them. Geographical variation in some calls seems likely. Bill-clacking or bill-snapping may form part of calls.

Habitat. Wide range of habitats in Australia, most commonly in dry sclerophyll forests and woodlands, usually dominated by *Eucalyptus* and with understorey varying from sparse with grassy ground cover to dense shrub or heath; often in forests of box or ironbark eucalypts, or riparian associations of river red gum (*Eucalyptus camaldulensis*), black box (*Eucalyptus largiflorens*) or coolibah (*Eucalyptus coolabah*). Also mixed forests or woodlands of combinations of *Eucalyptus*, *Angophora*, *Corymbia*, cypress-pine (*Callitris*) or *Acacia* including brigalow (*Acacia harpophylla*), gidgee (*Acacia cambagei*) or mulga (*Acacia aneura*); sometimes in *Acacia* woodland or open shrublands (e.g. of gidgee, mulga, brigalow or combinations of these), including those with understorey of dense emu-bush (*Eremophila*), but can be rare in pure or dominant stands of other non-eucalypt species (e.g. *Callitris*). Sometimes in mallee eucalypt shrubland. Usually found in healthier forest and woodland associations, rather than those affected by dieback, although can be common in small remnant patches and fragmented forests and woodlands. In coastal areas, sometimes in coastal scrub or low forest dominated by *Banksia* or mixed with *Eucalyptus* or *Leptospermum*, low coastal woodland dominated by casuarinas, coastal heathland or mangroves; and coastally and inland, occasionally in riparian associations of paperbarks (*Melaleuca*), casuarinas or bottlebrushes (*Callistemon*), or ecotone between riverine associations and eucalypt woodlands. Only occasionally in wet sclerophyll forest or rainforest. Often in urban areas, in parks and gardens, and along streets, especially with native vegetation in flower; or in vineyards and orchards. In New Guinea common in low, mainly coastal open *Eucalyptus* savanna; in Morehead area found in all habitats.

Food and Feeding. Nectar, pollen, arthropods (mainly insects, also spiders), fruit, and lerp and manna; reported also as taking eggs and nestlings of Common Starling (*Sturnus vulgaris*), and small fish (3 cm long). Forages mainly in crowns of trees, particularly among flowers and foliage of upper canopy, but recorded at all levels, occasionally in understorey or on ground, and in air; also searches on branches and trunks. Probes flowers for nectar, and catches invertebrates by probing, gleaning and sallying, including sally-striking, e.g. for flying termites (Isoptera). In Australia, seen to probe scars on *Eucalyptus*, presumably taking sap from feeding sites of sugar gliders (*Petaurus breviceps*). Wide gape enables it to feed on large cicadas (Cicadoidea), a favourite food during spring–summer (availability of which may limit breeding success). Seen singly, in twos (probably pairs) and in flocks of up to 30 individuals; often forages in loose flocks of 10–20 birds, and sometimes congregates in larger numbers in fruiting or flowering trees; seen also to forage with other species, including *P. citreogularis* and other meliphagids; sometimes frequent aggression between friarbirds and *Anthochaera* wattlebirds in flowering trees, though can forage with little aggression.

Breeding. Few data for New Guinea, recently fledged young Dec; in Australia breeds Aug–Mar, in NE Queensland clutches Aug–Dec, in New South Wales–Victoria clutches Aug–Jan, near Armidale (N New South Wales) laying early Nov to Jan, and at Moruya (SE New South Wales) laying starts late Oct to early Nov (replacements until mid-Dec); occasionally two broods in a season. Female does all or most of building, nest a large, deep, sturdy and open cup or basket usually of long interwoven strips of bark, bark fibre or grass, sometimes wool, bound with spider web or spider egg sacs, lined with fine dry grass, plant stems or sometimes leaves or rootlets (some nests solely of bark); others include thin sticks, twigs, feathers, leaves or pine or casuarina needles, plant fibre or down, lichen, hair, fur or artificial fibres), external diameter 12–17.8 cm, depth 7.6–14 cm, internal diameter 9.5–14 cm, depth 5.1–10 cm; usually suspended from fork (usually horizontal), drooping twigs or foliage, sometimes partly supported, towards outer edge in wide variety of trees and shrubs, including mistletoe (Loranthaceae), 1.8–35 m (mean 9.1 m) up; nest often near those of conspecifics or other species, e.g. Willie Wagtail (*Rhipidura leucophrys*) and Magpie-lark (*Grallina cyanoleuca*); strong nesting association with Leaden Flycatcher (*Myiagra rubecula*), other flycatchers and other species that apparently nest near friarbirds for protection from potential predators. Clutch 2–4

eggs, occasionally 5, most often 3 (mean throughout range 3), clutch size possibly decreases from S to N; incubation by female, period 15–19 days; chicks tended and fed by both sexes, nestling period 16–19 days; family members initially stay together near nest, fledglings fed by both parents for up to 35 days after leaving nest. Nests parasitized by Common Koel (*Eudynamis scolopacea*), Pallid Cuckoo (*Cuculus pallidus*) and possibly Fan-tailed Cuckoo (*Cacomantis flabelliformis*). From 79 eggs in 30 nests at which outcome known, overall success 1.37 fledged young per nest; near Armidale success variable from year to year, of 242 nests over eight seasons 40.9% fledged at least one young and successful nests produced mean of 2.08 fledglings.

Movements. Complex. Patterns of movements appear to differ between races, though for both often appear associated with (or said to be dependent on) flowering of foodplants, especially myrtaceous (e.g. *Angophora*, *Eucalyptus*) and proteaceous (*Banksia*, *Grevillea*) species. Race *monachus* partly migratory, but at many sites throughout range also present all year and considered resident (most of population S of 35° S migratory, and at least part of populations N to SE Queensland also moves); migratory populations move N (to as far as CE Queensland) in autumn–winter and return S in late winter–spring, with strong evidence for a movement along large parts of E coast; near Armidale, where migratory, site-fidelity over many seasons high, but fidelity to natal site appears low. Also, some evidence of altitudinal migration from highlands of SE in autumn–winter. Nominate race in New Guinea and NE Australia poorly known, but apparently largely sedentary, possibly with some coastal movement in dry season. At some sites, throughout range, occurs erratically or numbers vary greatly and thus claimed to be nomadic, but such suggestions appear to reflect lack of knowledge of movements, which probably very local. Coastal influxes in Queensland sometimes coincide with drought inland. Vagrants recorded far beyond normal range, e.g. Lord Howe I.

Status and Conservation. Not globally threatened. In New Guinea, generally fairly common to very common and locally abundant; common in Australia. No estimates of total abundance, but recorded densities of up to 5.4 birds/ha at various sites; much higher densities, of 29 birds/ha, in flowering mugga ironbark (*Eucalyptus sideroxylon*) forest, and up to 44 birds/ha in heavily flowering white box (*Eucalyptus albens*) woodland.

Bibliography. Barrett, Ford & Recher (1994), Barrett, Silcocks *et al.* (2003), Beehler *et al.* (1986), Bellchambers *et al.* (1994), Bielewicz & Bielewicz (1996), Blakers *et al.* (1984), Bravery (1970), Campbell (1900), Chan (1995c), Coates (1990), Cody (1991b), Colston (1974), Cooney *et al.* (2006), Cooper (1975a), Courtney & Marchant (1971), Egan (1997), Emison *et al.* (1987), Er & Tidemann (1996), Ford, H.A. (1998a, 1999), Ford, H.A. & Bell (1981), Ford, H.A. & Debus (1994), Ford, H.A. & Trémont (2000), Ford, H.A., Bridges & Noske (1985), Ford, H.A., Davis *et al.* (1993), Ford, H.A., Noske & Bridges (1986), Ford, H.W. (1908), Gilmore (1985), Gosper, C.R. (1999), Gosper, D.G. (1992), Green & Catterall (1998), Griffioen & Clarke (2002), Hannah *et al.* (2007), Hardy & Farrell (1990), Higgins (1999), Higgins *et al.* (2001), Immelmann (1961), Jones (1986), Jurisic & Sanderson (1994a), Keast (1968a, 1985a), Kikkawa *et al.* (1965), Lavery (1986), Leach (1988, 1995), Ley *et al.* (1997), Marchant (1979, 1983, 1992), Mayr & Rand (1937), McAllan *et al.* (2004), McCulloch (1990), McFarland (1984b, 1988, 1994b), McLean (1995), McLean *et al.* (2005), Milledge & Recher (1985), Nielsen (1991, 1996), North (1907), Oliver *et al.* (1999), Pyke (1985), Pyke & Recher (1988), Rand (1942a), Rand & Gilliard (1967), Recher & Abbott (1970a), Roberts & Ingram (1976), Saunders (1993), Saunders & Burgin (2001), Saunders, Ambrose & Burgin (1995), Saunders, Burgin & Jones (2003), Schodde & Mason (1999), Storr (1984), Taylor, I. (1987), Taylor, M. (1992), Tokue & Ford (2006, 2007), Traill *et al.* (1996), Turner (1992), Wieneke (1992), Woodall (1995).

163. New Caledonian Friarbird

Philemon diemenensis

French: Polochion moine **German:** Lessonlederkopf **Spanish:** Filemón de Nueva Caledonia

Taxonomy. *Tropidorhynchus diemenensis* Lesson, 1831, “La Terre de Diémen”; error = New Caledonia. Forms a superspecies with *P. corniculatus*. Monotypic.

Distribution. New Caledonia and Loyalty Is (Lifou and Maré).



Descriptive notes. 27–32 cm; male 69.5–84 g, female 53–62 g. Large honeyeater with moderately long, heavy and slightly decurved bill (no protuberance at base). Head and neck are largely brown, streaked darker brown and grey on forehead, crown and nape, and paler on chin and throat, with silvery grey hindneck-collar, small patch of silvery grey on lower rear ear-coverts, and narrow moustachial stripe of small dark brown feathers; mantle and back brown, merging to dark olive-brown on scapulars, rump and uppertail-coverts (mantle feathers soft and loosely textured, and can be puffed up); uppertail black-brown, with broad and diffuse

slaty blue-grey outer edges when fresh (fairly rapidly lost with wear and fading); upwearing black-brown, conspicuous slaty blue-grey fringes on median coverts, slaty blue-grey outer edges on greater coverts and all except outer couple of remiges (blue-grey margins combining to form conspicuous pale panel and striping on folded wing; blue-grey much reduced with wear and fading); light grey-brown to buff-brown below, with conspicuous buff-white to silvery white and finely black-streaked gorget of long, curving pointed feathers over throat and centre of upper breast; undertail black-brown (reflective, appearing pale brownish-grey in some lights); underwing pale brownish-grey, sparsely mottled white on coverts; iris red-brown to light brown; bill black; legs blue-grey to dark grey-brown. Sexes alike in plumage, male slightly larger than female. Juvenile is like adult but paler and more washed out, and lacking specialized silvery white feathers of throat and breast. **VOICE.** Heard often. Variety of loud squeaks and disjointed notes. Several calls described: a descending whistle; a harsh grating sound while pursuing another bird; and a loud “hee-haw”. Usual call sounds like “popinjay”, last syllable emphasized. Local name “Koniyou” derived from one of its calls.

Habitat. Common in forests, but mainly in open habitats and often forages in gardens around human dwellings; also occurs in other disturbed areas.

Food and Feeding. Insects, nectar and fruit. Probes flowers for nectar, and seen to sally for insects over water; one chased a cicada (Cicadidae) with aerobic manoeuvres and, having captured it, returned to perch and battered the insect before ingesting it. Bold, active and pugnacious, often chasing conspecifics and other birds, including raptors, crows (*Corvus*) and parrots (Psittacidae).

Breeding. Active nests Oct–Dec and juveniles seen Dec. Nest a thick-walled woven cup, made of twigs and leaves, unlined, external diameter 12–13 cm, internal diameter 8.5–9 cm, suspended from small branches high in tree. Clutch 2 eggs; no information on incubation and nestling periods.

Movements. Probably sedentary.

Status and Conservation. Not globally threatened. Restricted-range species: present in New Caledonia EBA. Common in New Caledonia; scarce or uncommon on Lifou. No estimates of global population.

Bibliography. Delacour (1966), Doughty *et al.* (1999), Hannecart & Lécroart (1980), Layard & Layard (1880), Mayr (1940, 1945b), Myers (2004), Ross (1988), Stattersfield *et al.* (1998), Stokes (1980), Tristram (1879).

164. Timor Friarbird

Philemon inornatus

French: Polochion sobre **German:** Timorlederkopf **Spanish:** Filemón de Timor
Other common names: Plain Friarbird

Taxonomy. *Tropidorhynchus inornatus* G. R. Gray, 1846, no locality = Kupang, Timor. Forms a superspecies with *P. brassi*, *P. citreogularis* and *P. kisserensis*. Proposed race *robustus* (described from Mt Ramelan, in E Timor) is considered inadequately differentiated to warrant recognition. Monotypic.

Distribution. Timor, in E Lesser Sunda.



Descriptive notes. 24 cm. Small friarbird with moderately long and slightly decurved bill without protuberance at base. Plumage is plain brownish-grey above, with pale grey and rather downy hindneck and side of neck forming obvious half-collar; darker brown face formed by dark ear-coverts and small patch of dark bare skin on lores and beneath and just behind eye; thin olive edges on remiges (faintly paler panel on folded wing), fine olive edges on rectrices; silvery white chin and throat merging to dusky grey and white-mottled lower throat; breast and belly very pale greyish-brown, diffuse streaking or scaling on breast (formed by slightly elongated and pointed feathers with off-white tips) merging to off-white or very pale grey lower

underbody; iris dark brown; bill black; legs dark grey to black. Sexes alike in plumage, male probably on average slightly larger than female. Juvenile is browner above than adult, with more distinct but diffuse yellow-green panel on wing, yellow wash on chin, throat and breast. **VOICE.** Song a medley of moderately loud notes, including a rapid series of similarly pitched "t-chika wook..." lasting 6-5 seconds with c. 2 notes per second; also gives irregular series of seesawing notes, often before song.

Habitat. Primary and secondary monsoon forest, open woodland, open scrub, occasionally lightly wooded cultivation; sea-level to 2400 m.

Food and Feeding. No details on diet. Forages mainly in canopy; seen singly or in twos (possibly pairs); noisy, aggressive and conspicuous.

Breeding. No information.

Movements. No information.

Status and Conservation. Not globally threatened. Restricted-range species; present in Timor and Wetar EBA. Very poorly known. Considered widespread and common within small global range. No estimates of population.

Bibliography. Coates & Bishop (1997), Mayr (1944a), Noske & Saleh (1996), Stattersfield *et al.* (1998), Trainor, Coates *et al.* (2007), Trainor, Santana *et al.* (2008), White & Bruce (1986).

165. Brass's Friarbird

Philemon brassi

French: Polochion de Brass **German:** Mamberamolederkopf **Spanish:** Filemón de Brass
Other common names: Brass's (s) Friarbird

Taxonomy. *Philemon brassi* Rand, 1940, Bernhard Camp, Idenburg River, north-west New Guinea. Forms a superspecies with *P. inornatus*, *P. citreogularis* and *P. kisserensis*. Monotypic.

Distribution. Upper Mamberamo Basin (Idenburg R, lower Mamberamo R, probably also Rouffaer R) and Wapoga Basin (Tirawiwa R and Logari R), in W New Guinea.



Descriptive notes. 21-22 cm. Small, rather slender friarbird, with long, heavy and slightly decurved bill with no protuberance at base. Plumage is largely plain dark olive-brown above, slightly darker, blackish-brown, on remiges and rectrices, with extensive area of largely bare slate-grey to blackish-grey skin on forehead, supercilium, lores and around eye, flecked with small, sparse, varying grey and white feathering on lores and around eye; crown, nape, ear-coverts and malar region dark grey, flecked with white; chin and upper throat conspicuously white, and feathers of upper breast dark grey, finely spotted or flecked with

white; underbody pale grey, slightly darker on breast and tinged brown on thighs; underwing dull off-white with dark trailing edge and tip; plumage becomes much paler, greyish-brown, with wear; iris dark brown; bill black; legs dark grey to blue-grey. Sexes alike in plumage, male slightly larger than female. Juvenile is like adult, but with rufous tinge on top of head and mantle, back and scapulars, conspicuous olive outer edges on remiges, olive edges on rectrices (lost with wear), and more brownish breast; immature like adult but retains juvenile remiges and rectrices, and probably some or all upperwing-coverts, also has white tips on otherwise dark scapulars, back and rump, less obvious spotting on throat, and sometimes yellowish tinge on lower throat or upper breast (possibly varying between sexes). **VOICE.** Noisy; only vocalization described is an upslurred call note typical of genus.

Habitat. On Idenburg R, common in flooded canegrass and dense riparian secondary growth around a lagoon; on Tirawiwa and Logari rivers, locally common in vegetation along river edge and in disturbed areas, and over (but not in) canegrass. Recorded at c. 50 m and at 80-275 m.

Food and Feeding. Nectar, fruit and insects; one fed low down in flowering *Elaeocarpus* overhanging river. Not so noisy or pugnacious as *P. buceroides*. On Idenburg R, commonly in small parties of about twelve individuals; seen to congregate with other nectarivorous birds in flowering trees.

Breeding. Male with enlarged gonads in Mar. No other information.

Movements. Presumably sedentary.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species; present in North Papuan Lowlands EBA. One of least known of New Guinean birds. No estimates of population. Found to be common at two sites in recent surveys (1998) in Wapoga Basin, though not recorded in recent surveys (2000) on Mamberamo R. Appears secure at present, with much lowland forest of Mamberamo R and Idenburg R within Foja Nature

Reserve, and the region is largely inaccessible and undisturbed. Potentially threatened, however, by timber-harvesting and agricultural schemes, and a proposed dam on the Mamberamo Gorge.

Bibliography. Anon. (2007a), Beehler (1985), Beehler *et al.* (1986), Butchart & Stattersfield (2004), Collar *et al.* (2001), Mack & Alonso (2000), Rand (1940a, 1942b), Rand & Gilliard (1967), Richards & Suryadi (2002), Stattersfield & Capper (2000), Stattersfield *et al.* (1998).

166. Little Friarbird

Philemon citreogularis

French: Polochion à menton jaune **German:** Glattstirn-Lederkopf **Spanish:** Filemón Goligualdo
Other common names: Yellow-throated Friarbird, (Little) Leatherhead

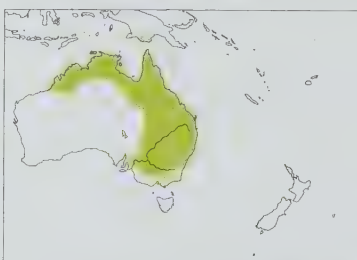
Taxonomy. *Tropidorhynchus citreogularis* Gould, 1837, interior of New South Wales, Australia. Forms a superspecies with *P. inornatus*, *P. brassi* and *P. kisserensis*; often treated as conspecific with last of those. Nominant race intergrades with *sordidus* in Queensland (from near Cape York S to around Georgetown); also exhibits slight clinal variation in size, with decrease in length of wing and increase in length of bill from S to N. Additional proposed races in Australia are *occidentalis* (described from Derby, in N Western Australia), *breda* (from Melville I), *johnstoni* (from Johnston R, in N Queensland) and *carpentariae* (from Normanton, in NW Queensland), but all of these represent only minor and clinal variation in size and tone of plumage. Three subspecies recognized.

Subspecies and Distribution.

P. c. papuensis Mayr & Rand, 1935 – CS New Guinea (Merauke E to Oriomo R).

P. c. sordidus (Gould, 1848) – N Western Australia (mainly N of 19° S, including many offshore islands) E through Top End of Northern Territory (including Melville I, Groote Eylandt and Sir Edward Pellew Is) to NW Queensland (S to Selwyn Range).

P. c. citreogularis (Gould, 1837) – Queensland (from Cape York Peninsula and E of Diamantina Drainage Basin) to New South Wales (largely absent E of Great Divide in SE), N Victoria and extreme CE South Australia (along Murray R).



Descriptive notes. 27 cm (25-29); male 58-71 g and female 59-84 g (nominant), male 50-77 g and female 48-76.5 g (*sordidus*), one male 53 g and one female 55 g (*papuensis*). Large honeyeater with moderately long and slightly decurved bill (lacking casque), and long tail with tip appearing slightly notched when folded and square-cut when spread. Nominant race is brown-grey above, with downy paler grey half-collar (hindneck to side of neck); diagnostic blue-grey triangular bare patch across malar area and ear-coverts and as a separate narrow strip above eye, bordered above by dark brown and finely pale-scaled lores, thin

line of feathering above eye and triangular patch behind eye, and bordered behind by black at rear of ear-coverts; thin white edges of remiges (faintly paler panel in folded wing) and narrow off-white tip of tail; silvery white chin and throat, duller greyish lower throat; breast light brown-grey, sparsely and finely streaked white, merging to paler grey or grey-white on flanks and much of belly, and to whitish in centre of lower belly, vent and undertail-coverts; undertail light grey, narrow off-white tip and edges of rectrices; underwing light grey-brown, narrow white scaling on outer wing-coverts and darker grey-brown trailing edge and tip; iris brown to dark brown, black orbital ring; bill black, or black with blue-grey base and gape; legs slate-grey to black. Sexes alike in plumage, male slightly larger than female. Juvenile is similar to adult but slightly browner above (including marginal and median secondary coverts), with fine paler brown scaling throughout, fine yellow-green edges on greater coverts and remiges (greenish panel on folded wing), narrow whitish fringes at tips of primaries, fine yellow-green edges and slightly wider pale tip on rectrices (suffused brownish in centre), bright yellow chin and throat merging to warm-brown breast tinged yellow, gape yellowish and swollen, and some have downy band across lower throat continuous with hindneck-collar; immature similar to adult but appearance varies greatly with wear and fading during first year, initially differs from adult in bold white scalloping on upperbody, bright yellow chin and upper throat merging to yellow wash on lower throat and upper breast, which also overlaid with scattered fine yellow streaks and (on lower breast), fine white streaks, prominent yellow patch on side of lower breast, also retains juvenile tail and remiges and some or all upperwing-coverts; with wear and fading in first year plumage much more adult-like, with upperbody plain brown-grey (white scalloping reduced or lost), chin and throat whitish, usually with few yellow-tipped feathers on throat, and yellow of lower throat and breast much reduced. Races differ only slightly in plumage (mainly colour and pattern of underbody) and size (especially bill): *sordidus* is similar in size to nominate but with significantly longer bill, has slightly browner and mottled upperparts, slightly darker, dirty grey underbody, diffuse dusky mottling on breast; *papuensis* is smaller than nominate, and generally darker, with bolder white feather tips on breast, bare facial skin possibly paler, light blue-grey, and iris described as grey (not brown) but confirmation needed. **VOICE.** Not well known. Variety of calls, and can be very noisy (though usually not so noisy as larger congeners). Song in breeding season in Australia consists of a mellow somewhat melodic "che-weep, che-wip, che-wip, che-will, che-will", elements of songs can be given separately, e.g. in New Guinea often a repeated, moderately high-pitched, liquid mellow double whistle, "tlew" or "chiew", probably elements of song. Also utter continuous discordant chatter, especially when in flocks, and short note in alarm; repeated call given occasionally while advancing towards feeding conspecific.

Habitat. In New Guinea occupies savanna woodland and monsoon forest. In Australia common in wide range of open sclerophyll forests and woodlands dominated by eucalypts, typically with grassy ground layer or sparse understorey of shrubs and grasses, though sometimes with denser understorey of shrubs or a secondary layer of trees and saplings, e.g. forest and woodland dominated by river red gums (*Eucalyptus camaldulensis*) and often with understorey of *Acacia* or, in riparian associations, dense stands of lignum (*Muehlenbeckia*), or woodland dominated by black box (*Eucalyptus largiflorens*) and coolibah (*E. coolabah*) with understorey of saltbush (*Atriplex*); also often in mixed forest or woodland combinations of *Eucalyptus*, *Acacia*, e.g. brigalow (*Acacia harpophylla*), gidgee (*Acacia cambagei*) or mulga (*Acacia aneura*), cypress-pine (*Callitris*) or casuarina, with understorey of scattered trees and shrubs, or in mixed woodland dominated by broadleaf species such as *Excoecaria* and *Bauhinia*, with *Eucalyptus*, *Terminalia* and *Atalaya* present, and sparse layer of shrubs over grassy ground layer. Recorded also in range of other woodland or forest associations, including riverine or swamp paperbark (*Melaleuca*) forest, woodlands or thickets (particularly in N Australia), and *Acacia* woodlands or thickets, e.g. of gidgee, mulga, brigalow, pindan (*Acacia tumida*) or lancewood (*Acacia shirleyi*); less often, riverine forest dominated by casuarina or silky oak (*Grevillea robusta*), or woodland or low forest of *Banksia*. Common in some modified

habitats, particularly with flowering trees, such as parks and gardens in towns and cities, orchards, or isolated trees or remnants in agricultural land. Sometimes in coastal heathland, shrubland or scrub, or in mangroves; very rarely in wet sclerophyll forest, mallee, or patches of monsoon rainforest. From coast and inland slopes and plains to at least 900 m in Australia; lowlands in New Guinea.

Food and Feeding. Predominantly nectar and invertebrates (mainly insects, also spiders); also flowers, fruit and seeds. Forages at all levels, mostly in trees and shrubs and often in canopy. Exploits wide variety of substrates: frequently at flowers, but also inner and outer foliage and, sometimes, dead foliage, bark of trunks and large branches of trees (including dead branches), stems, and in shrubs; only occasionally on ground or in air. Nectar obtained by probing flowers; gathers invertebrates mainly by gleaning (including from nectar-bearing flowers), also by flutter-chasing (scrambling roughly through foliage and catching dislodged arthropods as they fall or land below), sallying (including sally-striking at foliage or in air and sally-hovering), and by probing. Near Darwin, in Northern Territory, foraged on flowers that provide best sources of nectar, mainly those with stameneriferous cups, e.g. *Eucalyptus* (50-3%), brush inflorescences, e.g. *Banksia* and *Melaleuca* (9-8%) and gullet-shaped flowers, e.g. *Grevillea* (12-3%). Usually singly, in twos (probably pairs), or in small loose parties of 6-20 individuals at food sources, such as flying insects around tops of trees or at flowering eucalypts, paperbarks or grevilleas; large gatherings, of up to 500, occasionally reported. Often forages with other honeyeaters, especially *P. corniculatus* and *Anthochaera carunculata* in Australia, and *P. buceroides* and *P. corniculatus* in New Guinea; in NE Queensland, seen feeding in mixed-species flocks with up to five other meliphagid species.

Breeding. Nestlings recorded in Apr and late Oct and fledglings early Apr in New Guinea; in Australia season Aug-Apr (clutches Sept-Apr in N, Aug-Feb in E & SE); possibly double-brooded. All following details from Australia. Nest a large, deep, open and loosely woven cup, sometimes frail (contents visible from below), usually made of strips of bark, grass or plant stems and vines, bound with spider web or wool, lined with finer grass, plant fibre, rootlets and feathers (other materials include rootlets, twigs and leaves, casuarina needles, hair), external diameter 11-4-14 cm, depth 8-4-10-2 cm, internal diameter 7-6-10-2 cm, depth 5-7-8-9 cm; supported by rim in fork or twigs, often in outer branches or drooping foliage, sometimes in mistletoe (Loranthaceae), nearly always in live tree near or overhanging water and often well concealed among dense foliage, 1-19 m (mean 6-3 m) above ground; often in same tree as, or near, active nest of Magpie-lark (*Grallina cyanoleuca*) or Willie Wagtail (*Rhipidura leucophrys*) or, less often, a range of other species. Clutch usually 2-3 eggs, sometimes 4, mean 2-44 (mean clutch size possibly decreasing from S to N); incubation probably by female only, period 13-16 days; chicks fed by both sexes, nestling period 13-15 days; one brood fed for 10 or more days after fledging. Nests parasitized by Common Koel (*Eudynamis scolopacea*). From 24 eggs in nine nests at which outcome known, overall success 0-67 fledged young per nest.

Movements. Not properly known. Appears largely resident throughout range, but partly migratory in SE Australia; undertakes at least local, or possibly regional, movements to exploit spatial and temporal variation in nectar and insect resources; occurrence or abundance often associated with flowering of foodplants. Widely classed as nomadic, but many such observations probably refer to local or regional movements. General tendency to shift towards N tropics for winter and to vacate N extremes of range in wet season; over much of N Australia appears predominantly resident, or occurs throughout year, but some indication of partial seasonal movement towards coast in dry season, and appears to vacate S Northern Territory range in winter; also highly mobile at local scales, and numbers at sites correlated with flowering, e.g. at Berry Springs (Northern Territory) density strongly and positively correlated with overall availability of nectar. At least partly migratory in S & SE of range; migratory populations move N in autumn and early winter, and return S from mid-winter to early to late spring (return to SW New South Wales as late as Oct in some years); extent of N migration not known, but some passage to SE Queensland, and some indication of augmentation of NE populations with migrants. Some occurrences relate to climatic factors, e.g. irregular occurrence or concentrations in SE & NE Australia attributed to drought or sustained winds. Scattered records outside normal range; vagrants on islands of Torres Strait possibly of nominate race.

Status and Conservation. Not globally threatened. In New Guinea generally fairly common to common, and locally abundant; common in Australia. No estimates of total abundance, but recorded densities of 0-03-6-13 birds/ha in Australia.

Bibliography. Aumann (1991), Barrett *et al.* (2003), Beehler *et al.* (1986), Blakers *et al.* (1984), Boeckel (1976, 1979b, 1980a), Brooker *et al.* (1990), Campbell (1900), Colston (1974), Cooney *et al.* (2006), Crawford (1972), Deignan (1964), Emison *et al.* (1987), Finch (1982b), Franklin (1997), Franklin & Noske (1998, 1999, 2000a), Frith & Hitchcock (1974), Gannon (1962), Gilmore (1985), Gosper (1986, 1992), Griffioen & Clarke (2002), Hannah *et al.* (2007), Higgins (1999), Higgins *et al.* (2001), Johnstone (1983), Johnstone & Storr (2004), Johnstone *et al.* (1977), Jones, D.N. (1983, 1986), Jones, M.V. (1981), Keast (1968a, 1985a), Lavery *et al.* (1968), Le Souëf (1903), Leach (1988), Leach & Hines (1987), Leach & Watson (1994), Loyn (1985b), Mayr & Rand (1935, 1937), McFarland (1988, 1994b), McKean (1985), McKeown (1936), McLean (1995), Mees (1982), Miller (1939), Morris *et al.* (1981), Nielsen (1991, 1996), North (1907), Noske (1996), Noske & Franklin (1999), Officer (1971), Pizzey (1980), Rand (1942a), Rand & Gilliard (1967), Roberts & Ingram (1976), Sage (1994), Schodde (1976), Schodde & Mason (1999), Schönwetter & Meise (1981), Sedgwick (1988b), Storr (1977, 1984), Traill *et al.* (1996), Turner (1992), Verbeek *et al.* (1993), Wheeler (1967b), Woinarski (1990, 1993), Woinarski & Fisher (1995a, 1995b), Woinarski & Tidemann (1991), Woinarski *et al.* (1988).

167. Grey Friarbird

Philemon kisserensis

French: Polochion de Kisar **German:** Graulederkopf **Spanish:** Filemón de la Kisar

Taxonomy. *Philemon kisserensis* A. B. Meyer, 1884, Kisar, south Banda Sea, Lesser Sundas. Forms a superspecies with *P. inornatus*, *P. brassi* and *P. citreogularis*; often treated as a race of last, but such treatment anomalous in relation to biogeography of these species. Monotypic.

Distribution. Kisar, Leti and Moa, off E Timor, in E Lesser Sundas.



Descriptive notes. 25 cm. Rather small friarbird, with moderately long and slightly decurved bill lacking casque. Plumage is plain brownish-grey above, with narrow off-white tip of uppertail, and thin pale edges of remiges; fairly narrow and triangular blue-grey bare facial patch bordered above by narrow dark brown and finely scaled paler lores and supercilium, and bordered behind by black-brown rear ear-coverts; pale grey to silvery grey downy half-collar on hindneck and side of neck; chin and upper throat white to silvery white, merging to pale brownish-grey lower throat and breast overlaid with some whitish streaks;

brownish-grey of breast merges with paler grey or greyish-white lower underbody, palest in centre of lower belly, vent and undertail-coverts; undertail light grey with narrow off-white tip and edges, underwing light grey-brown with darker grey-brown trailing edge and tip; iris brown to dark brown; bill black or grey-black; legs slate-grey to black. Sexes alike in plumage, male probably larger than female. Juvenile and immature undescribed. VOICE. No information.

Habitat. No information.

Food and Feeding. No information.

Breeding. No information.

Movements. No information.

Status and Conservation. Not assessed. Status uncertain, as generally listed as race of *P. citreogularis*; probably not globally threatened. Restricted-range species; present in Banda Islands EBA. Very poorly known, and no current information on biology or status. Formerly considered common, and possibly still is.

Bibliography. Coates & Bishop (1997), Trainor (2003b), White & Bruce (1986).

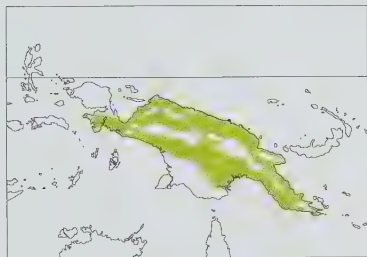
168. Meyer's Friarbird

Philemon meyeri

French: Polochion de Meyer **German:** Zwerglederkopf **Spanish:** Filemón de Meyer
Other common names: Dwarf Friarbird

Taxonomy. *Philemon meyeri* Salvadori, 1878, Rubi, Geelvink Bay, north-west New Guinea. Monotypic.

Distribution. Widespread in New Guinea from Bomberai Peninsula (Fakfak Mts and Kumawa Mts), and E from head of Geelvink Bay and, in S, E from Fly R.



Descriptive notes. 22 cm; male 53-58 g, female 46-54 g. Small, rather drab and non-descript friarbird with proportionately long, moderately heavy and slightly decurved bill lacking protuberance at base, and with little bare skin on head. Plumage is uniformly dark grey-brown to dusky brown above, faintly and diffusely streaked blackish-brown, and paler grey-brown below, with small area of bluish-black to blackish bare skin over lores and narrowly around eye; plumage becomes much browner with wear and fading; iris dark brown; bill black; legs slate-grey. Sexes alike. Juvenile is similar to adult, but back to uppertail-coverts finely scaled or spotted off-white, outer secondaries and inner primaries finely edged yellow-olive (diffuse pale panel on folded wing), rectrices also finely edged yellow-green, throat washed bright bronze-yellow, upper breast diffusely barred dark brown and bronze-yellow (by time when wings and tail fully grown, warm brown of lower throat and breast are broken up by beginnings of immature plumage, with prominent yellow patch on side of breast and bright yellow wash on lower throat and upper breast); immature like adult, but with bronze-yellow wash across upper breast. VOICE. At times calls loudly for long periods from exposed perch high in tree. Advertising call is a short but loud, high-pitched and downslurred whistled "tiew", "teeuw" or "weeeeu", repeated several to many times at intervals of 2-3 seconds or longer, and often given in middle of day. Song a jumbled series of 12 or more notes alternating in pitch (a tone apart), "peet o weet" or "wee to wee to wee to...", delivered at rate of 5 notes per second, similar to call of *Xanthotis flaviventer*.

Habitat. Rainforest, forest edge, swamp-forest, tall and dense secondary growth and other disturbed areas, such as sides of roads and tracks. In examination of vegetation succession (from gardens to forest) resulting from slash-and-burn agriculture in lowland New Guinea, recorded mainly in late regrowth and undisturbed habitat. Lowlands to c. 1200 m; to 300 m in Kumawa Mts and to 700 m in Fakfak Mts.

Food and Feeding. Fruit, nectar and insects. Mainly in upper canopy, at times descending to upper levels of middle stage or lower in dense secondary growth. Forages mainly in dense outer or upper foliage of crowns of trees (where can be difficult to see), but sometimes in leafless trees; often in flowering trees, including patches of low sago palms (*Metroxylon*). Of 71 observations of foraging in lowland rainforest at Brown R, most in upper canopy 30-35 m above ground (54%) and lower canopy 25-30 m above ground (39%), with rest in subcanopy at 8-25 m (7%); not recorded as foraging in understorey or emergent trees. Usually seen singly or in twos (probably pairs); sometimes with other species in flowering trees; chases smaller honeyeaters from trees.

Breeding. One clutch of 2 eggs (described). No other information.

Movements. Few data. Resident at Brown R, in S New Guinea; may move locally from hill forest to lower altitudes to exploit flowering trees.

Status and Conservation. Not globally threatened. Not well known. Considered generally common to abundant; e.g. abundant in Lakeamu Basin. Density in lowland rainforest near Brown R 0-2 birds/ha.

Bibliography. Anon. (1978a), Bailey (1992), Beehler (1995), Beehler *et al.* (1986), Bell (1969, 1970c, 1982a, 1982c), Bowman *et al.* (1990), Coates (1990), Coates & Peckover (2001), Diamond (1972a, 1985), Finch (1980b, 1983), Fletcher (2000b), Gilliard & LeCroy (1967a, 1968), Hartert (1930), Mack (1998), Mack & Alonso (2000), Mayr & Rand (1937), Pearson, D.L. (1975), Rand (1942a), Rand & Gilliard (1967), Richards & Suryadi (2002), Schönwetter & Meise (1981).

Genus *MELITOGRAIS* Sundevall, 1872

169. White-streaked Friarbird

Melitograis gilolensis

French: Polochion strié **German:** Halmaheralederkopf **Spanish:** Filemón Estriado
Other common names: White-streaked Honeyeater, Bonaparte's/Gilolo/Striated Friarbird

Taxonomy. *Tropidorhynchus gilolensis* Bonaparte, 1850, Gilolo Island = Halmahera. Genus formerly subsumed in *Philemon* and considered closely related to latter. Monotypic.
Distribution. Morotai, Halmahera, Kasiruta and Bacan, in N Moluccas.



Descriptive notes. 23 cm; one male 54 g. Distinctive medium-large friarbird-like honeyeater with long, heavy, decurved bill that appears to droop distally. Has top of head off-white, finely streaked dusky grey-brown, patch of bare blue skin from lores and broadly around eye continuing in band from rear of eye across nape; rest of head, neck and upperparts largely brownish-black with olive tinge, with fine white shaft streaks on upperbody; upperwing dark chestnut-brown, richer than rest of upperparts, and uppertail brown; underparts dark brown, with fine white shaft streaks on chin, throat and breast; iris dark, blackish; bill

blackish; legs dark grey to blackish. Sexes apparently alike. Juvenile and immature undescribed. Voice. Main call a moderately high to high-pitched unmusical note, given at rate of c. 1 per second. Also utters harsh rasping note.

Habitat. Inhabits lowland and montane forests, including swamp-forest, forest edge and remnants in grassland and cultivated areas, selectively logged forest and regrowth forest, as well as coconut

plantations and mangroves. Recorded from sea-level up to 960 m on Halmahera, and up to 2130 m on Bacan.

Food and Feeding. Apparently mainly arthropods and nectar, but also small fruits. Forages in flowering trees and shrubs; gleans for arthropods. Quiet and inconspicuous; usually seen singly, also in twos (probably pairs) or in small parties. Aggressive, but sometimes forages with other species, e.g. seen in canopy of flowering *Albizia* with flowerpeckers (*Dicaeum*), sunbirds (of genera *Leptocoma* and *Cinnyris*) and leaf-warblers (*Phylloscopus*), though with much chasing; on Halmahera and Bacan single birds apparently defended crowns of flowering trees, and one seen to chase and disperse a small flock of Northern Golden Bulbuls (*Thapsinillas longirostris*), and another defended a flowering *Erythrina* tree, continually darting out at other birds that attempted to feed in tree. On Halmahera, often forages with *Myzomela obscura*, which people of Jailolo region consider to be the young of present species.

Breeding. Male with enlarged gonads in Sept. No other information.

Movements. No information; probably resident, with some local movements.

Status and Conservation. Not globally threatened. Restricted-range species: present in Northern Maluku EBA. Moderately common on Halmahera; earlier was considered scattered and seen only infrequently on Halmahera and Bacan.

Bibliography. van Bemmelen (1948), Coates & Bishop (1997), Poulsen & Lambert (2000), Ripley (1959d, 1961b), Statfield *et al.* (1998), White & Bruce (1986).



PLATE 53

PLATE 53

Family MELIPHAGIDAE (HONEYEATERS) SPECIES ACCOUNTS

Genus *XANTHOTIS* Reichenbach, 1852

170. Spotted Honeyeater

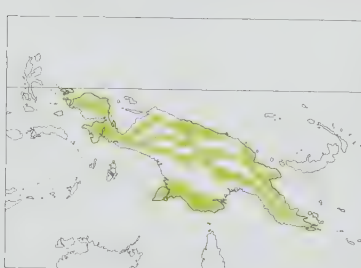
Xanthotis polygrammus

French: Méliophage moucheté **German:** Drosselhonigfresser **Spanish:** Mielero Manchado
Other common names: Spotted Xanthotis, Gray's/Many-spotted Honeyeater

Taxonomy. *Ptilotis polygramma* G. R. Gray, 1862, Waigeo, West Papuan Islands. Genus formerly subsumed in *Meliphaga* by some authors. Six subspecies recognized.

Subspecies and Distribution.

X. p. polygrammus (G. R. Gray, 1862) – Waigeo, in West Papuan Is.
X. p. kuehni E. J. O. Hartert, 1930 – Misool, in West Papuan Is.
X. p. poikilosternos A. B. Meyer, 1874 – Salawati (in West Papuan Is), and mountains of NW & W New Guinea (Vogelkop and E at least to Victor Emanuel Mts).
X. p. septentrionalis Mayr, 1931 – mountains of N New Guinea from Mamberamo R E, including Cyclops Mts and mountains of Sepik R region, to Adelbert Mts.
X. p. lophotis Mayr, 1931 – mountains of Huon Peninsula and SE New Guinea (E from at least Karimui).
X. p. candidior Mayr & Rand, 1935 – S New Guinea (S Trans-Fly region).



upper ear-coverts; ear-coverts bordered behind by bold yellow auricular plume that angles up and back onto side of neck; mantle, back and scapulars dark olive-brown, boldly but irregularly barred or scaled white and overlaid with varying olive-green wash (sometimes white spotting of hindneck

Descriptive notes. 15–17 cm; male 19.7–23.5 g and female 18–19.5 g (*lophotis*), 19 g and 25 g (*poikilosternos*), one male 20 g (*kuehni*). Distinctive, medium-small honeyeater with moderately long and slightly decurved bill. Race *lophotis* has top and side of head and neck dark olive-brown to black-brown, fine white spotting on hindneck; large, fleshy partial orbital ring yellow to yellow-orange above eye, merging to pink behind or below eye (or both), or to grey beneath eye, broken at front by blackish lores and bordered below by blackish moustachial stripe that continues across lower ear-coverts, isolating small patch of pale grey on

continues onto upper mantle), rump and uppertail-coverts olive-brown to brownish-olive; uppertail olive-brown, slightly greener edges of rectrices; upperwing dark brown to dark olive-brown, small off-white to olive-white tips on smaller wing-coverts, yellowish-olive fringes and larger off-white tips (sometimes tinged olive) on greater coverts, fairly broad yellowish-olive outer edges on remiges (strong olive panel on folded wing); chin and throat pale grey, short, narrow and diffuse blackish malar stripe; underbody cream to pale creamy buff, weak olive tinge at side of breast, and fine olive-brown streaking over upper breast merging into boldly flecked or spotted lower underbody, large bold triangular marks throughout, most densely on lower breast (where black markings enclose small white spot at tips); undertail brownish-grey, olive tinge at edges of rectrices; underwing-coverts white, merging to buff across bases of remiges, and with silvery grey-brown trailing edge and tip; iris black-brown to black; bill black; legs grey. Sexes alike in plumage, male larger than female. Juvenile is like adult, but auricular plume paler, sometimes washed grey, mantle, back and scapulars tinged yellowish-olive, rufous-buff tips on upperwing-coverts, fine buff tip on tail, underparts less boldly spotted, gape yellow and more prominent than in adult. Race *candidior* is like *lophotis*, but black of feather centres of back less distinct, and underbody whiter, with finer black streaking and smaller black spotting or flecking; nominate race lacks yellow auricular plume; *kuehni* has top of head olive with dusky mottling or streaking, prominent yellow auricular plume, and yellow tinge on mantle, back and scapulars; *poikilosternos* has much-reduced auricular plume, olive tinge on top of head, and yellowish tinge on mantle, back and scapulars and underbody; *septentrionalis* has auricular plume barely visible, upperparts slightly paler and duller than previous and with only very fine white streaks or speckles, greyish underbody lacking olive tinge, also iris of one adult male described as blue-grey. **Voice.** Fairly quiet, but small groups can be noisy. Vocalizations include brief upslurred disyllabic musical whistle, “wu-dée”, repeated many times at intervals of 1.5–3.5 seconds; repeated trisyllabic phrase from individuals in small parties; occasional “tup”. Main vocalization also described as a repeated mechanical series of notes in descending pattern.

Habitat. Lowland, foothill and lower montane primary rainforest, foothill monsoon forest, secondary forest, edges of forest and, in lowlands, dense savanna. Sea-level to c. 1500 m; mainly in foothills and lower mountains, but commonly in lowlands in Trans-Fly region and around Port Moresby, and locally at base of foothills.

Food and Feeding. Primarily insectivorous; also takes nectar and fruit, including figs (*Ficus*). Forages mainly in canopy to lower middle storey (including on vines), as well as in understorey. Of 97 observations of foraging in lowland rainforest at Brown R (in SE of range), most were in understorey (49%), including 35% from ground to 2 m above ground) and in upper canopy at 30–35 m (37%), with fewer in lower canopy 25–30 m above ground (7%) and in subcanopy at 8–25 m (7%); not recorded foraging in emergent trees; in Eastern Highlands, when in flowering trees, foraged evenly in upper canopy and in lower canopy. Distribution of foraging heights reflects types of food being sought, with most nectar-feeding in canopy and much insectivory at lower levels. Typically forages in foliage, especially among dead curled leaves, gleaning arthropods (including caterpillars), but also in flowering or fruiting plants. At Brown R study site foraged mostly

among flowers (70% of observations) and foliage (18%), with rest on branches (7%) of rainforest trees and at fruits (5%); all observations described as involving gleaning, but this probably includes probing. Usually seen singly, less often in twos or threes; sometimes associates loosely with other meliphagids or other bird species at food sources, and commonly displaced by similarly sized congener *X. flaviventer* in flowering trees in Eastern Highlands; sometimes in mixed-species flocks.

Breeding. Single record (without details) in Mar, and indirect evidence of breeding in Sept (one in breeding condition), Oct (three females with ovaries enlarged or becoming enlarged) and Jan (three in breeding condition). No other information.

Movements. Few data. Resident at Crater Mt and Brown R (E & SE New Guinea), probably with some local movements. Only recoveries of ringed birds were at site where initially ringed, and more than one year later.

Status and Conservation. Not globally threatened. Generally common to uncommon. Estimated density in lowland rainforest near Port Moresby (SE New Guinea) 1 bird/10 ha. No estimates of global population.

Bibliography. Beehler (1978a), Beehler, Pratt & Zimmerman (1986), Beehler, Sengo *et al.* (1995), Bell (1982a, 1982b, 1982c, 1984a, 1984b), Brown & Hopkins (1996), Coates (1990), Coates & Peckover (2001), David & Gosselin (2002b), Diamond (1972a), Finch (1980b, 1983), Gilliard & LeCroy (1961, 1967a), Gregory (1995b), Gylstenloot (1955b), Hartert (1930), Lamothe (1979), Mack & Wright (1996), Mayr & Rand (1935, 1937), Ogilvie-Grant (1915), Rand (1942a, 1942b), Ripley (1964), Schodde & Hitchcock (1968), Stein (1936), Terborgh & Diamond (1970), Watson *et al.* (1962).

171. Macleay's Honeyeater

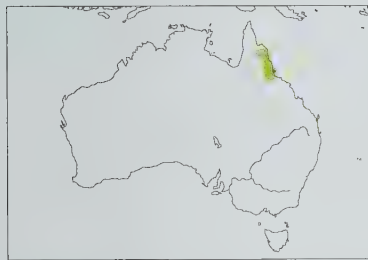
Xanthotis macleayanus

French: Méliphage de Macleay **German:** Kappenhonigfresser **Spanish:** Mielero de Macleay
Other common names: Buff-striped/Mottled/Mottle-plumaged/Yellow-streaked Honeyeater

Taxonomy. *Ptilotis macleayana* E. P. Ramsay, 1875, Cardwell, Rockingham Bay, Queensland, Australia.

Genus formerly subsumed in *Meliphaga* by some authors. Monotypic.

Distribution. NE Queensland from Cooktown S, including Hinchinbrook I and extending inland to W slopes of Atherton Tableland, to S Paluma Range, and occasionally farther (to The Pinnacles, SW of Townsville), in NE Australia.



Descriptive notes. 17–21.5 cm; male 30–39 g, female 25.5–31 g. Highly distinctive, medium-sized honeyeater with rather short tail, and long, rather hefty, slightly decurved bill. Has top of head and neck dull black, spotted white on centre of nape and hindneck; orange-brown lores, eyering and malar area combine to form pale patch surrounding eye and enclosing prominent narrow white gape-stripe and pinkish-white subocular patch, bordered behind and below by golden-yellow to ochre plumage across upper ear-coverts; chin, throat and side of neck pale grey, with olive wash on lower throat; upperbody blackish-brown, diffuse yellowish streaking on

mantle merging to bold white streaking on scapulars, and with diffuse olive mottling on rest of upperbody; uppertail and upperwing dark brown, all rectrices with narrow greenish-yellow edges, bold white streaks at tips of smaller secondary coverts, narrow greenish-yellow edges and white “rosethorns” at tips of greater coverts and tertials, narrow greenish-yellow edges on remiges; upper breast pale grey with olive-yellow wash and yellowish-white streaking, diffuse greenish-yellow patch at side of upper breast; lower breast, belly and upper flanks coarsely streaked blackish-brown and white, merging to almost uniform greyish-brown on lower underbody; undertail dark grey; underwing pale yellow along leading edge, merging to pink-buff on greater coverts and bases of remiges, and with dark grey trailing edge and tip; iris black-brown, narrow light grey orbital ring; bill black; legs blue-grey. Sexes alike in plumage, male larger than female. Juvenile is very similar to adult but duller overall, with smaller and duller pale spotting and streaking on nape, hindneck and upperbody, paler and greyer below, with fainter pale streaking and very faint olive-yellow wash on breast. **VOICE.** Calls loud and conspicuous, but species usually quiet. Song a rapid somewhat musical call of 2 or 3 disyllabic notes, rendered “t-wit, t-weee, t-whit” or “chewit-che-wew” or as brisk rollicking “pchee, cherreep”. Also utters single loud ringing “chip” and a churring call.

Habitat. Mainly rainforest, mostly low-altitude forests (including mesophyll vine forest and complex notophyll vine forest), but also often at rainforest edges, in open *Eucalyptus* forests and woodlands, and in parks, gardens and orchards in towns, also in picnic grounds within rainforest; occasionally in mangroves. May prefer primary rainforest over secondary forest, but often recorded in secondary growth and, sometimes, logged forest. Sea-level to c. 1100 m.

Food and Feeding. Mainly insectivorous; also takes nectar and fruit, including small figs (*Ficus*). Forages at all levels of forest, particularly upper and middle storeys, but mainly in canopy; mostly among foliage of crowns of trees and epiphytes or vines, or on bark. In rainforest at Lacey's Creek, foraged mainly in canopy and sometimes in emergent trees, only rarely on ground; searched mainly in clumps of dead foliage and among live foliage, twigs and small branches, with rest of foraging time spent at flowers, fruits and seeds, or in air. Also seen to feed at sap-flows from incisions cut into trunks of *Eucalyptus* trees by yellow-bellied gliders (*Petaurus australis*). Captures insects by gleaning and probing, and probes flowers for nectar, often hanging upside-down while feeding; also sallies for insects, and reported as sometimes climbing trunks in manner of Australasian treecreeper (*Climacteridae*). Active, but quiet and unobtrusive; can be noisy when foraging through dead foliage. Usually seen singly or in twos (probably pairs), sometimes in small flocks, and may gather in groups of up to 30 individuals at food sources (including birdfeeders); sometimes forages with other species, such as Victoria's Riflebird (*Ptiloris victoriae*), *Meliphaga lewinii*, *Myzomela obscura* and Silvereye (*Zosterops lateralis*). Aggressive towards conspecifics and other species of similar size.

Breeding. Poorly known. Breeding (including fledglings) reported in Sept–Dec and Feb–Mar, with eggs Oct–Dec and nestlings Oct. Nest a rather small, deep cup made of palm fibre, small leaves, bark or other plant material, and some spider egg sacs, lined with palm fibre and a few feathers, one nest had external diameter 8.3 cm, depth 10.2 cm, internal diameter 5.7 cm, depth 6.4 cm; attached by rim to several twigs or in thin forked horizontal branch, in vines or other foliage, usually in crown of tree but sometimes in shrub. Clutch 2 eggs; female incubates, but not known if male assists, and both parents feed nestlings; no information on duration of incubation and nestling periods

Movements. Resident; possibly some seasonal altitudinal movements near Cooktown, moving to higher altitudes in Dec–Jan.

Status and Conservation. Not globally threatened. Restricted-range species: present in Queensland Wet Tropics EBA. Locally common. No estimates of numbers or density.

Bibliography. Alexander (1926), Barnard (1926), Barrett *et al.* (2003), Blakers *et al.* (1984), Boles & Longmore (1989), Bourke & Austin (1947), Bravery (1970), Colston (1974), Cooney *et al.* (2006), Crome (1978), David & Gosselin (2002b), Gannon (1962), Gill, H.B. (1970), Griffin (1974, 1995), Griffioen & Clarke (2002), Higgins *et al.* (2001), Keast (1968a), Kikkawa (1982), Laurance *et al.* (1996), Lavery (1986), McLean (1995), Nielsen (1996), North (1907), Officer (1971), Pizzey & Knight (1997), Schodde & Tidemann (1986), Storr (1984), Wheeler (1967b).

172. Tawny-breasted Honeyeater

Xanthotis flaviventer

French: Méliphage à ventre fauve

Spanish: Mielero Ventrihabano

German: Ockerbrust-Honigfresser

Other common names: Tawny-breasted/Brown Xanthotis, Buff-breasted/Streaked/Streak-naped/Honey-breasted/Rufous-breasted/Brown(!) Honeyeater

Taxonomy. *Myzantha flaviventer* Lesson, 1828, Dorey = Manokwari, Vogelkop Peninsula, New Guinea. Genus formerly subsumed in *Meliphaga* by some authors. Species sometimes referred to by name of *X. chrysotis*; was originally described under name *Philedon chrysotis*, but this invalid, as preoccupied, and species subsequently renamed. Taxonomy not fully understood, and number of races recognized varies from fewer than ten to 14; validity of those listed below requires confirmation. Races intergrade where they meet, and several proposed races appear to be from zones of intergradation: *rubensis* (described from Rubi, at head of Geelvink Bay) is probably an intergrade between nominate and *saturator*; *giulianietii* (Avera, on Aroa R, in SE New Guinea) is between *saturator* and *visi*; and *kumusi* (Kumusi R, on N coast of SE New Guinea) is considered an intergrade between *visi* and *madaraszii*. Further, described race *tararae* (Tarara, Wassi Kussa R, c. 140 km W of Daru, in S Trans-Fly) is synonymized with *saturator*, and *austera* (Tamulol, on Misool I) with nominate. On basis of plumage characters, races fall into five groups: greenish nominate and *fusciventris*; plain dusky grey *meyeri*, *philemon* and *madaraszii*; rufescent *visi*; white-faced and ventrally spotted *spilogaster*; and bare-faced and fawn-breasted *filiger* and *saturator*. Nine subspecies tentatively recognized.

Subspecies and Distribution.

X. f. fusciventris Salvadori, 1876 – Waigeo and Batanta, in West Papuan Is.

X. f. flaviventer (Lesson, 1828) – Salawati and Misool (West Papuan Is), and NW New Guinea Vogelkop.

X. f. meyeri Salvadori, 1876 – Yapen I, in Geelvink Bay (NW New Guinea).

X. f. philemon Stresemann, 1921 – N New Guinea from Mamberamo R E to Huon Peninsula.

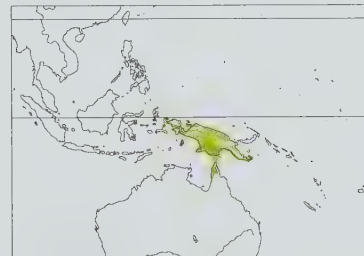
X. f. madaraszii (Rothschild & E. J. O. Hartert, 1903) – NE New Guinea (E from Astrolabe Bay to Huon Peninsula and Markham Valley, S to Wau).

X. f. saturator (Rothschild & E. J. O. Hartert, 1903) – Aru Is, S New Guinea (from Mimika R E to Fly R and Gulf of Papua), and islands in N Torres Strait (including Saibai, Boigu and Daru).

X. f. visi (E. J. O. Hartert, 1896) – S & SE New Guinea E from Huon Gulf and Gulf of Papua to about Milne Bay.

X. f. spilogaster (Ogilvie-Grant, 1896) – Trobriand Is and D'Entrecasteaux Archipelago (including Goodenough, Ferguson and Normanby), off SE New Guinea.

X. f. filiger (Gould, 1851) – NE Queensland (Cape York Peninsula S to about Edward R in W and to McIlwraith Range–Rocky R–Silver Plains Station in E), in NE Australia.



Descriptive notes. 18–21 cm; male 33–41 g and female 26.5–37 g (*filiger*), male 47–50 g and female 38–44.5 g (nominate), male 46–54 g and one female 40–5 g (*philemon*), sexes combined average 39 g (*visi*), male 43–54 g and female 37–49 g (*meyeri*), male 40–55 g and female 38–49 g (“*rubensis*”). Medium-sized, rather drab honeyeater with long, fairly hefty and slightly decurved bill. Nominate race is dark brown with strong olive-green tinge on top of head, neck and upperbody, with obscure fine pale-grey spotting on nape and hindneck (spots sometimes lacking); lores, malar area and narrow line of feathers around eye olive-brown,

paler than top of head, divided by bold whitish stripe of bare skin extending from gape below eye and tapering behind eye to narrow streak over upper ear-coverts; ear-coverts, side of neck, chin and throat grey (paler on chin and throat), small yellow plumbe bordering rear edge of ear-coverts; uppertail and upperwing dark olive-brown, fine olive edges on rectrices, fine buff edges on remiges (large buff panel on folded wing), fine buff flecks at tips of lesser and median secondary coverts and fine buff fringes on greater coverts (in fresh plumage, pale median-covert tips form broken wingbar); breast rufous-buff, washed with olive-yellow, grading to more rufous-brown on lower underbody; undertail dark grey, underwing rich buff with dark grey trailing edge and tip; iris black-brown to brown or red-brown, blue-grey orbital ring; bill black; legs light blue-grey to grey. Sexes alike in plumage, male slightly larger than female. Juvenile is like adult, but separable (in reasonable view) by having yellow auricular plumage smaller and less obvious, rump and uppertail-coverts diffusely washed buff, fine buff tip of tail, buff fringes and tips of secondary coverts slightly broader and bolder, longest feather of alula thinly fringed buff (all dark in adult), edges of remiges richer buff, and underbody duller. Races differ mainly in ground colour and patterning of head, neck and body, and in size: *fusciventris* is like nominate but with weaker rufous tinge on underbody, and with strong olive-green wash on breast and brownish-grey mottling on belly; *filiger* differs from nominate in being dark olive-brown (less greenish) above, grading to grey-black with fine pale grey mottling or spotting on nape and hindneck, also has rich buff (rather than rufous) breast merging to grey-buff on vent, with faint olive-green wash and faint paler streaks on upper breast, and bolder creamy streaks and spots on belly; *saturator* differs from previous in darker olive-brown upperbody, contrasting with olive-brown of top of head and grey-black and indistinctly spotted (or unspotted) nape and hindneck, little or no pale spotting on belly, and anterior part of pale facial stripe often broken and obscure (or absent); *visi* is similar to last but with much yellower facial stripe, more rufescent ground colour above, and strong yellowish-brown lower underbody; *spilogaster* also is similar, but with some obscure yellowish-white spots on breast; *philemon* is much duller, darker and plainer than preceding races, entire upperparts drab dark brown, darker blackish-brown on top and side of head,

with deep orange plume on rear edge of ear-coverts, and dull pale brown below, slightly paler and greyer on chin and throat; *meveri* is very like last, but crown on average darker, blackish, and breast greyer, with faintly darker grey mottling; *madaraszii* also is like *philemon* but paler above, with olive wash on mantle, scapulars and upper back. **VOICE.** Not noisy, but commonly heard throughout day. Main call a series of rather loud single whistles, rising and falling in pitch and loudness; in E New Guinea, consists of a phrase of usually 3 (sometimes 2) notes, "whit-wut-wu" or "whip-to-whew" (length of phrases 1–1.6 seconds), repeated 3–10 or more times (at rate of c. 6.5–7.5 phrases per 10 seconds); some variation in calls, with one to all notes in phrase disyllabic, or phrase sometimes incomplete; also some apparent geographical variation in phrases and speed of delivery. Antiphonal duets reported. In New Guinea, contact call an excited "tip-tip-tip-tip", given in flight or during foraging in mixed-species flocks, and when disturbed gives high-pitched "tjiewiet-tiet...tjiewiet-tiet" (a characteristic call of forests where it occurs). Other calls include, in New Guinea, a sharp "chup" and a weak "whuk" or "tup"; in Australia, a 3-note call, with emphasis on first or last note (possibly "which-which-which"), and chattering and scolding notes.

Habitat. Mainly dense lowland rainforest (including vine forests, gallery and other riparian associations, and monsoon scrub), forest edge, remnant forest patches, and secondary rainforest, and, in New Guinea, monsoon forest. Also, often in mangrove forests and woodlands (and largely confined to mangroves on Boigu and Saibai, in Torres Strait) and, in Australia, open eucalypt and paperbark (*Melaleuca*) forests and woodlands adjacent to rainforest; in New Guinea, also savanna and swamp-forest. In New Guinea also in many disturbed habitats, such as gardens and secondary growth along roads and tracks, occasionally in towns. On W Cape York Peninsula, isolated occurrences in semi-deciduous dune woodland. Sea-level to c. 1500 m.

Food and Feeding. Mainly insects, including beetles (Coleoptera), grasshoppers (Acridae), cockroaches (Blattodea), cicadas (Cicadidae) and caterpillars; also nectar and fruit, e.g. of figs (*Ficus*). Forages at all levels, mostly in upper canopy, less often in lower canopy and middle stages, only occasionally lower, including on ground. Of 486 feeding observations in lowland rainforest at Brown R (SE New Guinea), most foraging in canopy (total of 54% observations: 33% in lower canopy 25–30-m high, and 21% in upper canopy at 30–35 m) and subcanopy 8–25 m high (35%); rarely lower (10%) or on emergent trees (1%). In Eastern Highlands, when in canopy of flowering trees, foraged significantly more in lower half of canopy than in upper half. Foraged at all levels in mangroves in Torres Strait. Searches among foliage (including dead leaves) of trees and vines, and on and among flowers and fruits, gleaning insects and fruits and probing blossom for nectar (including *Syzgium*); seeks food also on trunks and branches of trees, probing forks and crevices in bark, and, rarely, forages aerially. In Eastern Highlands, not seen to forage in trees with fruits more than 10 mm in diameter. Often hangs upside-down while foraging. At Brown R study site, foraged mostly among flowers (c. 40% of observations) and foliage (29%), at fruits (19%), and occasionally on branches (9%) of rainforest trees; rarely fed aerially (3%); 97% of observations involved gleaning and 3% sallying. Usually unobtrusive, but active and easily observed; can be noisy when foraging. Usually singly, less often in twos (probably pairs) or, occasionally, in small parties of up to eight individuals, some of which family parties of adults and young. Often in same trees as other species, including *Philemon buceroides* and *Myzomela obscura*; also commonly in mixed-species flocks, especially with rufous, brown and black birds, notably Australasian babbler (*Pomatostomus*) and pitohui (*Pitohui*). Can be aggressive towards conspecifics, also aggressive to other species; in flowering trees in Eastern Highlands, commonly displaced similarly sized *X. polygrammus* and *Pycnopygius ixoides*.

Breeding. In New Guinea appears to nest in late dry season to early wet season, and at end of wet season, with breeding noted Aug–Feb and Apr–May (though few records of eggs or nestlings); in Australia reported Sept–Apr (including fledglings Sept, mid-Oct and late Dec, and eggs and nestlings Nov). Nest probably built by female, cup-shaped, woven from strips of bark and bark fibre and leaves, lined with fibre, fine rootlets and fine strips of bark, usually suspended by rim from thin horizontal fork or forks in dense foliage, usually well concealed high in tree or shrub, 3–20 m above ground or water. Clutch 2 eggs; incubation probably by female, both sexes appear to care for and feed chicks and fledglings (once, insects brought to nestling every 2 minutes or so); suggested incubation period c. 15 days and nestling period c. 14 days..

Movements. Resident. In Australia, some may move locally into more open forest in wet season. **Status and Conservation.** Not globally threatened. Abundant and ubiquitous at lower altitudes in New Guinea, and recorded density of 1 bird/ha in lowland rainforest at Brown R; scarcer at higher altitudes, and considered uncommon in surveys in N New Guinea. Common on Torres Strait islands (Boigu and Saibai). Probably uncommon in NE Australia.

Bibliography. Bailey (1992), Barnard (1911), Barrett *et al.* (2003), Beehler (1978a), Beehler & Dumbacher (1996a), Beehler, Pratt & Zimmerman (1986), Beehler, Sengo *et al.* (1995), Bell (1970c, 1982a, 1982b, 1982c, 1982d, 1984a, 1984b), Beruldsen (1979, 1990), Blakers *et al.* (1984), Bishop (1977), Carter *et al.* (1997), Clarke (2004), Coates (1990), Coates & Peckover (2001), Cooney *et al.* (2006), David & Gosselin (2002b), Diamond (1972a, 1987), Diamond & Terborgh (1968), Draffan *et al.* (1983), Finch (1980b, 1983), Fletcher (2000b), Forshaw & Muller (1978), Frih & Frih (1993a), Gannon (1962), Garnett (1987), Garnett & Bredl (1985), Gilliard & LeCroy (1966, 1967a), Greenway (1966), Gregory (1995b), Gregory *et al.* (1996), Gyldestolpe (1955b), Heron (1977a), Hicks (1988b, 1992), Higgins *et al.* (2001), Hoogerwerf (1971), Johnson & Hooper (1973), Jones (1926), Keast (1968a), Kikkawa (1975), Lamothe (1979), Longmore (1991a), MacGillivray (1914, 1917, 1918), Mack & Wright (1996), Mayr & Gilliard (1954), Mayr & Rand (1937), Melville (1979), Murray (1988b), Officer (1967, 1971), Ogilvie-Grant (1915), Pizzey (1980), Rand (1938, 1942a, 1942b), Rand & Gilliard (1967), Richards & Suryadi (2002), Ripley (1957, 1964), Rothschild *et al.* (1932b), Schodde & Hitchcock (1968), Schodde & Mason (1999), Schodde & Tidemann (1986), Schönwetter & Meise (1981), Storr (1973, 1984), Terborgh & Diamond (1970), White (1911).

173. Kadavu Honeyeater

Xanthotis provocator

French: Méléphage de Kandavu **German:** Goldaugen-Honigfresser **Spanish:** Mielero de la Kandavu
Other common names: Provocator/Yellow-faced Honeyeater, Yellow-faced Xanthotis

Taxonomy. *Ptilotis provocator* E. L. Layard, 1875, Kandavu Island (= Kadavu), Fiji. Genus formerly subsumed in *Meliphaga* by some authors. Present species has in the past been placed in genus *Foulehaio* by some authors; formerly placed also in *Meliphacator* or *Ptilotis*, both now defunct. Monotypic.

Distribution. Kadavu, in S Fiji.

Descriptive notes. 16–21 cm. Rather drab, medium-sized honeyeater with moderately long and gently decurved bill. Top of head and hindneck are drab olive-grey, finely spotted or mottled pale grey on crown, merging to longer sparser fine pale grey streaking on lower hindneck; triangular blackish area extends broadly from lower forehead, over lores, to pter on just in front of eye; yellowish-white lores and anterior cheek merge into narrow yellowish supercilium over and behind eye, meeting greenish-yellow ear-coverts, all combining to form large pale yellowish to golden-yellow area surrounding eye, bordered below by broad blackish malar stripe that extends from base of bill and curves around below ear-coverts, terminating in front of small tuft of yellowish feathers on side of neck; chin and throat pale olive-grey, bordered below by gorget of finely brown-streaked



whitish lanceolate feathers (extends onto side of neck); upperparts drab olive-grey, finely streaked white on mantle, back and scapulars, more diffusely streaked white on rump and uppertail-coverts; upperwing and uppertail darker brownish-grey, fine pale tips on median and greater coverts, fine yellow-olive edges of remiges (diffuse paler panel on folded wing), and diffuse yellow-olive outer edges of tail; underparts below gorget slightly paler olive-grey than upperparts, heavily and broadly streaked white (mid-line almost whitish), and merging to largely whitish vent and undertail-coverts, which faintly tinged or mottled olive-

brown; undertail pale brownish-grey; underwing-coverts pale buff, remiges brownish with pale buff inner edges (appearing largely buff); iris grey-brown to brown, eyering pale yellowish; bill black; legs grey-green. Sexes alike in plumage, male larger than female. Juvenile is like adult but strongly tinged yellowish-olive, with upperwing-coverts and shaft streaks of remiges pale yellowish-olive. **VOICE.** Variety of mellow whistling calls or loud, ringing *Philemon*-like calls, or a jumble of whistles that often starts with strong, ringing "kee-kow" (like that of *Foulehaio carunculatus*).

Habitat. Wide range of habitats, including mature montane and lowland forest, secondary forest, coastal scrub and swamps, mangroves, agricultural land; also towns, villages and urban gardens, and other urban and suburban habitats. Occurs from coast to interior.

Food and Feeding. Poorly described. Mainly nectar, as well as some arthropods (insects and spiders). Regarded as ecological equivalent of *Foulehaio carunculatus* on Kadavu.

Breeding. Poorly known. Three clutches found in Sept, and breeding recorded also in May. Nest a fragile cup, made of fine grasses and rootlets, lined with softer material, including thin wiry grass, with cotton and feathers in base of nest, external diameter 10 cm, depth 6.4 cm, internal diameter 6.4 cm, depth 3.8 cm. Clutch usually (or only) 1 egg (all three clutches found); no information on incubation and nestling periods.

Movements. Presumably sedentary.

Status and Conservation. Not globally threatened. Restricted-range species: present in Fiji EBA. Described as very common within tiny global range on single island. No estimates of global population.

Bibliography. Beekun (1993), Blackburn (1971), Clunie (1984), Fisher & Longmore (1995), Gregory (1997), Layard (1876b), Mayr (1932, 1944b, 1945b), Myers (2004), Pernetta & Watling (1978), duPont (1976), Pratt *et al.* (1987), Schönwetter & Meise (1981), Watling (1982a, 2001).

Genus PLECTORHYNCHA Gould, 1838

174. Striped Honeyeater

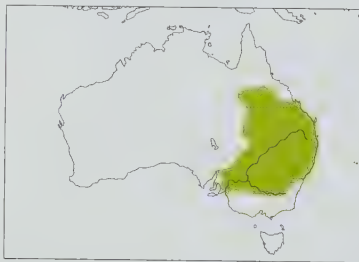
Plectorhyncha lanceolata

French: Méléphage lancéolé **German:** Strichelhonigfresser **Spanish:** Mielero Lanceolado
Other common names: Lanceolated Honeyeater

Taxonomy. *Plectorhyncha lanceolata* Gould, 1838, New South Wales, Australia.

Molecular studies indicate that genus is closely allied to the morphologically dissimilar and monotypic *Grantiella*, both being part of a subclade that includes also *Philemon* and *Xanthotis*. Monotypic.

Distribution. E Australia from C & SE Queensland (mainly S of 20° S) S & SW through inland and NE New South Wales (extending to coast S to about Sydney) to NW Victoria and SE South Australia (E of Yorke Peninsula).



Descriptive notes. 21.5–23.6 cm; male 33–48 g, female 33–45 g. Medium-large honeyeater with short, virtually straight bill and longish tail with slight notch at tip; feathers of head and neck often raised in shaggy crest. Head and neck are white with diagnostic, bold blackish streaking on top and side, isolating diffuse whitish supercilium and lores, and with narrow black moustachial stripe continuing down side of neck and merging with black streaking on sides of lower throat and upper breast; feathers of lower throat and centre of upper breast long and lanceolate; rest of underbody white with fine brown streaking; upperparts brown-grey,

with bold and coarse black-brown streaking on mantle, back and scapulars, and fine diffuse black-brown streaking on rump and uppertail-coverts; narrow greyish-white fringes on median and greater secondary coverts and tertials, narrow whitish edges on other remiges (diffuse pale panel on folded wing); tail has fine white fringes when fresh; undertail dark grey; and underwing dark grey with broad white scaling on coverts; iris brown to black-brown; bill blue-grey, grey-black tip; legs dark blue-grey or grey-black. Sexes alike in plumage, male slightly larger than female. Juvenile is similar to adult, but with shorter, finer and duller, dark brown streaking on head and neck, buff suffusion on top of head (head appears paler overall), finer and duller streaking on mantle, back and scapulars (additionally finely streaked and scaled buff), buff scalloping or mottling on rump and buff wash on uppertail-coverts, upperwing-coverts tipped and fringed buff, tertials tipped buff, edges of remiges tinged cream and suffused buff at tip, and underside white or creamy with only sparse and finer streaking restricted to breast, flanks and undertail-coverts, also bill wholly grey-black; immature similar to adult, but with retained juvenile wing and tail feathers. **VOICE.** Typically noisy, and vocalizes periodically throughout day. Stationary song (usually given while perched) distinctive, a loud, melodious warbling or whistling "chirp, chirp, cherry, cherry", and described as rollicking or bubbling; song phrases also rendered as "chim chee-a-ree" or "chim chim cheere" (duration 1 second). Flight song a sustained, rich phrase, "chee-a-ree chree chirrup" or "chee-a-ree chirrup", rising slightly in pitch and volume, with usually 6–8 phrases sung in succession (total duration c. 7–9 seconds); given in either horizontal or ascending flight. Members of pair duet; duets typically not well synchronized, and usually performed when birds perched within 10 m of each other (but up to 60 m recorded) and more often within 100 m of nest than farther away. Sometimes sings in response to mate's song but not in duet. Calls include "chewee", apparently as contact and given at intervals of 2–3 seconds; a soft

contact warble lasting 5–10 seconds when near or at nest; and a shrill whistling note or short, harsh “zeet” when defending nest.

Habitat. Diverse range of generally tall and open, dry sclerophyll woodlands. Often in eucalypt woodlands, including savanna woodland, riparian woodland, and mallee woodland, especially tall, unburnt, open mallee. Also common in woodlands or scrublands dominated by casuarina, sometimes with mallee eucalypts; and in shrublands and woodlands dominated by cypress-pine (*Callitris*), sometimes mixed with stands of casuarinas, eucalypts or *Eremophila*. Less often in semi-arid and arid *Acacia* shrubland, including mulga (*Acacia aneura*) and lancewood (*Acacia shirleyi*) shrubland; and softwood scrub and woodland, including remnant, dominated by brigalow (*Acacia harpophylla*) or mixed with eucalypts or kurrajong (*Brachychiton*). In coastal and subcoastal regions, often in sclerophyll swamp-forest and woodland of paperbarks (*Melaleuca*) and casuarinas; or heathlands and thickets of casuarina, paperbark or *Banksia*; sometimes in dry sclerophyll forests. Rarely in mangroves. Commonly in modified habitats, such as parks, reserves and gardens of towns or cities, in orchards, vineyards and homestead gardens, and in cleared agricultural land with isolated trees. Wide-ranging, from coasts to arid and semi-arid inland, up to c. 1000 m.

Food and Feeding. Diet includes nectar, seeds, fruits, and invertebrates (mainly insects and their larvae). Forages mostly in foliage and from upper branches of crowns of trees, but occasionally lower and, rarely, on ground. Probes flowers for nectar. Takes invertebrates by gleaning from foliage, twigs and live and dead branches; by probing under loose bark, in crevices in bark, or among woody fruits; and occasionally by sally-striking in air; sometimes while hanging upside-down. Individual gleaning invertebrates from outer foliage of a *Eucalyptus* was observed to take prey to a branch and (unusually for a meliphagid) place item under a foot, then to dismember prey before swallowing. One bird extracted larvae of case moths (Psychidae) by inserting bill into lower end of larval case, which was only point of entry; a few cases were taken to a post and held down by one foot, while larvae removed. Often shy, but noisy. Usually seen singly or in twos; sometimes gregarious, in small parties or flocks of up to twelve individuals; at one site, foraged in loose mobile groups of 2–10 or more, individuals feeding independently at times and moving together at other times. Sometimes forages with other honeyeaters, including *Acanthagenys rufogularis*, *Manorina flavigula*, and *Philemon citreogularis*.

Breeding. Recorded in Aug–Jan, mostly Oct–Nov. Usually nests solitary; co-operative breeding observed occasionally. Nest built by both sexes, a deep, somewhat untidy cup, sometimes bag-shaped, often slightly smaller at opening and with rim running up to points of attachment, usually made of fine grass, sometimes with plant down, hair, rootlets or other vegetation, held together by spider web and egg sacs, plant down, prickly seeds, feathers or wool, which cover exterior, usually lined with dry grass stems, less often with fine rootlets and wool, external diameter 6–10.4 cm, depth 6.5–12.3 cm, internal diameter c. 7–6 cm, depth 6.5–9.6 cm; often Emu (*Dromaius novaehollandiae*) recrires worked into upper portion, which makes nest conspicuous (and material from earlier nests often reused); suspended by rim from thin drooping twigs, foliage or branches, usually in foliage near end of horizontal branch of tall, usually live, shrub, sapling or low tree, 1–12 m (mean 4.5 m) above ground; appears to have nesting association with Grey Butcherbird (*Cracticus torquatus*). Clutch 1–5 eggs, usually 3, only occasionally 1 or 5 (mean of 25 clutches 3.04); incubation by both parents in roughly equal proportions, period probably 15–17 days; chicks brooded and fed by both parents, female of some pairs doing more brooding than male, any helpers present also help to feed chicks, nestling period c. 15 days to 17 or more days; both parents feed fledglings. Nests parasitized by Pallid Cuckoo (*Cuculus pallidus*). From 98 eggs in 35 nests, overall success 0.75 fledged young per nest.

Movements. Appears to be resident over much of range. Some movements recorded, however, even in regions or at sites where normally resident, e.g. occurring at sites where mistletoes (Loranthaceae) or trees in flower. Also sporadic or erratic visitor at some sites, especially inland or at edges of range, where small irruptions sometimes recorded; in New South Wales most isolated records at or near edge of range May–Sept. Scattered records N of main range in Queensland (to W of Townsville), on and E of Great Divide in New South Wales S to about Sydney (largely absent S coast and tablelands), in C & SW Victoria and in SE South Australia (Mt Lofty Ranges and Adelaide Plains) mostly during irruptions. Claims that species is nomadic or partly nomadic based solely on apparently erratic occurrence, and with no data on movements.

Status and Conservation. Not globally threatened. Rather uncommon. No estimates of population. Range has expanded into SE Queensland, mainly since 1960s. At least formerly, considered a pest in orchards at certain times.

Bibliography. Baldwin (1976), Barrett *et al.* (2003), Blakers *et al.* (1984), Briggs & Tooth (1994), Britton (1997), Campbell (1900), Colston (1974), Cooney *et al.* (2006), Dawson *et al.* (1991), Driskell & Christidis (2004), Emison *et al.* (1987), Ford (1992), Franklin & Alley (1995), Gannon (1962), Garnett & Cox (1988), Gosper (1986), Griffioen & Clarke (2002), Hannah *et al.* (2007), Higgins (1999), Higgins *et al.* (2001), Hindwood (1945), Keast (1968a), Leach (1988, 1995), Leach & Hines (1987), Ley & Davie (1995), Longmore (1978, 1991a), Mack (1961), Martin *et al.* (2004), McKilligan (1972), Moffatt *et al.* (1983), Morris *et al.* (1981), North (1907), Officer (1971), Paton & Ford (1977), Paton *et al.* (1994), Pizzey (1980), Robertson & Woodall (1983), Schmidt (1978), Schodde & Tidemann (1986), Sharp & Sewell (1995), Storr (1973, 1984), Stove (1994), Taylor, P.W. (1987), Turner (1992), Woinarski (1989b), Wood & Ley (2005a, 2005b).

Genus *GRANTIELLA* Mathews, 1911

175. Painted Honeyeater

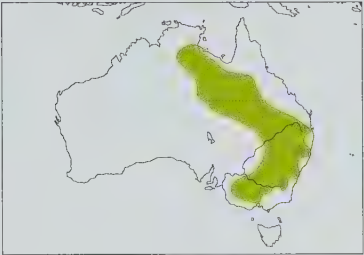
Grantiella picta

French: Méléphage peint **German:** Granthonigfresser **Spanish:** Mielero Pintado

Taxonomy. *Entomophila picta* Gould, 1838, New South Wales, Australia. Molecular studies indicate that genus is closely allied to the morphologically dissimilar and monotypic *Plectorhyncha*, both being part of a subclade that includes also *Philemon* and *Xanthotis*. Genus has in the past been subsumed in *Conopophila*. Monotypic.

Distribution. N & E Australia: CE Northern Territory (sparse) and Queensland W of Great Divide and S of c. 20° S (though few records in SW S, on and W of Great Divide, to N Victoria.

Descriptive notes. 14–15 cm; three males 20–25–20 g, one female 18 g. Distinctive medium-small honeyeater with short, gently decurved bill and short tail. Male is strongly pied, mostly black above (slightly duller on rump, uppertail-coverts and upperside) and white below, with black hood sharply demarcated from white throat, small white patch on rear ear-coverts, and sparse blackish streaks or spots on flanks, breast and belly; rump and uppertail-coverts also variably mottled or scaled with brown, sometimes white band across rump; blackish upperside boddy marked with broad pale yellow margins on median and greater secondary coverts and bright yellow outer edges on greater primary coverts and remiges (bright yellow panel on folded wing); uppertail appears black with



yellow sides and fine white tip (when spread, shows obvious white tip and yellow panels in sides); underwing white, dark mottling on outer coverts, reflective blackish-brown trailing edge and tip; undertail mostly white with black sides; iris red-brown, often dark; bill and gape pink, brownish tip of bill; legs dark grey. Female is like male but somewhat smaller, with upperparts and chin duller, brownish-black, olive-brown tinge on rump, and slightly darker blackish face and duller top of head. Juvenile is like female, but upperparts and chin much paler, brown to grey-brown, with pale mottling or scaling on rump and uppertail-coverts, paler yellow to off-white edges on upperside-coverts and tertials (and usually pinkish-buff fringes at tips), and edges of remiges (and panel on folded wing) slightly paler yellow, also bill greyish-horn (not pink), iris greyish-brown, and legs greenish-grey. **VOICE.** Noisy. Song the most common vocalization, given from perches and in display-flight, a highly distinctive, repeated loud two-syllable piping “geor-gie” or “georg-ééé” or “sue-see”, with second syllable higher-pitched; also siren-like variant, “see-sue”, “wee-oo” or “fee-oo”, and occasionally other variants of main song. Series of “chur” phrases, repeated 4–48 times, often given at change-over at nest; phrase of female hoarser, more throaty and less audible than that of male. Has low-intensity and high-intensity alarm calls, including plaintive whistle. Other calls include frequent disyllabic “chee-haw”, in which second syllable lower-pitched; low twittering notes during construction of nest; and double “chew-it” during incubation and early part of brooding by assumed female. Said to give loud but undescribed single note, piping and soft chatters and purring notes, soft “tweet” calls and other soft calls.

Habitat. In all habitats, strongly associated with presence of mistletoes, e.g. drooping (*Amyema pendulum*), box (*Amyema miquelii*), needle-leaf (*Amyema cambagei*), grey (*Amyema quandang*) and wire-leaf mistletoes (*Amyema preissii*). Mainly in box–ironbark eucalypt woodlands and forests on inland foothills of Great Divide, dominated by such species as red ironbark (*Eucalyptus tricarpa*), mugga (*Eucalyptus sideroxylon*) and yellow box (*Eucalyptus melliodora*); box eucalypt–casuarina woodlands, especially those dominated by yellow gum (*Eucalyptus leucocylon*) with buloke (*Allocasuarina leuhmannii*) or belah (*Casuarina cristata*); riparian forests of river sheoak (*Casuarina cunninghamiana*); and in scattered eucalypts or remnant patches of woodland or forest in farmland. Less often in patches of *Acacia* with mistletoes, in woodlands dominated by cypress-pine (*Callitris*), woodlands of river red gum (*Eucalyptus camaldulensis*) and black box (*Eucalyptus largiflorens*), in mallee woodland, and in paperbark (*Melaleuca*) associations. Sometimes in urban parks and gardens, especially with large eucalypts. In study of irruption in woodland dominated by brigalow (*Acacia harpophylla*), gidgee (*Acacia oswaldi*), rosewood (*Allocryon oleofolium*) and white cypress-pine (*Callitris glaucochylla*) in N New South Wales, woodland in which this species was found had significantly more mature trees, greater canopy cover and more mistletoes per tree and per unit area than did sites not occupied.

Food and Feeding. Diet mostly fruit and nectar of mistletoes, as well as other fruit, and nectar from flowering eucalypts and other plants; also invertebrates (insects, spiders). Usually forages in canopy of trees, especially among flowering and fruiting mistletoe. Invertebrates gleaned from foliage or branches, also taken by sally-striking in air. Forages singly, in pairs or in small parties of up to six individuals; occasionally in larger groups, e.g. in NE Victoria 100 or more in small groups dispersed through forest.

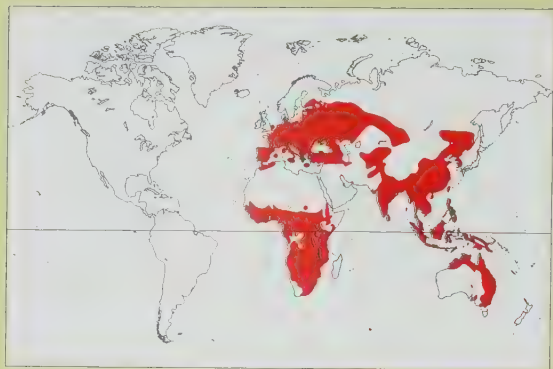
Breeding. Timing may depend on availability of mistletoe fruit; recorded Aug–Feb, apparently starting on average later farther S; claim of eggs in Northern Territory in Mar; in Victoria usually two broods each year, in Oct–Nov and Jan–Feb, but only one brood if fruiting season poor. Pairs tend to nest close together, and possibly loosely colonial, but distance between nests varies; will nest solitary, but some solitary attempts known to have failed or been abandoned; study required to determine success of solitary nests and group-nesting. Both sexes collect nesting material and both build, often together; nest usually a strong but thin cup (some more substantial) made of grass or fine rootlets, occasionally with twigs, flowers, bark or fibres, and bound together and attached to nest plant with spider web (which may sometimes form much of nest), external diameter 6.4–7.6 cm, depth 3.8–5.1 cm, internal diameter 5.1 cm, depth 4.4 cm; attached by rim to pendulous foliage and drooping branchlets in outer part of tree (mainly eucalypt or casuarina), often one with mistletoes. 18 nests were 2–15 m (mean 7.2 m) above ground, but up 19.5 m recorded; usually returns each year to same or nearby tree to nest, and in one case nests built in almost identical position in same tree for 5 years in succession. Clutch usually 2 eggs, occasionally 1 or 3; incubation by both sexes, also male said to feed incubating female constantly, period at least 13 days or 14–15 days; chicks brooded by both parents, mostly by female, also fed by both, nestling period once 20 days; both parents feed fledglings.

Movements. Generally considered a N–S migrant, being a non-breeding winter visitor N of c. 26° S. In S of range, most records New South Wales between Sept–Oct and Mar–Apr and in Victoria between late Sept/early Oct and early Dec (occasional records to Feb–early Apr); in N, most records in Northern Territory May–Aug (majority Jun–Jul) and most in N Queensland Jun–Sept. Analysis of data for E Australia found no conclusive evidence of any movements. Irregular visitor at some sites, and sometimes considered nomadic, although extent of movements involved and context in wider patterns of movements not known. Presence in an area, and movements, sometimes linked with fruiting of mistletoe. Males said to arrive in breeding areas at least two weeks before females, and young said to migrate with parents. Vagrant in E South Australia, although no recent records; single record in N Western Australia (at Bell Creek, in W Kimberley), in mid-May 2002.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Generally uncommon and sparsely distributed. Total population possibly c. 50,000 birds. Once recorded as breeding at density of 0.03 birds/ha. Thought to have undergone long-term decline, likely to have been caused or accelerated by clearing or thinning of trees for agriculture, and lack of tree regeneration because of grazing, or overgrazing, by introduced herbivores such as livestock and rabbits (*Oryctolagus*). Much habitat used for breeding, in S of range, has become degraded, and species has declined in numbers in CN Victoria, W New South Wales and probably NC Queensland; also no recent records from S South Australia. Preference for mature trees with greater canopy cover, as shown by study in brigalow woodlands of N New South Wales, indicates that protection of sites with these habitat characteristics likely to be important for the survival of this species.

Bibliography. Anon. (2007a), Barea & Watson (2007), Barrett *et al.* (2003), Blakers *et al.* (1984), Bounds (1994), Butchart & Stattersfield (2004), Campbell (1900), Collar *et al.* (1994), Colston (1974), Cooney *et al.* (2006), Driskell & Christidis (2004), Eddy (1961), Emison *et al.* (1987), Frith & Davies (1961), Gannon (1953, 1962, 1966), Garnett (1993), Garnett & Crowley (2000), Griffioen & Clarke (2002), Hannah *et al.* (2007), Higgins (1999), Higgins *et al.* (2001), Hindwood (1935, 1937a), Hindwood & McGill (1951), Hopton (1998), Immelman (1961), Johnstone & Storr (2004), Keast (1968a), Lenz & Dabb (2003), Ley & Davie (1995), McGill (1975), Morris (1975a), Morris *et al.* (1981), North (1906), Oliver, Chambers & Parker (2003), Oliver, Quin *et al.* (1998), Pizzey & Knight (1997), Schmidt (1978), Schodde & Mason (1999), Schoenjahn (2003), Stattersfield & Capper (2000), Storr (1984), Thomas & Wheeler (1983), Traill *et al.* (1996), Trémont & Williams (1999), Whitmore & Eller (1983), Whitmore *et al.* (1983), Woodcock (1985).

Class AVES
Order PASSERIFORMES
Suborder OSCINES
Family ORIOLIDAE (ORIOLES)



- Medium-sized, robust passerines with relatively strong bill; many species very colourful in yellow to golden and black.
- 17.5–32 cm.



- Old World.
- Woodland, forest and parklands.
- 2 genera, 30 species, 92 taxa.
- 3 species threatened; none extinct since 1600.

Systematics

The orioles and figbirds form a small and well-defined family of highly arboreal, medium-sized birds inhabiting woodlands, forests and parklands of the warmer parts of the Old World, mainly in Africa and tropical southern Asia eastwards through Wallacea and New Guinea to Australia. Different authors have recognized between 25 and 30 species in the family, and with differing species limits within this range. In the present treatment, Oriolidae comprises 30 species in two genera: *Sphecotheres*, containing the figbirds, and *Oriolus*, with the orioles. Figbirds are distinguished on the basis of the bare red skin around the eye and their colonial nesting habits. Among the orioles proper, some early taxonomists separated a sombre-coloured group of Australasian species, which they placed in the genus *Mimeta*, from the generally brightly coloured Afro-Asian species, which constituted the genus *Oriolus*, but R. B. Sharpe, in his 1877 review of the family, combined them all in *Oriolus*. This arrangement was continued in a 1923 review by R. Meinertzhagen, who pointed out that the only criterion for retaining *Mimeta* would be that the species involved lacked the brilliant colours of adult *Oriolus*; in all other respects, however, the two groups are closely similar. Meinertzhagen also reasoned that the family might be Australo-Papuan in origin, rather than, as had formerly been assumed, Oriental. His argument was based on the fact that adults of the former region's *Mimeta* group retained a striped plumage like that of juveniles of the brightly coloured Afro-Asian species, and the fact that the genus *Sphecotheres* is confined to eastern Indonesia, New Guinea and Australia. Meinertzhagen envisaged two distinct branches arising from Australasia. The first involved the two maroon species, namely the Maroon Oriole (*Oriolus trailii*) and the Black-and-crimson Oriole (*Oriolus cruentus*), in Southeast Asia; this branch, linked to *Mimeta*, he thought, by the Black Oriole (*Oriolus hosii*), did not spread to the Palearctic or Africa. The second branch produced the bright black-and-yellow orioles, linked to *Mimeta* by the Isabela Oriole (*Oriolus isabellae*) and the Philippine Oriole (*Oriolus steerii*), over the rest of Eurasia and Africa.

Traditionally, the Oriolidae were considered to be most closely related to the drongos (Dicuridae), the crows (Corvidae), the leafbirds (Chloropseidae) and the fairy-bluebirds (Irenidae). On the basis of evidence obtained in analyses of DNA–DNA hybridization, however, C. G. Sibley and J. E. Ahlquist found the orioles' immediate closest relatives to be the cuckoo-shrikes

(Campephagidae). These authors placed the orioles and cuckoo-shrikes together in a tribe, the Oriolini, in the subfamily Corvinae, within their much-expanded family Corvidae. Although the link between the orioles and the cuckoo-shrikes is corroborated by the results of protein studies and some similarities in osteological traits, other morphological differences suggest that the retaining of Oriolidae and Campephagidae as separate families is the preferable course of action. Although Sibley and Ahlquist's family Corvidae also includes the drongos, DNA–DNA hybridization does not support a close relationship between the drongos and the orioles. More recent sequencing of nuclear genes reveals the leafbirds and the fairy-bluebirds to be even more remote from the orioles. Thus, although taxonomic syntheses based on the sequencing of both mitochondrial and nuclear genes have pro-



Figbirds (*Sphecotheres*) differ from orioles (*Oriolus*) in having bare skin around the eye and by breeding colonially. Current taxonomy considers Oriolidae to comprise 30 species, whereas some previous authors identified as few as 25. The figbirds have been notably affected by this recent splitting, as the **Timor Figbird**, endemic to two islands in the Lesser Sundas, was previously considered conspecific with both its congeners, so that just a single figbird species was recognized.

[*Sphecotheres viridis*, W Timor, Lesser Sundas. Photo: Morten Strange]

Stocky, medium-sized passerines, the oriolids are rather long-winged and short-legged. In terms of proportions, figbirds differ from orioles by having a longer tail and shorter bill. Some members of the family show sexual dichromatism. In about half of the orioles and all the figbirds, the female is considerably drabber in plumage than the male. In the **Australasian Figbird**, the male (right) is brightly coloured, whereas the female (left) is brown above and heavily streaked below.

[*Sphecotheres vieilloti*
flaviventris,
Mossman, Queensland,
Australia.
Photo: Marie Read]



vided a finer and perhaps more reliable resolution of some parts of the oscine tree, as shown by, for example, the 2003 study by P. G. P. Ericson and U. S. Johansson, they have not so far directly affected the lower-level inter-familial relationships of the orioles as suggested by Sibley and Ahlquist in 1990.

The position of the Madagascan genus *Tylas* is of some interest. It has been suggested that this genus, which contains a single species, *Tylas eduardi*, might be closely related to the Oriolidae. Current opinion, however, is that it is a vanga, and it is generally therefore placed in the Vangidae, a family confined to Madagascar and the nearby Comoro Islands. Nevertheless, the true systematic position of the *Tylas* Vanga merits further study.

Molecular-genetic techniques have not yet been used as a means of investigating species limits within the family Oriolidae, and these still rely on conventional characters such as osteology,

plumage and voice. Although the genus *Oriolus* appears remarkably homogeneous, with no need for subdivision, as was recognized by Sharpe, Meinertzhagen and, most recently, J. C. Greenway in J. L. Peters's *Check-list of Birds of the World*, attempts have nevertheless been made at one time or another to introduce some substructuring, by proposing alternative genera or subgenera in which to group similar species. Five such suggestions have been made. The first of these involves the original Australasian genus *Mimeta*, erected by N. A. Vigors and T. Horsfield in 1827, and comprising dull brown to olive-green species with striped underparts. This name has been used to group the Green Oriole (*Oriolus flavocinctus*) with the Brown (*Oriolus szalayii*), Dusky-brown (*Oriolus phaeochromus*), Grey-collared (*Oriolus forsteni*), Black-eared (*Oriolus bouroensis*), Olive-brown (*Oriolus melanotis*) and Olive-backed Orioles (*Oriolus sagittatus*). These last six were considered by Sibley and Monroe and by R. Schodde and I. J. Mason to form a superspecies.

The alternative genus *Xanthonotus*, originally described by C. L. Bonaparte in 1854, has been used to group the Dark-throated Oriole (*Oriolus xanthonotus*), the Philippine Oriole and the Isabela Oriole, the first two of which were considered by Sibley and Monroe to be sister-species. The subspecies *albiloris* of the Philippine Oriole has sometimes been elevated to the rank of a full species, but in other treatments the Philippine Oriole, including *albiloris*, has been considered a subspecies of the Dark-throated Oriole.

C. M. N. White and M. D. Bruce, in their 1986 checklist of Wallacea, considered the Eurasian Golden Oriole (*Oriolus oriolus*), African Golden Oriole (*Oriolus auratus*), Slender-billed Oriole (*Oriolus tenuirostris*) and Black-naped Oriole (*Oriolus chinensis*), the so-called "yellow-headed group", to constitute a superspecies, to which the Indian Golden Oriole (*Oriolus kundoo*), now separated from the Eurasian species, can be added. Four years later, however, Sibley and B. L. Monroe treated these taxa as comprising two sets of sister-species: *O. oriolus*, with *kundoo* as a subspecies, and *O. auratus* forming one set; the other consisting of *O. chinensis* and *O. tenuirostris*.

In the Afrotropics, the "African black-headed group", comprising the Green-headed (*Oriolus chlorocephalus*), Sao Tome (*Oriolus crassirostris*), Western Black-headed (*Oriolus brachyrhynchus*), Ethiopian Black-headed (*Oriolus monacha*), Mountain (*Oriolus percivali*), Eastern Black-headed (*Oriolus larvatus*) and Black-winged Orioles (*Oriolus nigripennis*), could be considered to belong to the alternative genus *Baruffius*, created by Bonaparte in 1854. Sibley and Monroe regarded the West-

Among males and also the females of some species, typical oriole plumage comprises large areas of vivid colour. Two species groups inhabiting different continents complete this startling effect with a glossy black or dark head. The "African black-headed group" comprises seven species, including the **Ethiopian Black-headed Oriole**. In this group, female plumage is similar to that of the male. There is a greater degree of sexual dichromatism in the four species that form the "Asian black-headed group" of orioles.

[*Oriolus monacha*
meneliki,
Debre Libanos,
Oromia, Ethiopia.
Photo: Johannes
Ferdinand]





ern Black-headed and Ethiopian Black-headed Orioles as sister-species, and the Eastern Black-headed and Mountain Orioles likewise to be sister to each other.

Finally, the alternative genus *Analcipus*, created by W. Swainson in 1832, has been used to accommodate the Black Oriole, Black-and-crimson Oriole, Maroon Oriole and Silver Oriole (*Oriolus mellianus*). These, together with the Black-hooded Oriole (*Oriolus xanthornus*), have been referred to as the "Asian black-

headed group". Within this group, the Maroon and Silver Orioles were considered sister-species by Sibley and Monroe.

As it is not clear to what extent plumage characteristics among orioles, on which much of the above grouping rests, carry a strong phylogenetic signal, we cannot be confident that such substructuring accurately reflects evolutionary relationships within the oriole family tree. Given also that some species, such as the Black-naped Oriole, are undoubtedly polyphyletic as presently constituted, a molecular-genetic reappraisal of the Oriolidae is much needed.

Schodde and Mason, in 1999, proposed that the genus *Sphecotheres* should be placed before *Oriolus* in the systematic sequence, because they regard *Sphecotheres* as the ancestral taxon. This is the practice currently adopted.

Morphological Aspects

Orioles and figbirds are medium-sized, robust passerines 20–30 cm in length. The sexes are of similar size, although the female is usually slightly smaller than the male. Orioles have a slightly decurved and finely hooked bill which is about equal in length to the head. It varies, however, from being long and slender, as with the Slender-billed Oriole, to robust, deep and broad, as in the Sao Tome Oriole and some races of the Black-naped Oriole, or rather short and like that of a bulbul (Pycnonotidae), as in the Western Black-headed Oriole. Figbirds differ from orioles proper in having a very short bill. In the Eurasian Golden Oriole, the bill of the juvenile is dark reddish-brown, changing to pale red in adults; likewise, the juvenile's iris is light brown and usually becomes progressively redder with age. Orioles have relatively large, long and pointed wings with ten primaries, the outermost, P10, being about half the length of the adjacent one (P9), with primary P8 the longest. The tail is square, short to medium length, and has twelve rectrices. The tarsi are relatively short but strong, and the feet are also short but rather weak; they are apparently not used in feeding.

Many species of oriole are colourful, at least in the adult male plumage, which is often patterned in brilliant golden-yellow and black colours. The family name may derive from the Old French *oriol*, which may, in turn, have come from the Latin *aureolus*,

A group of Australasian orioles have dull olive-brown plumage for a quite remarkable reason: they mimic the particular species of friarbird (Philemon) with which they share their range and habitat. This imitation presumably originated as a mechanism of reducing the threat of being attacked. New Guinea's **Brown Oriole** is thus very similar in plumage to the Helmeted Friarbird (*P. buceroides*) and even imitates the latter's vocalizations. Amazingly, the Brown Oriole is itself mimicked by a smaller species, the Streak-headed Honeyeater (*Pycnopygius stictocephalus*), which, like the friarbirds, belongs to the family Meliphagidae.

[*Oriolus szalayi*, Port Moresby, SE New Guinea. Photo: William S. Peckover]



Most oriole species are brightly coloured. The golden-yellow that is the base colour of many can, perhaps surprisingly, offer the bird concealment in its sunny woodland habitat. Among some Asian orioles, however, the yellow is replaced by silver, crimson or maroon, as in the case of the **Maroon Oriole**. Such species have a grey or bluish bill, whereas the yellow ones have a pink or red bill. Juvenile orioles tend to resemble the respective female, but subsequent development towards mature adult plumage remains poorly known in many species.

[*Oriolus traillii ardens*, Wu Lai, Taiwan. Photo: Penshing Liao]

meaning "golden", or it may be just an onomatopoeic rendition of a common oriole call (see Voice), or it could be due to both. It was applied originally to the Eurasian Golden Oriole, but the males of many other species in the family are also mostly golden-yellow with black wings, the African Golden Oriole being a good example, although some Oriental species have the yellow replaced by crimson or silvery white. Those species having yellow in the plumage possess a dull red or pink bill, whereas those with red in the plumage have a horn-coloured or bluish bill. Figbirds are much duller in plumage, being predominantly dull yellow, green, brown and grey or white, with a black or brownish bill. Within the Oriolidae, there are occasional documented records of melanistic individuals or individuals with other colour aberrations.

Although the adult plumages of male and female orioles are mostly well known, the sequence of immature plumages as young birds moult from juvenile to adult is not. Among species in which the sexes differ strongly in adult coloration, sexual differences usually become apparent after the second moult. In general, the immature plumage of females can be expected to resemble a duller version of the adult female, but in the case of males of such species, or with orioles in which adults of both sexes are brightly coloured, an immature may pass through a more complex sequence, especially if sexual maturity is delayed. For many of the oriole species this has been poorly recorded, and further research is required. Adult orioles apparently moult once per year.

Orioles and figbirds vary in the degree of sexual dichromatism exhibited. Some species are distinctly dichromatic, with the female quite different from and much less brightly coloured than the male. Examples include the Eurasian Golden Oriole and the African Golden Oriole, the females of which retain an olive-green, streaked plumage like that of an immature, although, on rare occasions, females strongly resemble the males. In about half of the species, however, the female resembles the male or is only slightly duller. This is so in the "African black-headed group", which comprises the Eastern Black-headed, Western Black-headed and Ethiopian Black-headed Orioles, the Mountain Oriole and the Black-winged Oriole; also included with these species are the Green-headed Oriole, which has the black pigment of the head replaced by green, and the island endemic, the Sao Tome Oriole, which resembles a "washed-out" version of the mainland species. The "Asian black-headed group" includes four species,



the Black, Black-and-crimson, Maroon and Silver Orioles, which exhibit no yellow but, instead, have this colour substituted by red, brown or silver. These species are sexually dichromatic, although the degree to which this is expressed varies. Uniquely, the Black-and-crimson Oriole has two subspecies which are strongly dichromatic while the other two are apparently monochromatic. Several Australasian species, however, lack bright coloration in both sexes and are generally greenish above and



Preening is an essential activity for all birds. Stretching a wing enables this female **Eurasian Golden Oriole** to repair any remiges where the barbules have become displaced, reducing flight efficiency. Birds also preen in order to waterproof their feathers: coating the bill in oil from the uropygial gland, birds smear this waterproofing agent all over their feathers. It is also believed that uropygial oil serves to repel parasites by dint of having antifungal and antiparasitic characteristics.

[*Oriolus oriolus*, Hungary.]

Photo: Markus Varesvuo

Bathing is an important routine, helping to rid the feathers of parasites. Most birds wishing to bathe approach the water source from ground level. The **Eurasian Golden Oriole**, however, frequently bathes by plummeting steeply from a nearby perch, splashing briefly into the water, and then heading rapidly to a tree or bush. This oriole also behaves like swallows (*Hirundinidae*) by gliding over water and briefly dipping in its underparts.

[*Oriolus oriolus*, Dauka, Oman.]

Photo: Hanne & Jens Eriksen

streaked below, resembling the females and immatures of the African and Asian species that are strongly dichromatic. In this respect they are similar to the figbirds, both sexes of which are also greenish above and streaked below, the most conspicuous sexual dichromatism being in the colour of the bare skin around the eye, which is red in the male and bluish-grey in the female.

The drab brown or olive-green coloration of a number of Australasian oriole species may be unimpressive in itself, but it is remarkable in that it closely mimics the plumages of friarbird (*Philemon*) species, which have ranges coinciding with those of the orioles themselves. The mimicry in coloration includes the possession by the orioles of black-feathered areas that match areas of black bare facial skin on the friarbirds, and the similarities are so close that even specimens held in the hand may be confused. This plumage mimicry is reinforced by similarities in posture, movements and flight, as well as by vocal mimicry in two species, so that orioles and friarbirds may be even harder to distinguish in the field, although the friarbirds belong to a different family, the honeyeaters (Meliphagidae). Thus, in New Guinea, the Brown Oriole is similar visually and also vocally to the Helmeted Friarbird (*Philemon buceroides*), although it is streaky below and lacks the friarbird's bill knob. The Dusky-brown Oriole on Halmahera is a close visual mimic of the Dusky Friarbird (*Philemon fuscicapillus*) and difficult to distinguish in the field, and on Seram the Grey-collared Oriole is virtually identical to the Seram Friarbird (*Philemon subcorniculatus*). The two subspecies of the Black-eared Oriole, one on Buru and the other in the Tanimbar Islands, are each visually very similar to the respective island races of the Black-faced Friarbird (*Philemon moluccensis*) and are said also to be vocal mimics. On Wetar, the female of the local race *finschi* of the Olive-brown Oriole is quite similar to the local Helmeted Friarbird but the male is less so, while on Timor, where the nominate race of this oriole occurs, the female is again quite similar to the Helmeted Friarbird but the male is not. In Australia, however, where both the Olive-backed Oriole and the Green Oriole overlap in range with the Helmeted Friarbird, there is no mimicry.

It seems clear that the orioles mimic the friarbirds, rather than *vice versa*. The brown plumage and black facial skin are shared by all except one species of friarbird and by many other meliphagids, but the combination of brown plumage and black

facial feather patches is unique among orioles. Furthermore, sister-taxa with identical plumage in the same friarbird superspecies occur on many islands where the mimicking orioles do not, yet the mimetic orioles are virtually confined to islands with friarbirds. A further intriguing fact is that, the greater the size disparity between friarbird and oriole, the more perfect is the mimicry. Orioles in this superspecies are rather uniform in body mass, whereas the friarbirds vary from oriole-sized to roughly twice this. The Seram Friarbird is the largest and is approximately 78% heavier than the Grey-collared Oriole, which is an almost perfect mimic of it. The friarbirds on Halmahera, Buru and Tanimbar are about 50% larger than the Dusky-brown Oriole and the two races of the Black-eared Oriole, respectively, and the mimicry of these last is close but not perfect. In New Guinea and on Wetar, the friarbirds are about 39% heavier than the Brown and Olive-brown Orioles, respectively, and the mimicry is even less good. On Timor, where the friarbird is only some 13% larger than the Olive-brown Oriole, the mimicry is fair in the female but absent in the male, and it is lacking altogether in both sexes of the Olive-backed and Green Orioles in Australia, where the local friarbirds also average only 12% larger. A further twist to the story is that the Brown Oriole in New Guinea is itself closely mimicked, both visually and vocally, by another meliphagid less than half its size, the Streak-headed Honeyeater (*Pycnopygius stictocephalus*).

These size relationships between models and mimics suggest that smaller birds are mimicking larger ones, rather than its being a case of Batesian mimicry, in which palatable orioles may avoid predation by mimicking a distasteful friarbird model. There is no evidence that friarbirds are distasteful, nor would Batesian mimicry explain why another honeyeater would mimic an oriole. J. M. Diamond has plausibly suggested that the frequent incidence of attacks among orioles, friarbirds and other honeyeaters might provide a strong selective force for the evolution of size-dependent mimicry. These birds have similar habitat preferences and regularly feed together in the same flowering and fruiting trees, exhibiting a broad overlap in their diets of insects, fruit and nectar. There is a great amount of fighting within these feeding assemblages, with a dominance hierarchy based on size and aggressiveness, the larger birds, friarbirds especially, being more combative and more successful. Nevertheless, Diamond, during his studies in New Guinea, never observed an attack by a Helmeted Friarbird on a Brown Oriole, nor an attack by a Brown Oriole on a Streak-headed Honeyeater, despite the fact that these regularly fed within a few metres of each other and frequently attacked other species. In north-east Australia, however, he saw the same friarbird species attack and drive off the smaller non-mimetic Green Oriole, and in south-east Australia the non-mimetic Olive-backed Oriole stands its ground when attacked by the similar-sized Noisy Friarbird (*Philemon corniculatus*), and either species may win or lose a fight. Diamond's suggestion is that mimics, by convergence in appearance, escape attack by larger models that might otherwise drive them away; and, the greater the size disparity between oriole and friarbird, the more perfect the mimicry had to be for the oriole to protect itself against an increasingly large aggressor.

Although the Australian populations of the Olive-backed Oriole do not mimic friarbirds, they may mimic the Australasian Figbird (*Sphecotheres vieillotii*). The plumage of both sexes of the former is very similar to that of the female figbird, and the oriole often feeds with figbird flocks and may nest close to figbird breeding colonies. The Olive-backed Oriole's behaviour is secretive in the presence of figbirds, which ignore it, whereas the presence of other species usually elicits an aggressive response.

Habitat

Orioles are primarily canopy feeders (see General Habits). Almost all members of the family have been recorded in primary forest habitats of various kinds: dry, closed-canopy African woodlands, evergreen and semi-evergreen broadleaf forests, including monsoon forest, damp highland and moss forests, eucalypt (*Eucalyptus*) woodland, and deciduous and coniferous forests, as well as mixed forests such as pine-oak (*Pinus-Quercus*) forest.

Many orioles are renowned for their rich, mellifluous songs, and the liquid, fluting or whistling quality of these is immediately recognizable as emanating from an oriole. Their vocalizations are, however, not always so easy on the human ear. Most species, the **Maroon Oriole** among them, also have rather harsh, nasal or growling calls, in addition to a distinctly feline "miaow". In contrast to the orioles, the vocal repertoire of figbirds is somewhat impoverished, comprising rather tuneless whistles, chirps or trills.

[*Oriolus traillii* traillii,
Cai Yang He National
Nature Reserve,
Yunnan, China.
Photo: Dong Lei]





As the English name of the genus suggests, figbirds are primarily frugivorous. Inevitably, figs (*Ficus*) form an important part of the diet of the **Australasian Figbird** (above male, below female), but this species also consumes fruits from a wide range of trees and shrubs. Favoured plant genera or species include raspberries (*Rubus*), mulberries (*Morus*), native cherries (*Exocarpus cupressiformis*), guavas (*Psidium*) and cultivated bananas (*Musa*). Australasian Figbirds are active and noisy foragers, usually feeding in pairs but also, occasionally, alone. Outside the breeding season, their gregarious nature means that they frequently congregate in flocks of more than 100 individuals, moving noisily around their forest habitat in search of fruiting trees. Australasian Figbirds also readily take advantage of other sources of food offered by shrubs and trees, alternately eating seeds and sipping nectar, depending on the season.

[*Sphecotheres vieilloti*.



Above: Beerwah, Queensland, Australia.
Photo: Graeme Chapman.

Below: Darwin, Northern Territory, Australia.
Photo: Raoul Slater]



While orioles have a rather varied diet, they are primarily frugivorous. The **Olive-backed Oriole** is typical, seeking out fruits and berries as varied as olives (*Olea*), figs (*Ficus*), camphor laurel (*Cinnamomum camphora*) and white cedar (*Melia azedarach*). This species is also one of several orioles attracted to commercial orchards, raiding grape (*Vitis*), cherry (*Prunus*) and paw-paw (*Asimina*) plots. Not surprisingly, this sometimes results in persecution by fruit farmers.

[*Oriolus sagittatus sagittatus*, near Bugaldie, New South Wales, Australia.
Photo: W. R. Taylor/Ardea]

Nevertheless, with the exception of the globally threatened and Near-threatened species (see Status and Conservation), which appear to be particularly dependent on large undisturbed tracts of closed-canopy forest, most orioles seem to prefer semi-open woodland habitats over completely closed forests, even when taking into consideration the possibility of observer bias due to the fact that birds are more easily observed in open habitats. These open woodland habitats can also be of various kinds, although they are structurally rather similar to one another. Thus, 20 oriole species have been recorded in forest edges, including treefall gaps and small overgrown clearings, 19 in relatively mature second growth, 16 in semi-open woodlands, 15 in cultivated areas with

large trees, 13 in tall riverine vegetation such as gallery forest, twelve in plantations, twelve in gardens, nine in parks, five in windbreaks and avenue trees, five in groves and five in orchards. Other, similarly open habitats include bushes, scrub and thickets, in which eleven oriolids have been recorded, mangroves, with ten species, swamp-forests, with five, and bamboo forests, in which three have been found. In a particularly comprehensive study, S. Baumann monitored the movements of breeding Eurasian Golden Orioles in northern Germany. Using telemetry, she found that movements varied strongly from one breeding pair to another depending on habitat geometry, time of the breeding season and, concurrently, food supplies. Forested habitats were clearly preferred, but tree plantations, parks, gardens and isolated groups of trees, such as avenue trees, were also popular, while treeless habitats were almost completely avoided.

Although orioles are usually bound to tree-dominated habitats, they do nevertheless sometimes exploit other habitats opportunistically. In particular, the Eurasian Golden and Indian Golden Orioles are found in open deserts and high mountain regions during migration. While the Eurasian Golden Oriole does no more than rest on stopover at Saharan oases while on passage through Africa, the Indian Golden Oriole breeds in such places, for example oasis plantations in the Kyzyl-Kum Desert, south-east of the Aral Sea. The Eurasian Golden Oriole also forages in treeless heath and among sand dunes on almost treeless islands, using the few trees present for breeding only. Thus, the breeding requirements of these species may sometimes be as simple as a tree with a suitably shaded forked branch for nesting and sufficient invertebrate food available in the foliage or on the ground.

General Habits

Orioles are highly arboreal, generally foraging secretively alone or in pairs. Despite the conspicuous plumage of most of the species, orioles are usually hard to see against a leafy forest background dappled by the sun's rays, and they seem deliberately to hide from the observer, although their characteristic calls (see Voice) reveal their presence. Even in flight, orioles may be inconspicuous. The typical flight pattern is swift, silent and undulating, as the bird closes its wings at regular intervals, in the manner of a woodpecker (*Picidae*). They have a powerful but somewhat irregular wingbeat, reaching average speeds of 40–47 km/h, and a male can achieve up to 70 km/h when chasing

Whilst fruits and berries comprise much of the diet of orioles, invertebrates provide a significant proportion too, particularly in the case of migrating and wintering **Eurasian Golden Orioles**. This bird has just caught a grasshopper (*Orthoptera*). Amidst a wide variety of invertebrates taken by Eurasian Golden Orioles are earthworms (*Oligochaeta*), dragonflies (*Odonata*), cicadas (*Cicadidae*) and hoverflies (*Syrphidae*). The protein provided by invertebrate larvae, in particular, forms the major component of the diet of newly hatched Eurasian Golden Oriole nestlings.

[*Oriolus oriolus*, Razhdavitsa, Kyustendil, Bulgaria.
Photo: Iva Hristova]



While oriolids tend to spend the majority of their time foraging in the middle and upper strata of trees, the occasional abundance of aerial insects can sometimes prove attractive too. Both orioles and figbirds willingly leave the confines of the canopy to flycatch for winged termites (Isoptera) and the like. This **Australasian Figbird** is seen in mid-sally; once successful, it will return to a secluded perch to consume its catch.

[*Sphecotheres vieilloti*
vieilloti,
near Brisbane, SE
Queensland, Australia.
Photo: Brian J. Coates]

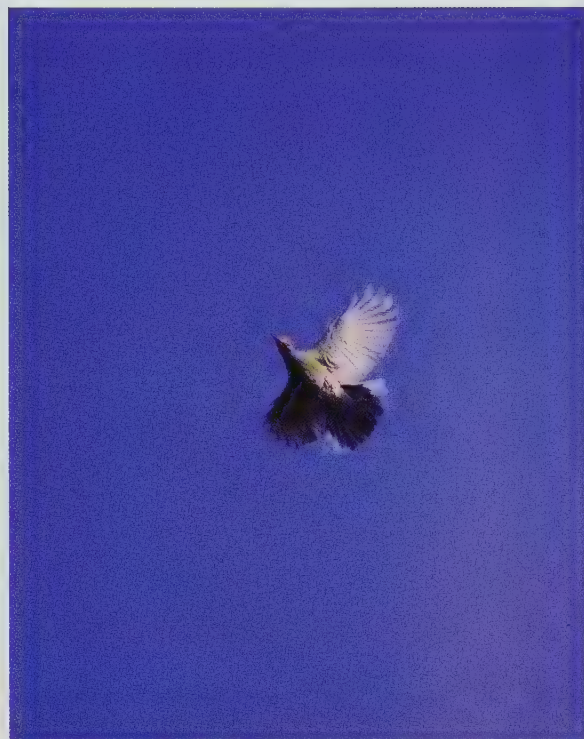
Like its congeners, the **Black-naped Oriole** takes large numbers of invertebrates, such as this small spider (Araneae). Small vertebrates including nestlings are also readily taken. This species mainly forages in the canopy, where it hops, climbs or makes short flights to investigate sites that might harbour prey. Orioles use both eyes and ears to locate insects, which they glean or pluck from their hiding places. On occasion, the pursuit of insects takes the Black-naped Oriole into the lower strata. Larger insects are prepared for consumption by being brushed or wiped against the perch.

[*Oriolus chinensis*
diffusus,
Yingda Ecological Farm,
Pingtung, Taiwan.
Photo: Penshing Liao]

another male. In their favoured, tree-dominated habitats they will typically fly from treetop to treetop, never staying in the open for long. Before landing on a perch, they typically sweep upwards with half-opened wings. Orioles can hover for short periods, with an upright body posture and fast-beating wings, looking not unlike a miniature kestrel (*Falco*), in order to observe or catch a food item or when building a nest. Figbirds, on the other hand, are gregarious and travel in noisy flocks of up to 100 or more individuals. A feeding flock may remain in a fruiting tree until it is virtually stripped clean, the birds even hanging upside-down on the ends of twigs to reach the last fruits. Many oriole species, especially in the tropics, occasionally gather in small groups in fruiting or flowering trees, and regularly join marauding mixed-species flocks in the search for food; these mixed flocks can comprise a dozen or more different bird species. Likewise, up to ten individuals may congregate in a small area wherever caterpillar densities are high. Although orioles generally sleep solitarily, evening roosts can at times attract dozens or even hundreds of individuals to the same place. Usually, however, individuals or pairs keep away from each other in widely spaced feeding territories, with younger individuals floating in and out of these territories. The Eurasian Golden Oriole, for example, has an average feeding range of about 40 ha, but this varies from 7 ha to 110 ha, while defended territories around the nest are much smaller, at about 1.3 ha, ranging from 0.7 ha to 2.3 ha.

Territorial advertisement and defence against conspecifics involve calls and songs (see Voice), most singing taking place in the morning and evening from exposed and regularly used perches high in the tree canopy. The calling frequency decreases in bad weather and also after the young have hatched. In order to heighten the threat against an intruder, the Eurasian Golden Oriole turns from side to side and ruffles its neck feathers while giving a more varied song than usual, and with increased volume, speed and intensity. It may then resort to an aggressive stance, with the wings held open, the tail fanned and the head stretched forward, aided by short, loud calls, wing-beating and beak-snapping, or it may even hover in front of the intruder. Finally, chases and physical attack ensue, and these can, in rare instances, lead to injury or death through collision in the air or impact with the ground resulting from the birds interlocking their feet.

With their often brightly coloured plumage but self-concealing habits, it is difficult to know how vulnerable adult orioles



may be to predation. Orioles are probably regularly attacked by birds of prey, but reports of such events are only anecdotal. When feeling threatened, orioles usually fixate on the danger for a short period, in motionless posture, before they retreat to a higher perch in the canopy. When encountering unexpected noises or other potential threats while foraging on the ground, however, the Eurasian Golden Oriole immediately seeks cover. In attempts to avoid an attacking Eurasian Sparrowhawk (*Accipiter nisus*), one individual reportedly escaped into a woodpecker hole, and another hid under the edge of a roof. A further individual of this species hid in dark rock crevices to escape the attentions of an Eleonora's Falcon (*Falco eleonora*). Migrating Eurasian Golden Orioles





Fruits and invertebrates provide the vast majority of the nutritional needs of orioles, but at times other items may be consumed.

This **Eastern Black-headed Oriole** is visiting an aloe (Aloe). The berries of this plant are a frequent foodstuff for this species, but this individual is using its long bill to reach inside the aloe flower to sip the nectar. The Eastern Black-headed Oriole also feeds on aloe pollen and on both the nectar and pollen of coral (Erythrina) trees. When breeding, however, this oriole tends to provision its nestlings with insects and caterpillars; the size and species of the caterpillar increases as the chicks grow. The quest for caterpillars may induce the Eastern Black-headed Oriole to descend to low shrubs or even the ground, but normally this species prefers to forage in the canopy. While it usually feeds alone or in pairs, it may be attracted in small groups to fruiting trees, and immatures in particular frequently join mixed-species flocks.

[*Oriolus larvatus larvatus*, Pafuri, Kruger National Park, South Africa. Photo: Warwick Tarboton]

Aloes (Aloe) are important for **Eastern Black-headed Orioles**, providing a direct source of food and at the same time a foraging substrate. This species eats both the berries and the nectar of aloes, but these same food types also attract insects, providing the birds with a third potential food source on a single plant. The Eastern Black-headed Oriole mostly gleans its insect prey from the vegetation, but a swarm of winged termites (Isoptera), for example, may tempt it into some aerial flycatching. It readily feeds on insects as diverse as locusts (Orthoptera), beetles (Coleoptera) and honeybees (Apis).

[*Oriolus larvatus larvatus*, Kruger National Park, South Africa. Photo: Hanne & Jens Eriksen]



are frequently captured by Eleonora's Falcons in the Mediterranean region and by Sooty Falcons (*Falco concolor*) in Ethiopia. Other raptors recorded as preying on this oriole are the Booted Eagle (*Hieraaetus pennatus*), Red (*Milvus milvus*) and Black Kites (*Milvus migrans*), the Common Kestrel (*Falco tinnunculus*), the Red-footed (*Falco vespertinus*), Lanner (*Falco biarmicus*) and Peregrine Falcons (*Falco peregrinus*), the Northern Goshawk (*Accipiter gentilis*) and the Eurasian Buzzard (*Buteo buteo*). The Eurasian Eagle-owl (*Bubo bubo*), Northern Long-eared Owl (*Asio otus*), Ural Owl (*Strix uralensis*) and Tawny Owl (*Strix aluco*) have also been recorded as taking Eurasian Golden Orioles as prey. Peregrine Falcons and Japanese Sparrowhawks (*Accipiter gularis*) attack and sometimes kill Black-naped Orioles, and Black Sparrowhawks (*Accipiter melanoleucus*) and Peregrines have both taken Eastern Black-headed Orioles.

An intriguing anti-predator response is exhibited by adult Eurasian Golden Orioles, which, when threatened, adopt a stiff posture with beak turned upwards, similar to that of a bittern (*Botaurus*) when disturbed or alarmed. This behaviour is demonstrated also by fledglings when warned by their parents, and it is already evident even among nestlings; the latter, if a parent gives a warning call, press themselves flat into the bottom of the nest but keep the bill pointing upwards. Dodging all dangers, ringed Eurasian Golden Orioles reached a maximum age of eight years, with an average of 1.5 years for ringed nestlings and 3–4 years for individuals that had reached adulthood.

Orioles must drink, and they may do so in various ways. The Eurasian Golden Oriole may pump or suck water, as well as nectar, upwards into its downward-pointed beak, or it may use a sequence of alternately pumping and raising its beak, a "suck-and-tilt" process. Usually, this species drinks from tree hollows, takes dew or raindrops from branches or leaves, or flies closely above the surface of a waterbody and quickly dips its bill. In rare instances, it will also drink from rain puddles.

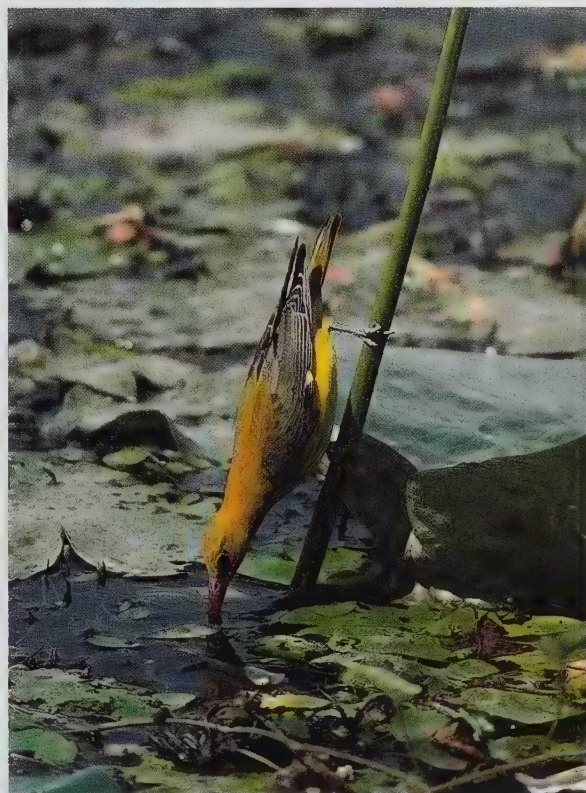
The Eurasian Golden Oriole bathes by diving down rather steeply from a waterside tree or bush, splashing briefly on to the surface of the water and immediately returning to the original perch or another one, a method recorded also for the Indian Golden Oriole. Alternatively, the former species will bathe in the manner of swallows (*Hirundinidae*) by gliding just above the water and briefly dipping its breast and belly. It will also bathe in the shallows along the water's edge or in wet foliage. During rainshowers,

several individuals have been observed to hang upside-down from a branch, with the wings held open. Bathing is usually followed by an extensive and vigorous grooming bout in order to rearrange and clean the feathers, a task for which orioles prefer high and covered perches. A group of Australasian Figbirds, for example, started rain-bathing high up in some fig trees (*Ficus*) by lowering the head and fanning the tail; the birds then slowly slid under the perching branch into an upside-down position, where they cupped the wings for 1–3 seconds, after which they returned to an upright position to shake, ruffle and groom the entire plumage. This performance was repeated several times. An Olive-backed Oriole rain-bathed in a similar upside-down position, but with its head thrown back, its wings fully opened and its tail fully fanned. Orioles may also sun-bathe, but the function of this behaviour is less clear, as it may be used for comfort, for thermoregulation or for the control of ectoparasites. Anting has not been recorded for any of the family.

Voice

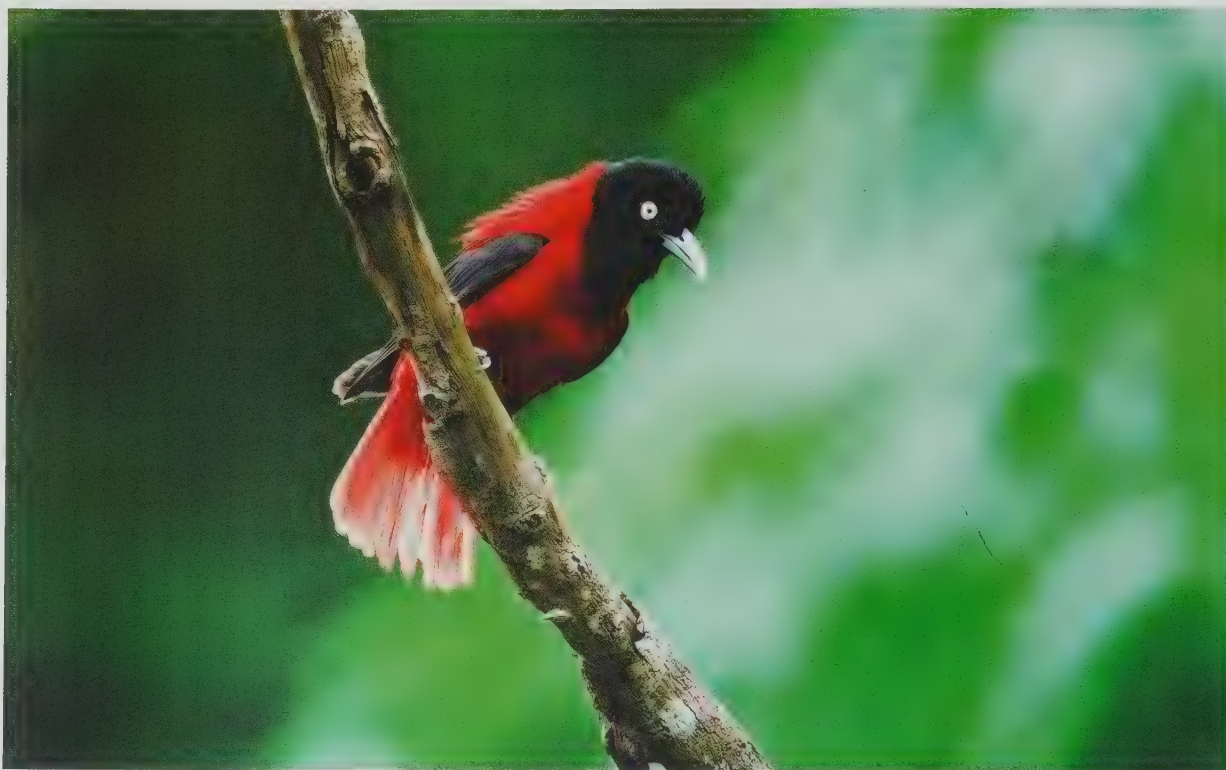
As already discussed, a plausible explanation for the origin of the name "oriole" is that it is onomatopoeic (see Morphological Aspects). Although this derivation is associated with the Eurasian Golden Oriole, which does indeed utter a clear "o-ri-ole" call, the songs and calls of many other species in the genus *Oriolus* have the same sweet, liquid, fluting characteristics, making them immediately recognizable as emanating from an oriole. Similarly widespread among the *Oriolus* species, having been recorded from at least 17 species, is a harsh nasal call, variously described as growling, sneezing or screeching, or a cat-like "miaouw". Figbirds utter a series of simple tuneless whistles and short sharp yelps.

The complexity of oriole calls varies greatly among the species. Several species, instead of producing clear musical calls, will at times emit a prolonged jumble of syncopated sweet notes, as demonstrated by the Black-hooded Oriole. The Philippine Oriole delivers a series of rapidly repeated simple syllables for an extended period, and the Dark-throated Oriole accompanies such a vocalization with tail-flicking; in the case of the Black-naped Oriole, several individuals join together in producing this rapid series. Three of the species in the "African black-headed group", namely the Black-winged Oriole and the Eastern Black-headed



Orioles require to drink water. Hanging almost vertically downwards, this female **Indian Golden Oriole** has plunged the tip of its bill beneath the surface of the water, and is forcibly sucking upwards into her mouth. The Eurasian Golden Oriole (*Oriolus oriolus*) deploys an additional technique, putting its bill into water and then tilting its body back to allow the water to run into its mouth.

[*Oriolus kundoo*, India. Photo: Gertrud & Helmut Denzau]



Male orioles, such as this **Maroon Oriole**, play the lead role in courtship. The male performs a variety of aerial manoeuvres in front of the female, calling all the while. He then demonstrates his physical prowess by beating his wings, ruffling his mantle and crown feathers, and fanning his tail. Aerial chases may follow. Should the female be receptive, these may result in copulation, usually on a branch or on the nest itself. As the male hops around the female whistling, she calls back to him and places her tail to one side to facilitate mounting.

[*Oriolus traillii*,
Photo: Chien Te Wang]

and Western Black-headed Orioles, have very varied and extensive repertoires, and another in that group, the Sao Tome Oriole, also exhibits much variation. Three species in this group, the Mountain, Eastern Black-headed and Black-winged Orioles, may extend their calls into a duetting sequence between male and female. Similarly, the Eurasian Golden Oriole will perform a quiet antiphonal duet, and in New Guinea the Brown Oriole duets but the performance is poorly synchronized.

Western Black-headed, Eastern Black-headed, Brown and Olive-backed Orioles are excellent vocal mimics of several other species. In the case of the Brown Oriole, this includes its visual mimic, the Helmeted Friarbird, the call of which the oriole also uses in the duetting sequence. Likewise, the Black-eared Oriole is said to be a vocal mimic of the Black-faced Friarbird, which it closely resembles in appearance (see Morphological Aspects).

The vocalizations of orioles have provided some corroborative support in taxonomic diagnoses, most recently as one of the characters separating the Eurasian Golden and Indian Golden Orioles at the species level. In other cases, some clear vocal differences among taxa have not yet persuaded taxonomists that they provide sufficient evidence for the "splitting" of species. As an example, the call of the "White-lored Oriole" is different from that of the Philippine Oriole, within which it is currently placed as the subspecies *albiloris*, and the extensive racial differences within the Black-naped Oriole complex remain largely unstudied.

Food and Feeding

Orioles are omnivorous and almost exclusively arboreal, foraging mainly high in trees. They feed chiefly on berries, fruits and invertebrates, with some other foods taken opportunistically. The latter include, for example, nectar, pollen, flowers, flowering shoots, leaf buds, seeds of, among others, barley, oats and grasses, and vertebrates such as lizards and small mammals, as well as bird eggs and nestlings. While the three *Sphecotheres* figbirds feed mostly on fruits, the *Oriolus* species take much more animal food, although the proportion of fruits to invertebrates in the diet varies widely, depending on species, sex, age, habitat and season. As an example, the Eurasian Golden Oriole apparently consumes more fruit during migration and winter than it does during the breeding period, and it feeds its growing young with progressively more fruit, if this is available.

Foraging orioles keep mainly to the canopy and middle storey, where they detect food items mostly by sight but sometimes by sound, and then glean or snatch these from branches and foliage. While searching for food, orioles move through the vegetation in short flights and hops or by climbing, but they may also use other body postures, including hanging upside-down, in order to reach food. Sometimes they will catch insects, such as winged termites (Isoptera), in mid-air, and they are also able to hover in a kestrel-like manner to glean items from the undersides of leaves or to locate prey from close above. Orioles sometimes forage in lower levels of vegetation if a good food source is available, as along forest edges or in clearings, treefall gaps or fruiting shrubs. Rarely, however, are they seen to forage on the ground, a substrate which they usually exploit only when pursuing large invertebrates, picking up fallen fruit or foraging in mostly treeless habitats. In pursuit of terrestrial prey they often hover before pouncing to the ground, where they hop or briefly fly but rarely walk.

Orioles consume a wide variety of invertebrates, including earthworms (Oligochaeta), leeches (Hirudinea) and snails (Gastropoda), and arthropods such as spiders (Araneae) and a multitude of insect taxa. Among the last, damselflies and dragonflies (Odonata), crickets, katydids, grasshoppers and locusts (Orthoptera), preying mantises (Mantodea), termites, mealy bugs (Pseudococcidae), shield bugs (Acanthosomatidae), jewel bugs (Scutelleridae), stink bugs (Pentatomidae), cicadas (Cicadidae), weevils and other beetles (Coleoptera), snakeflies (Raphidioptera), mantid flies (Mantispidae), caddis flies (Trichoptera), gadflies (Tabanidae), hoverflies (Syrphidae), crane flies (Tipulidae), moths and butterflies (Lepidoptera), and such Hymenoptera as wood wasps (Siricidae), diprionid sawflies (Symphyta), ichneumon wasps (Ichneumonoidea), ants (Formicidae), hornets and wasps (Vespidae), and bumblebees and bees (Apoidea) have all been recorded as prey. Besides consuming adult invertebrates, orioles eat eggs, pupae and larvae, an oriole's apparently favourite meal being caterpillars, both hairless and hairy. It is worth remembering that hairy caterpillars are a potential food item that is avoided by most other bird species.

In addition to animal food items, orioles take an equally wide variety of fruits and berries, including those of alien species. The figbirds are, as the vernacular name implies, very fond of figs, but no fewer than 16 oriole species have been observed also to take figs, and it is likely that most other species take these fruits but have not so far been recorded as doing so. Orioles do not shy

Once a pair-bond has been established, orioles choose a nest-site within their foraging territory. The partners then set about constructing their nest. This male **African Golden Oriole** has collected strong, supple material to form the core structure of the nest. Grass, rootlets, stems, tendrils, and leaves are all suitable for this purpose. Spider-web silk may be used to bind the components together, thereby providing rigidity. To provide a warm, soft interior, the birds collect woolly plant down or feathers or animal hair.

[*Oriolus auratus*.
Photo: Konrad Wothe]



away from commercial orchards, either, and they are therefore sometimes considered agricultural pests. As a consequence they are persecuted at times (see Status and Conservation), especially during migration periods, when large numbers may assemble in the same orchard.

Less easily digestible food items, such as hairy caterpillars or hard-shelled insects, and fruits are typically prepared for up to five minutes before being consumed. This preparation involves the pressing, mandibulating, shaking or ripping of the item, or the vigorous brushing and pounding of it against a hard surface,

usually the perch, but the bird does not use the feet to hold the prey while it is being prepared in this way. Such manipulation makes caterpillars, for example, more digestible by removing their hairs and pulping the body, and it is often employed by the adults before feeding such items to the young. Likewise, the parents sometimes squeeze fruits so that the juice enters the mouth of the young chicks. Hard indigestible food items, such as chitinous body parts of insects, are later regurgitated.

Breeding

Breeding seasons are determined by seasonal climatic patterns, with some tropical species breeding throughout the year. While knowledge of the breeding behaviour of many oriole species is only rudimentary or non-existent, what we do know reveals an astonishing uniformity within the family, as the details for many of the species are more or less identical. More is known about the breeding behaviour of the Eurasian Golden Oriole than about that of any other oriolid but, apart from the figbirds, the breeding behaviour of the other members of the family appears to be very similar. So far as is known, all orioles are socially monogamous. Birds in the genus *Oriolus* evidently defend exclusive territories, while the *Sphecotheres* figbirds breed in loose colonies.

Courtship among orioles consists mainly of calls and aerial chases, the male flying, diving, hovering, wing-beating and tail-fanning in view of the female. Aerial chases are sometimes followed by copulation. The male whistles and hops around the female, and she entices her partner with screeching calls and by fanning her tail to one side to allow the male to mount. This he does up to four times, after which he may resume hopping or chasing. Copulation usually takes place on branches or on the nest. It is not known whether females elicit secretive extra-pair copulations. More rarely, several males may engage in lek-like courtship displays directed at a single female, features of which include aerial chases involving two males or one male and a female, and simultaneous or alternate calling.

A very elaborate courtship display by a male Eastern Black-headed Oriole was observed in Kenya. Having flown down to the branch of a small tree, the male fanned his tail, partly opened his wings, depressed his head and, in this position, slowly revolved on the branch. He then bent down, suddenly brought his fanned tail over his back, and lowered his wings and spread them

The nest of this **Eastern Black-headed Oriole** is typical of the genus *Oriolus*. It is cup-shaped, and in this instance quite deep, although others may be shallower. The cup is open, meaning that the incubating female has to provide her eggs and subsequent chicks with protection from the elements. The location of this nest also appears typical: suspended like a hammock in a slim, horizontal fork, deep inside a leafy canopy. The female takes sole responsibility for building the nest, the male proclaiming their territory by vocalizing nearby.



[*Oriolus larvatus larvatus*,
Stone Hills Game
Sanctuary, Zimbabwe.
Photo: J. R. Peek]



fully. Throughout the performance, the oriole called continuously with a mixture of imitations of starling (*Sturnidae*), sunbird (*Nectariniidae*) and robin-chat (*Cossypha*) calls interspersed with the liquid notes which the male of this species ordinarily utters. After a short silence, he displayed again, but this time with the head raised and the neck outstretched, the fanned tail held high, and the wings partially opened and held low on the branch as he bobbed up and down.

After pair formation, the partners collaborate in looking for potential nest-sites, which may be anywhere within the pair's

feeding territory. Several Asian and Australasian species will deliberately select a nest-site near the nest of more aggressive species, such as drongos, butcherbirds (*Cracticidae*) or friarbirds, which may afford some protection against nest predators. For example, both Slender-billed and Black-hooded Orioles will nest near Black Drongos (*Dicrurus macrocercus*), the Brown Oriole may nest near Hooded Butcherbirds (*Cracticus crassicus*) or Helmeted Friarbirds, and the Olive-backed Oriole may seek out nesting colonies of Australasian Figbirds, while the Australasian Figbird, in turn, may nest in association with Helmeted Friarbirds or Spangled Drongos (*Dicrurus bracteatus*). Likewise, the Eurasian Golden Oriole occasionally builds its nest near those of, for example, Fieldfares (*Turdus pilaris*), Great Grey Shrikes (*Lanius excubitor*) or Lesser Grey Shrikes (*Lanius minor*).

The typical oriole nest is a shallow to deep, open cup densely woven from various plant materials, decorated with moss and lichens, and suspended hammock-like in a thin, horizontal fork on a lateral branch high inside a well-foliaged tree canopy. If a suitable support is not available, the oriole may create one by weaving together several thinner branches. The nest is very tough and capable of withstanding severe storms. It is built mostly or entirely by the female, the male sometimes helping by collecting some nest material; the building work is completed within 1–2 weeks, exceptionally longer. Figbird nests, by comparison, are not woven and are simpler and flimsier structures, loosely put together from twigs and with no inner lining. For orioles, nest-building requires pliable material for fixing the main structure, soft material for lining, and other material suitable for camouflage. Materials utilized for nest-building are probably chosen opportunistically, as is illustrated by the use of animal items such as hair, feathers and even snakeskin, and man-made materials such as paper, string, plastics and textiles, once even stolen from a scarecrow. Around the beginning of the twentieth century, one lucky finder retrieved a 1000 franc banknote from a nest. During the First World War, a nest of the Eurasian Golden Oriole was found to have been made entirely of surgical dressings pilfered from a nearby dressing-station; after the Second World War, nests made almost entirely out of aluminium strips dropped by bombers to deflect the enemy's radar were found. Most nesting material, however, is plant-based and from a variety of sources, sometimes stolen from the nests of conspecifics or other species.

In a few orioles, the sexes share the parental responsibilities of nest-building, incubation, brooding and provisioning. The more frequent scenario, however, is that the female oriole does most of the work. This is the case with the **Eastern Black-headed Oriole**, where the female alone incubates the eggs and broods the nestlings. Incubation lasts 14–16 days, a relatively short duration for an oriole, some other species incubating for up to three weeks. During this vulnerable period, the female must take care not to attract the attention of potential predators. She thus sits very still while on the nest, scanning the surroundings for any sign of danger.

[*Oriolus larvatus larvatus*, Nylsvley Nature Reserve, Modimolle, South Africa. Photo: Warwick Tarboton]



The breeding characteristics of the **Green Oriole** of Australasia and east Indonesia are fairly typical of the genus *Oriolus*. The nest is a deep cup, woven from coarse and pliable material such as tendrils, twigs and grasses, and lined with softer material such as wool. The female does most of the incubating and brooding, the male helping occasionally. Both parents feed the young, but regurgitate food rather than providing whole items. The male proclaims territory ownership by singing all year, but the breeding season is usually confined to the months between August and January.

[*Oriolus flavocinctus kingi*, Ingham, N Queensland, Australia. Photo: Clifford & Dawn Frith]

Clutch size varies from one to six in orioles, depending on species and individual circumstance. The **Olive-backed Oriole** falls around the median of this range, normally laying two or three eggs. Incubation lasts 16–18 days. At hatching, oriole nestlings are naked and immobile, and have closed eyes; they are thus utterly dependent on their parents. Both Olive-backed Oriole parents feed the chicks, primarily with regurgitated food. The chicks stay in the nest until they are able to fly, leaving at 15–17 days old. They continue to be fed by both parents or by the male alone if the female is occupied in constructing a new nest to house a second brood. Once independent, they leave their natal territory to settle elsewhere. Interestingly, the Olive-backed Oriole often nests in or near colonies of the Australasian Figbird (*Sphecotheres vieilloti*). Australian populations of the Olive-backed Oriole resemble this figbird species and it is thought that this may be a case of mimicry.

[*Oriolus sagittatus sagittatus*,

Brisbane, Queensland, Australia.

Photo: Raoul Slater]



While building the nest, the female may alight in a neighbouring tree, before secretively hopping to the nesting site itself a little way away. She often uses saliva both to soften vegetable fibres and to glue the first few strips, 20–40 cm in length, to the branches, and frequently uses cobwebs for binding. After tightly wrapping the preliminary strips around the holding branches to produce a basic hammock-like structure, the female then intricately weaves further vegetable fibres into the basic structure, using her beak to pull fibres from the outside to the inside of the nest and from the inside to the outside. Once the nest's structure has reached a certain degree of sturdiness, its shape is constantly improved by the female turning and pressing against the inside.

Oriole clutches vary from one egg to six, but the average is about two to three eggs, usually laid at intervals of 1–2 days. The eggs measure approximately 2×3 cm and weigh 5–10 g. They are sometimes white or pinkish-white but mostly some sort of creamy colour, with reddish, brownish, purplish, greyish and blackish spots and streaks, these markings usually concentrated at the obtuse end. The eggs of figbirds, however, are duller, having a greyish-green to olive-brown ground colour.

Although, with some members of the family, it appears that both sexes build the nest, incubate the eggs, and brood and feed the nestlings, this is the exception. More usually, it is exclusively or almost exclusively the female that incubates, for a period of 2–3 weeks, and that broods the nestlings, again for 2–3 weeks. While incubating, the female of the Eurasian Golden Oriole leaves the nest to feed herself only for brief periods of about ten minutes, and rarely up to 38 minutes, but she leaves for longer foraging trips after the eggs have hatched. Meanwhile, the male may feed her and he may also incubate or brood for short periods.

The nestlings of orioles and figbirds are altricial and nidicolous. Both sexes feed them, in the early stages mostly with

small invertebrates, especially caterpillars, but later also with larger invertebrates and more and more berries and fruits, if these are available. The proportion of regurgitated food, as opposed to fresh, unregurgitated food, decreases as the young grow. In the Eurasian Golden Oriole, both male and female feed the chicks, at a rate of around 9–15 times per hour, but sometimes up to 24 times per hour, and with up to 211 feeds in a day. Nestlings begin to beg clamorously, with the open bill turned upward, as soon as they feel the vibrations and hear the sounds of an arriving parent; after opening their eyes at about 6–8 days of age, they also detect the parents' presence visually. The parents at first swallow the chicks' faecal sacs but they carry them away from the nest once the young are about 8–10 days old, at which time the chicks' digestion has become so efficient that their faecal sacs no longer contain any appreciable residual nutrients. Brood-feeding decreases or ceases altogether during the hot midday hours or during periods of bad weather, when nestlings will cuddle together for warmth and, in strong winds, use their claws to cling tightly to the bottom of the nest. During heavy rainfall, the female protects the nestlings by sitting on top of them; at times of intense heat, she may shade them while they pant to lose heat and, in such conditions, the chicks often spread out to such an extent that their heads may protrude over the edge of the nest.

Adverse weather decreases nesting success by depleting food resources, particularly invertebrates, or by directly killing nestlings or destroying nests. After such events, depending on circumstances, pairs may quickly make a new breeding attempt, or they may forgo breeding for the year in question. Exceptionally bad weather, such as hailstorms, can even kill adults.

Orioles use several strategies to defend the nest against predators and conspecifics. As has been seen, one is to build the nest close to the nests of combative species, which may themselves



chase off potential nest predators. If danger approaches, however, the female crouches low in the nest, or slinks away quietly to hide nearby, returning only once the danger has passed. Potential nest predators such as cats, martens (*Martes*), mice (*Muridae*), squirrels (*Sciuridae*), shrikes, starlings, and such corvids as ravens, crows, magpies and jays, as well as owls (*Strigidae*) and birds of prey, are actively chased away, the oriole sometimes defecating on them, and neighbouring pairs occasionally joining in. Orioles rarely resort to direct physical attack, but in a few instances they have been recorded as actually killing an intruding predator by using the bill. Known nest parasites of orioles, such as the Common Koel (*Eudynamis scolopaceus*) and other cuckoos

(Cuculidae), are also chased away. Once the young start begging for food, a warning call by one of the parents silences them immediately and causes them to crouch motionless in the nest.

Telemetric studies of the Eurasian Golden Oriole in northern Germany showed that, during the breeding season, the adults foraged for 45% of the time within 200 m of the nest and for 80% of the time within 700 m of the nest, but they would travel 1–3 km for especially abundant food sources, such as plants infested with caterpillars. Their foraging ranges increased significantly after the hatching of the eggs. Sometimes, up to three immature or adult orioles, presumably previous offspring of the nesting pair, helped in the feeding of the young, especially in habitats with poor food availability. A similar phenomenon has been recorded for the Australasian Figbird, the nestlings of which are occasionally brooded and fed by extra males and females.

Nestlings of the Eurasian Golden Oriole begin to preen and to exercise their wings when they are about 10–12 days old, which is the time when most down feathers start to be replaced with adult feathers. A few days later, some leave the nest and perch in the immediate surroundings, sometimes on the ground. They start to fly when 16–20 days old, after which the young stay with the parents in family groups for a few weeks, or perhaps even months, feeding by the parents eventually ceasing altogether. Orioles probably breed for the first time at the age of 2–3 years, as demonstrated for the Eurasian Golden Oriole.

Studies of Eurasian Golden Orioles have revealed that this species can exhibit site-fidelity over several years. In a few cases, ringing has confirmed that both male and female returned to the same territory year after year. Usually the pair chooses a new nesting site but will occasionally occupy the same nesting tree, or indeed the same branch. Orioles may even reuse materials from the previous year's nest or, rarely, will use the old nest, merely repairing it with some new material. Both the Eastern Black-headed Oriole and the Eurasian Golden Oriole have on rare occasions been recorded as using the same nest a year later.

Movements

Among the Oriolidae, only two species are long-distance migrants, the entire populations of which move seasonally. The Eurasian Golden Oriole migrates between breeding grounds in the Palearctic Region and non-breeding areas in the Afrotropics,

While incubating, the female **Eastern Black-headed Oriole** is fed by the male. It is essential that the male delivers sufficient food for the female to maintain her metabolic rate as this, in turn, generates the heat needed to maintain the eggs at the correct temperature. In this species, clutch size is usually 2–3. Of these, however, an average of just 1.1 chicks lives long enough to fledge. Once the eggs have hatched, the female Eastern Black-headed Oriole takes primary responsibility for brooding the chicks. The male, however, shares some of the brooding duties, and both sexes provide food.

[*Oriolus larvatus larvatus*, Stone Hills Game Sanctuary, Zimbabwe. Photo: J. R. Peek]



When oriole chicks are recently hatched, their parents feed them by regurgitating food. As the chicks grow, however, they become increasingly able to digest solid food. Accordingly, their parents increase the frequency of delivery of small, protein-rich invertebrates, as illustrated by this **Eastern Black-headed Oriole**. It does not take long for the chicks to learn that sudden vibrations and sounds at the nest signify the arrival of a parent with another meal, and they beg vociferously with bill agape and pointing upwards towards the adult bird.

[*Oriolus larvatus larvatus*, Stone Hills Game Sanctuary, Zimbabwe. Photo: J. R. Peek]

A total of two nestlings constitutes a rather small brood for the **Eurasian Golden Oriole**, as normal clutch size is 3–5 eggs. After being incubated by the female for 13–20 days, the eggs hatch within two or three days of each other. The female takes charge of brooding, but both sexes forage. Studies of breeding Eurasian Golden Orioles reveal that parents tend to feed their young 9–15 times per hour, which places a considerable burden on them. While almost half the time spent searching for food is within 200 m of the nest, adults are prepared to travel up to 3 km to reach particularly abundant food sources.

[*Oriolus oriolus*, Spain.

Photo: José Luis Rodríguez]

and the Silver Oriole moves between southern China, where it breeds, and Thailand and Cambodia, where it spends the non-breeding season. In eight other species, only parts of the population are migratory while others are sedentary; these are the Olive-backed, Indian Golden, African Golden, Black-naped, Slender-billed, Eastern Black-headed, Black-hooded and Maroon Orioles. The remaining 20 species in the family are largely sedentary, but may move short distances in response to food fluctuations, or the young may roam about, or “float”, while seeking to establish new territories. Whether individuals fly only a few kilometres or thousands of kilometres, the overriding reason for movements is the search for adequate food supplies, largely in the form of fruits and invertebrates (see Food and Feeding). It is usually, therefore, that part of the population living in areas where the winters are harshest that migrates, while sedentary populations are found in more stable climates.

Most is known about the migration of the Eurasian Golden Oriole, but the movement-related habits of this species are probably similar to those of other orioles which migrate. Migration is usually preceded by heavy bouts of feeding to promote the accumulation of fat reserves, a phenomenon observed also for the African Golden Oriole. Spring migration is faster, more direct and more diurnal than is autumn migration. This is because the males are competing to establish breeding territories as early as possible, and because the females, although usually arriving up to ten days later than the males, need to reach the breeding grounds in time to begin nesting in the optimal period. No such pressing needs push the birds during autumn migration, when the Eurasian Golden Oriole migrates at a more leisurely pace and reportedly mostly at night, probably in order to avoid predators (see General Habits). Adverse weather may pose another threat, as it can delay the spring migration of both the Eurasian Golden Oriole and the Black-naped Oriole by several weeks.

Eurasian Golden Orioles usually migrate alone or in small flocks of up to 30 individuals, although hundreds may gather around fruit resources, especially in gardens and orchards. In exceptional circumstances, even larger concentrations are recorded; for example, thousands were seen together south-west of Alexandria, in north Egypt, on 27th April 1982. Flight altitude can vary. Recorded heights during diurnal passage southwards vary between 5 m and 100 m while over land, many orioles then crossing the Mediterranean Sea at altitudes of 200–300 m but ascending to 1500–2000 m on reaching the Sahara. Within the



Afrotropics, with no need for breeding, the only consideration for Eurasian Golden Orioles becomes that of staying alive. This requires mainly that they follow the wet season as it moves southwards across the continent, since rainfall triggers the growth of green vegetation and a subsequent bonanza of caterpillars and other large invertebrates.

Relationship with Man

Several oriolids, among them the Eurasian Golden Oriole, the Eastern Black-headed Oriole and the Australasian Figbird, occa-

As might be expected for a predominantly frugivorous genus, the **Australasian Figbird** has few qualms about feeding its offspring with fruit and berries as soon as the nestlings' digestive systems are up to it. This female has returned to the nest with a berry that it will feed to one or more chicks. The three youngsters shown in this photograph are typical for the Australasian Figbird, the female only rarely laying either two or four eggs. The species breeds from October to February in the south of its range, extending by a month either side further north. Pairs may raise one or two broods per year. While no information exists on the breeding behaviour of the other two figbirds (*Sphecotheres*), a similar pattern can be expected.

[*Sphecotheres vieilloti*, Vieillot,

Goomboorian, Gympie, SE Queensland, Australia. Photo: Cyril Webster]





Upon hatching, figbird nestlings rapidly demand food from their parents. They are unable to deal with solid food, however, so meals over the first few days of their life comprise food regurgitated by the adults. In these photos, a female (above) and male (below) **Australasian Figbird** are in the middle of the regurgitation process. Over time, the nestlings will move onto a diet of intact invertebrates, fruit and berries. The adults seen here are probably, but not necessarily, the chicks' parents: Australian Figbirds are unusual among the Oriolidae in that nestlings are occasionally brooded or fed by adult helpers in addition to their parents. Such occasional co-operation is particularly interesting in the context of the Australasian Figbird breeding in loose colonies, which are often located close to the nests of Helmeted Friarbirds (*Philemon buceroides*) or Spangled Drongos (*Dicrurus bracteatus*). Figbird nests are rather flimsier structures than the neat cup of orioles, and comprise simple saucer-shaped arrangements of tendrils with no attempt at a softer, warmer inner layer. The nest is supported against a fork towards the tip of a roughly horizontal branch.

[*Sphecotheres vieilloti* vieilloti.]

Above: Goomboorian, Gympie, SE Queensland, Australia.
Photo: Cyril Webster



Below: Brisbane, Queensland, Australia.
Photo: Raoul Slater]

Once the eggs of an oriole pair have hatched, the bulk of the breeding adults' energies are devoted towards bringing food to the nest. With so much food arriving, the removal of excreta is essential in order to keep the nest clean and to reduce detectability. This male **Eurasian Golden Oriole** is in the process of collecting a faecal sac. For the first week or so, the adults swallow their nestlings' faecal sacs, but thereafter they carry the white sacs a safe distance from the nest, where they can be disposed of without drawing attention to the vulnerable nestlings.

[*Oriolus oriolus*,
Spain.

Photo: José Luis Rodríguez]



sionally cause damage to fruit crops in gardens and orchards, and have consequently been persecuted. It is very likely that other oriole species have met the same fate.

Orioles have been exploited by humans for food, sport hunting, the cagebird trade, taxidermy and medicine and for their eggs (see Status and Conservation). In the Altai Mountains of Central Asia, orioles were used by shamans in their religious rituals. Farther west, in the Chuvashskaya Republic of European Russia, the cooked feathers of the Eurasian Golden Oriole were believed to cure malaria and yellow fever, and in Hungary the nests of this species were burnt to produce a cure for mastitis in cows. African Golden Orioles were occasionally sold in markets in Nigeria, probably for traditional medicinal purposes, and the flesh of the Black-naped Oriole has been eaten by pregnant women in South-east Asia supposedly to make their babies more beautiful.

The Eurasian Golden Oriole is considered a harbinger of summer in Europe, and has been called the "Whitsun-bird" because of its late arrival in central Europe, the religious festival of Whitsun, or Pentecost, coming seven weeks after Easter. This species has been named the "beer-bird", because Whitsuntide used to be marked by a festival with a lot of merriment and ale-drinking. It has further been called "rain-bird" or "rain-cat", as it is sometimes the only bird to sing in the humid weather conditions that precede a thunderstorm. K. D. Feige, in his German-language monograph of the Eurasian Golden Oriole, lists more than one hundred colloquial names for this species. For example, this species' dietary preferences are reflected in such colloquial names as "cherry-thief", "fig-eater" and "grape-thrush", just as the name "mango-bird" for both the Indian Golden Oriole and the Black-hooded Oriole indicates one of the favourite feeding trees of these members of the family. The Indian Golden Oriole has also been endowed with the native name of *Peeluk*, meaning "The Yellow One", on account of its brilliant plumage, and the Eurasian Golden Oriole likewise has colloquial names such as "yellow-bird", "gold-bird", "gold-thrush" and "olive-thrush" in Arabic, English, German, Icelandic, Luxembourgish, Norwegian and Swedish.

The mournful whistled song of the Eurasian Golden Oriole evokes sad feelings in some people, apparently especially so among Russians. This is evidenced by the poem "I hear the always-sad voice of the oriole" by the Russian writer Anna Akhmatova which salutes the passing of the summer, as well as by the documentary movie "Somewhere laments an oriole...", by the Russian film-maker Edmond Keosayan, which tells the story of a Russian girl who, during the Second World War, was brought from Russia to Belgium, where she became an active Resistance fighter. Another book referring specifically to orioles is R. Trevelyan's *The Golden Oriole: Childhood, Family and Friends in India*, in which the author describes his journey across India as he revisits the places of his childhood and evokes the spirit of the British experience in colonial India.

Finally, one of Germany's best-loved comedians, Vicco von Bülow, whose last name is itself an onomatopoeic spelling of the oriole's song, adopted the French name of the oriole, *Loriot*, as his stage-name. The Eurasian Golden Oriole is quite a popular bird in Germany, with three excellent German monographs published in the last two decades: in addition to the one by Feige, there are those contributed by E. Bezzel and R. Wassmann. Bezzel's monograph celebrates the oriole being awarded the title of "Bird of the Year" in 1990, an honour bestowed annually on a particular bird species by the German BirdLife partner in order to raise conservation awareness among the general public.

Status and Conservation

Of the 30 species of Oriolidae currently recognized, three are globally threatened and a further three are listed as Near-threatened. This total of six species amounts to 20% of the family, the same as the global average for all avian families. Top of the list is the Critically Endangered Isabela Oriole of the north Philippines, rediscovered in 1993 after a 32-year absence of records, followed by the Sao Tome Oriole and, in south China, the Silver Oriole,



Adult orioles provide their offspring with a varied diet. Taken at the same **Olive-backed Oriole** nest, the first image shows the parent bringing back a bill full of black berries, whereas in the second it delivers a stick-insect (*Phasmida*). The insect is rather large, and the adult will probably have to break it into pieces before passing it on to the chicks. Judging from the limited fine streaking on the crown and the lack of any cinnamon edging to the remiges, the adult seen in both of these photographs appears to be the male.

[*Oriolus sagittatus sagittatus*, Goomboorian, Gympie, SE Queensland, Australia. Photos: Cyril Webster]

The two nestlings of this male **Black-naped Oriole** have lost their down and have developed yellow-olive adult feathers, which suggests that they are probably only a day or two from fledging. Both parents will continue to care for their offspring within the family's territory until the young become independent.

[*Oriolus chinensis maculatus*,
Ghim Moh Road,

Singapore.

Photo: Jimmy Chew]



the current status of each of which is considered to be Vulnerable. The Dark-throated Oriole, the Black Oriole and the Wetar Figbird (*Sphecotheres hypoleucus*) are not yet thought to be at immediate risk and are placed in the conservation category of Near-threatened.

The Isabela Oriole is apparently dependent on the lowland rainforests, and especially thick bamboo forest, on the Philippine island of Luzon, where it has had to contend with a 75% reduction of its habitat over the last century. Although this species has been recorded also in second growth and forest edges, primary forest habitat is probably of crucial importance for its continued survival. Likewise, the Sao Tome Oriole and the Silver Oriole appear to be dependent mainly on primary forest, utilizing mature secondary forest to a far lesser extent. Of the Near-threatened species, the Dark-throated Oriole and the Wetar Figbird use both primary and secondary forests, while the Black Oriole seems to be restricted to primary forest.

All six of these species have relatively small global ranges, predisposing them to extinction, but the ultimate causes of their precarious status are anthropogenic, principally habitat loss, degradation and fragmentation brought about by logging, agricultural expansion and, to a much lesser degree, other forms of human encroachment such as road-building, mining and uncontrolled fires. Pesticide use is also implicated in the decline of the Sao Tome Oriole. In reality, it is not really known how dependent many of the 30 oriole species are on primary, undisturbed forest for long-term survival or whether they could also survive in patches of secondary forest. The protection of large tracts of forest must, therefore, be considered essential in view of the current limited knowledge of these species' ecology. The conservation of the Silver Oriole is further complicated by the fact that this oriole migrates between breeding grounds in China and non-breeding areas in Thailand and Cambodia, thereby necessitating conservation strategies for both regions.

Encouragingly, all globally threatened and Near-threatened members of the family except the Wetar Figbird occur in one or more protected reserves, with further areas in the process of becoming protected. Nevertheless, it remains highly questionable whether these limited forest patches will suffice to ensure the long-term survival of each species, in particular because some of these reserves are poorly managed and inadequately protected. All except one of the six oriolids that are threatened or poten-

tially threatened have been observed in degraded forest habitats, which may enable them to survive in a patchwork of primary and secondary forest remnants. It is not known, however, whether they can successfully breed in degraded or secondary habitats, which may therefore act as population "sinks", such that these species still depend on primary habitats for survival. The Black Oriole, the only threatened or potentially threatened species that has so far been recorded only from primary forest habitats, may also make use of secondary habitats but has not yet been observed in them.



The **Philippine Oriole** is one of a number of oriolids that are poorly known. It appears to be fairly common over much of its sizeable range, occupying much of the Philippines. However, as forest destruction and degradation in the Philippines have been so intensive, it seems likely that the numbers of this species will have declined somewhat, even allowing for the fact that this species is often found in secondary habitats. Further research is required on this species.

[*Oriolus steerii samarensis*,
near Bislig, Mindanao,
Philippines.

Photo: Ian Merrill]



Several oriolids may soon be candidates for Near-threatened status, as they combine a medium-sized range, extending across 20,000–50,000 km², with continuing loss, degradation and fragmentation of forest. These are the Olive-brown Oriole, Black-eared Oriole, Grey-collared Oriole, Dusky-brown Oriole and Green-headed Oriole and the Timor Figbird (*Sphecotheres viridis*). These species should therefore be monitored, as they face similar ongoing threats to those afflicting the already threatened species, such as logging and agricultural expansion, with potential future threats that include oil-drilling activities and hydro-electricity schemes. Even widespread and common species are subject to some threats. For example, the Green Oriole and

the Australasian Figbird suffer from the continuing disappearance of rainforest patches with fruit resources, while the African Golden Oriole and the African Black-headed Oriole are partially dependent on miombo (*Brachystegia*) woodlands, which are vanishing fast. As a consequence, some maps depicting the ranges of oriolids may present an overoptimistic picture, and the true current range may be much more constricted than indicated. For example, it is well known that the Slender-billed Oriole is almost extinct in some areas of its Chinese range owing to habitat destruction, hunting, and trapping for the cagebird trade and taxidermy.

While its conservation status does not even approach that of globally threatened, the fate of the Eurasian Golden Oriole illustrates a number of other conservation issues. First, there has been a conspicuous northward expansion of its range, breeding populations having established themselves in Denmark, Sweden, Norway and the United Kingdom during the last two centuries. This expansion was probably caused by habitat change, such as the creation of poplar (*Populus*) plantations in East Anglia, in England, but perhaps also by gradual temperature increases. Recently, however, this oriole has experienced some regional population declines in western Europe the causes of which are much harder to pin down. In England, the recent decline has been due at least partially to the felling of the favoured poplar plantations, but other causes may be increased pesticide use, removal of trees and hedges and the disappearance of riparian forests in breeding areas, as well as losses during migration and in the non-breeding quarters due to hunting and to habitat loss and degradation. It is common knowledge that thousands of orioles are killed annually by hunters when they migrate through the Mediterranean region and along the Nile Valley, or at stopovers at Saharan oases. Sometimes this persecution is carried out in order to protect commercial fruit crops such as ripening dates and mulberries (*Morus*), but in most cases the birds are hunted for food or merely for "sport". Furthermore, some of the Eurasian Golden Oriole's favoured winter habitats, such as miombo woodlands, are vanishing fast in parts of the species' non-breeding range.

Whereas the Eurasian Golden Oriole is hunted heavily during certain stages of its migration, the Black-and-crimson, Black-naped, Dark-throated and Slender-billed Orioles, and probably other oriole species, are trapped for the purposes of taxidermy and the cagebird trade in China and other eastern Asian countries. Nets or bird-lime twigs are often used, or the birds are taken directly from the nest. The Black-naped and Slender-billed Orioles are now markedly rare in many areas of their

A rather drab-plumaged oriolid, the **Olive-brown Oriole** is a restricted-range species confined to the Timor and Wetar Endemic Bird Area in the eastern Lesser Sundas. At present, it is not considered to be globally threatened and was found to be common during recent surveys on Atauro. On Timor and Wetar, however, it is generally uncommon and thinly distributed. Given the rate of deforestation on these islands, and the existence of only a very few small protected areas, it would seem worthwhile monitoring the status of this species.

[*Oriolus melanotus melanotis*,
W Timor, Lesser Sundas.
Photo: Morten Strange]



The **Black-eared Oriole** (left) occurs on Buru and in the Tanimbar Islands, whereas further to the north the **Dusky-brown Oriole** (right) occurs only on Halmahera. While neither species is currently of global conservation concern, the logging concessions on Tanimbar and Halmahera, together with extensive deforestation on Buru, suggest that it would be wise to establish additional protected areas on these islands for these species and others.

[Left: *Oriolus bouroensis bouroensis*,
Wanlana, Buru, Moluccas.
Photo: Ron Hoff.

Right: *Oriolus phaeochromus*,
Halmahera, Moluccas.
Photo: Ong Kiem Sian]

The Dark-throated Oriole is fairly common in its relatively large range in South-east Asia, the Greater Sundas and the western Philippines. Moreover, it occurs in several widely spaced protected areas and tolerates both secondary growth and submontane elevations. Nevertheless, destruction of lowland forests in this region has been rampant, prompting dismal predictions of almost all the primary forest having disappeared by 2010. This attractive oriole is also sold in the cagebird trade. This combination of pressures has warranted the species' listing as Near-threatened.

[*Oriolus xanthonotus*
xanthonotus,
Panti forest, Malaysia.
Photo: Ong Kiem Sian]



Asian ranges as a result of overexploitation by humans, and no doubt the same applies to several other oriole species. Although some oriolid eggs may still be taken for food by local inhabitants, others are taken by egg-collectors, who are still active in, for example, England.

Some other human activities have unexpected consequences for oriole populations. While rising global temperatures may cause migrating orioles to arrive earlier at their breeding grounds and to leave later, the "Chernobyl disaster", in Ukraine, where a nuclear reactor exploded in 1986, led to an increase in Eurasian Golden Oriole populations as the birds began to breed in abandoned and overgrowing villages. Similarly, the Sao Tome Oriole

initially benefited from Portuguese decolonization, as many plantations reverted to secondary growth after 1975. So far as is known, no serious attempt has been made at introducing any oriole species into another part of the world.

In conclusion, while we certainly know factors that are detrimental to oriole populations, it is very difficult indeed to determine which factor is the most important for any given species. Considering all members of the family together, however, it seems that habitat loss, degradation and fragmentation are by far the most serious causes of population declines. The protection of large and undisturbed tracts of habitat has to be considered essential for the long-term survival of most of the Oriolidae.

Three species of oriole are globally threatened, one being the **Sao Tome Oriole**, which is rated Vulnerable. It is a restricted-range species endemic to São Tomé, with a total range of merely 480 km². While locally common in primary forest, historical clearance of forest for coffee and cocoa plantations means that suitable intact habitat has effectively retreated to higher elevations. Widespread pesticide use up to 1975 is thought to have caused a dramatic reduction in oriole numbers, and today possibly fewer than 1000 birds remain.

[*Oriolus crassirostris*,
São Tomé, Gulf of Guinea.
Photo: Walter Mankel]



General Bibliography

- Ali & Ripley (1972a), Anon. (1987), Appert (1994), Bannerman (1953), Barruel (1954), Barry (1998), Baumann (1999a, 1999b), Béland (1977), Bezzel (1989), Bock (1994), Borrett (1972), Brooke (1970a), Burfield & van Bommel (2004), Butchart & Stattersfield (2004), Collar (1975), Collar *et al.* (2001), Cramp & Perrins (1993), Dagley (1994), Dathe (1961), Dean (1985), Dementiev *et al.* (1954a, 1970), Diamond (1982), Dickinson (2003), Dickson & Scott (1998), Dorning (1954), Durango (1955), Eve & Guigue (1996), Feige (1986, 1995), Fletcher & Inglis (1936), Fry *et al.* (2000), Gilliard (1958), Goodman & Meininger (1989), Greenway (1962), Haffer (1993g), Hagemeyer & Blair (1997), Harwin & Manson (1972), Hemmingsen (1969), Higgins *et al.* (2006a), Hockey *et al.* (2005), Höppner (1964), Hume & Oates (1889), Irwin (1980), Jackson & Sclater (1938), Jonsson *et al.* (2008), Klose (1985), MacKinnon & Phillipps (2000), Mackworth-Praed & Grant (1960), Maclean (1993), Mann (1971), Marshall (1950), Meinertzhagen (1923, 1954), Miller (1992), Moreau (1969), Nikiforov (1993), Nikolaus (2001), Paz (1987), Pratt (1978), Price *et al.* (1999), Radernacher (1967), Rasmussen & Anderton (2005a, 2005b), Reinsch (1958, 1959a, 1984), Reinsch & Warncke (1971), Schodde & Mason (1999), Schodde & Tidemann (1990), Schönfeld (2001), Schönewetter & Meise (1983), Sharpe (1877), Shepherd *et al.* (2004), Sibley (1996), Sibley & Ahlquist (1985b, 1990), Sibley & Monroe (1990, 1993), Snow & Perrins (1998), van Someren (1956), Stahlbaum (1966), Stark (1900), Stephan (1965), Strange & Jeyarajasingam (1993), Tarboton *et al.* (1978), Uhlenhaut (1999), Voous (1960), Walter (1968), Walther (2004), Wassmann (1990a, 1990b, 1990c, 1993, 1997a, 1997b, 1997c, 1998, 2004), Wells (2007), Whistler & Kinnear (1949), White & Bruce (1986), Zippelius (1972).



PLATE 54

inches 5
cm 13

Genus *SPHECOTHERES* Vieillot, 1816

1. Timor Figbird

Sphecotheres viridis

French: Spéciothère figuier **German:** Timorfeigenpirol **Spanish:** Oropéndola de Timor
Other common names: Green Figbird

Taxonomy. *Sphecothera* [sic] *viridis* Vieillot, 1816, “Austral-Asia” = Kopang, Timor. Original description of genus included two different spellings, “*Sphecotheres*” and “*Sphecothera*”; former selected by first reviser as the valid name for this genus. Has sometimes been considered conspecific with *S. hypoleucus* and *S. vieilloti*; further research, including molecular-genetic analyses, is required. Monotypic.

Distribution. Timor and Roti I, in Lesser Sundas.



Descriptive notes. 26 cm; 75–80 g. Male has head and chin to upper mantle sooty black, bare skin around eye pink or red; lower mantle and back rich yellowish olive-green with dusky streaks, rump plainer; upperwing dark, primaries with narrow whitish edging, secondaries and upperwing-coverts broadly edged olive; central tail feathers dark, suffused with olive, with whitish terminal spots on inner webs, outer tail feathers white; throat and chest olive-green, lower chest lighter olive, merging into dusky yellow then off-white on belly and undertail-coverts; iris yellow to deep red; bill black; legs grey or greenish-black. Female has

facial skin bluish-grey; plumage above brown, streaked darker on crown and upper mantle, back and rump less streaked, rump greener; wing dark, secondaries edged greenish, tail feathers dark brown with slight greenish-yellow wash and faint whitish tips; underparts creamy white, heavily streaked dark brown, buffier from throat to upper breast; iris dark brown; bill and legs greyish-green. Immature is like female, but less boldly marked. Voice. Calls include muted, slightly burred trill of two very brief phrases, duration c. 1.5 seconds.

Habitat. Primary and mature secondary deciduous monsoon forests, gallery forest, forest edges and remnants, woodlands, wooded cultivations, mangroves and scrub; generally up to 160 m, but one specimen collected in hills at 850 m.

Food and Feeding. Fruits, e.g. figs (*Ficus*). Forages alone, in pairs or in small groups in tree canopy, and lower in shrubs; often joins mixed-species flocks.

Breeding. No information.

Movements. Presumed sedentary.

Status and Conservation. Not globally threatened. Restricted-range species: present in Timor and Wetar EBA. Moderately common in parts of range, which covers 20,000–50,000 km²; within this, significant, although increasingly isolated, forest patches remain. Species' population should be monitored, as large forest areas on Timor have been converted to agriculture, mostly in lowlands and valleys, and only a few small protected (but unmanaged) areas exist. A new BirdLife-managed project is aimed at establishing Timor-Leste's first national park, probably in the Lore-L Iratalaro-Jaco I region, an Important Bird Area.

Bibliography. Coates & Bishop (1997), Hellmayr (1914), Noske (2003), Schodde & Mason (1999), Stattersfield *et al.* (1998), White & Bruce (1986).

2. Wetar Figbird

Sphecotheres hypoleucus

French: Spéciothère de Wetar **German:** Wetarfeigenpirol **Spanish:** Oropéndola de la Wetar

Taxonomy. *Sphecotheres hypoleucus* Finsch, 1898, Wetar Island, Indonesia. Original description of genus included two different spellings, “*Sphecotheres*” and “*Sphecothera*”; former selected by first reviser as the valid name for this genus. Has sometimes been considered conspecific with *S. viridis* and *S. vieilloti*, even though present species is rather distinctive; further research, including molecular-genetic analyses, is required. Monotypic.

Distribution. Wetar I, in Lesser Sundas.



Descriptive notes. 26 cm; 75–80 g. Male has pink or orange-red bare skin around eye; head, neck and upper mantle black, rest of upperparts olive-green, faintly streaked; upperwing dark, secondaries, tertials and upperwing-coverts with greenish-yellow edging; tail dark, greenish wash on central feathers, white terminal patches on inner webs of outer rectrices; chin to belly white, some olive-green on flanks; iris dark brown; bill black; legs grey. Female has facial skin bluish-grey to dark green; plumage above brown, streaked darker on crown and upper mantle, with back and rump less streaked and rump olive-green; wing dark, secondaries

edged greenish, tail dark brown, central feathers olive-green, outer rectrices with faint whitish tips; throat and underparts buff-white, heavily streaked dark brown; iris blackish; bill black; legs bright plumbeous. Immature is like female, but less boldly marked. Voice. A muted series 3–4 seconds in duration, of rather harsh, chirpy, nasal and unmusical notes.

Habitat. Primary and secondary deciduous monsoon forests, woodland and scrub; recent observations also in other disturbed habitats, such as lightly wooded scrub.

Food and Feeding. No information.

Breeding. No information.

Movements. Presumed sedentary.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Timor and Wetar EBA. Occurs only on the relatively small (c. 3600 km²) Indonesian island of Wetar. Although rainforest still extensive on Wetar, some recent deforestation has taken place; this species is now found mostly in NW part of the island, where it should still be moderately common. No reserves exist on Wetar, but there are proposals for one. The island is sparsely populated and only a few roads connect the largest towns, making the species relatively secure, although some poorly managed gold mines have caused severe local environmental damage. Given that the island has been visited by ornithologists only once since 1910, and then only for a few hours, the species should probably be classified as Data-deficient.

Bibliography. Anon. (2007g), Butchart & Stattersfield (2004), Coates & Bishop (1997), Collar *et al.* (2001), Finsch (1898), Stattersfield & Capper (2000), Stattersfield *et al.* (1998), White & Bruce (1986).

3. Australasian Figbird

Sphecotheres vieilloti

French: Spéciothère de Vieillot **German:** Vieillotfeigenpirol **Spanish:** Oropéndola de Vieillot
Other common names: Figbird, Banana-bird, Mulberry-bird, Red-eye; Green/Grey-breasted/Southern Figbird (*vieilloti*); Yellow/Northern Figbird (*ashbyi*, *flaviventris*)

Taxonomy. *Sphecotheres Vieilloti* Vigors and Horsfield, 1827, near Rockhampton, east Queensland, Australia.

Original description of genus included two different spellings, “*Sphecotheres*” and “*Sphecothera*”; former selected by first reviser as the valid name for this genus. Has sometimes been considered conspecific with *S. viridis* and *S. hypoleucus*; moreover, race *flaviventris* has been treated as a separate species, but hybridizes widely with nominate in E Queensland; further research, including molecular-genetic analyses, is required. Five subspecies currently recognized.

Subspecies and Distribution.

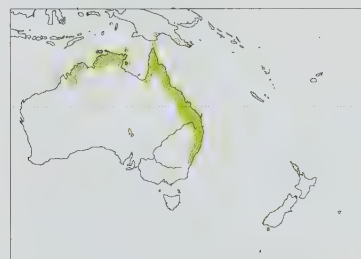
S. v. cucullatus (Rosenberg, 1866) – Kai Is (off SW New Guinea).

S. v. salvadorii Sharpe, 1877 – SE New Guinea.

S. v. ashbyi Mathews, 1912 – N Australia (N Western Australia and N Northern Territory).

S. v. flaviventris Gould, 1850 – islands in Torres Strait and NE Australia (Cape York and NE Queensland).

S. v. vieilloti Vigors & Horsfield, 1827 – E Australia.



Descriptive notes. 27–29.5 cm; 97–146 g. Male nominate race has crown, face, ear-coverts and neck jet-black with some gloss; bare skin around eye pink or red; upper mantle grey, lower mantle, scapulars and rump olive-green; upperwing blackish-brown, outer webs of secondaries and upperwing-coverts olive-green; tail blackish, outer three feather pairs with white tip on outer web and large white terminal patch on inner web, amount of white increasing outwards, outermost rectrix with outer web almost completely white; chin, throat and chest grey, merging into olive-green on lower chest, with varying amounts of yellow and

white on belly; undertail-coverts whitish; iris deep red-brown; bill black; legs pink. Female has bare facial skin dark purple-grey; crown, neck and upper mantle brown, streaked darker, merging into less streaked olive-brown lower mantle and back, rump plain olive-green; wing dark brown, primaries narrowly edged whitish, outer webs of secondaries with green wash and edged buffy-whitish; tail brown, inner feathers washed greenish above, outer feathers with small white tips; chin to breast buff, heavily streaked brown, lower chest and belly whitish, heavily streaked brown, vent and undertail-coverts with very faint streaking; iris dark brown; bill blackish; legs dull red to pinkish-grey. Immature is like female, but less boldly marked. Races differ mainly in plumage pattern and colour, to lesser extent in size: *flaviventris* is same size as nominate, but male has glossy black head and neck sharply demarcated (no grey collar) from yellowish olive-green upperparts, and chin to belly uniformly sulphur-yellow, with some olive wash at side of breast, lower underparts whitish; *ashbyi* male resembles previous, but is brighter dorsally and rich medium-yellow ventrally, with less olive-green wash on side of breast; *cucullatus* is larger, longer-billed, with deeper yellow underparts; *salvadorii* male resembles nominate in having grey nape and breast, but is smaller, with lower chest, upper belly and flanks mostly yellow with slight orange tinge (sometimes streaked grey), all rectrices except central pair with extensive white tips. Voice. Song a hesitant series of simple tuneless whistles ending in a downslur, e.g. as “tu-tu-heer, tu-heer, tu-heer”. Calls include short sharp yelps, “pow pow pow”, and a loud “sluck”; also loud “see-kew”, repeated irregularly. Mimics other bird species, including, among others, various Psittaciformes, Pallid Cuckoo (*Cuculus pallidus*) and other oriolids.

Habitat. Various wooded and forested habitats, e.g. gallery monsoon forest, large trees along rivers, eucalypt (*Eucalyptus*) woodlands, coastal second growth, mangroves, pockets and edges of rainforest, coconut plantations, also fruiting trees, even in savannas, urban parks and gardens; distribution determined mainly by that of foodplants, especially fig trees (*Ficus*). Mainly in coastal areas; up to 500 m in New Guinea.

Food and Feeding. Mostly fruits, also some seeds and nectar; also insects, occasionally small vertebrates. Fruits include those of e.g. figs, native cherry (*Exocarpus cupressiformis*), raspberries (*Rubus*), *Lantana*, tobacco-bush (*Solanum mauritanium*), and cultivated bananas (*Musa*), pawpaws (*Asimina*), guavas (*Psidium*), loquats (*Eriobotrya japonica*), mulberries (*Morus*), and the alien inkweed (*Phytolacca octandra*). Insects mainly beetles (Coleoptera), also cicadas (Cicadidae), ants (Formicidae), termites (Isoptera) and lepidopteran caterpillars. Small lizards, e.g. common blue-tongued lizard (*Tiliqua scincoides*), taken rarely. Forages actively and noisily, sometimes alone but more often in pairs; during non-breeding season in small to large flocks of up to 100 or more individuals. Searches for food mostly high in shrubs and trees. Catches aerial insects, e.g. swarming flying ants, by aerial flycatching.

Breeding. Breeds in Oct–Feb in S of range and Sept–Mar (rarely Apr and Aug) in N; one or two broods per year. Nests in loose colonies. Co-operative breeding recorded rarely. Nest a flimsy, thin, deep saucer of vine tendrils and sometimes a few fine twigs, external diameter 12.7–15.2 cm, height 5.7–6.4 cm, internal diameter 8.9–12.1 cm, depth 5.1–5.7 cm, woven into horizontal fork near end of

branch, usually fairly high up, in densely or sparsely foliated tree, especially fig or paperbark (*Melaleuca*); in N Australia (races *ashbyi* and *flaviventris*) often close to nest of Spangled Drongo (*Dicrurus bracteatus*) or Helmeted Friarbird (*Philemon buceroides*), presumably benefiting from aggressiveness of those species. Clutch usually 3 eggs, sometimes 2 or 4, dull greyish-green to olive-brown with dark reddish-brown and purple spots or blotches concentrated at obtuse end, sometimes with larger grey halo, dimensions 29.7–36.8 × 21.2–24.6 mm; incubation by both sexes, period 16–17 days, rarely to 20 days; both also brood and feed nestlings with regurgitated food, very occasionally extra males and females (helpers) bring food to nestlings and perhaps even brood them, nestling period c. 14–17 days. Nests sometimes parasitized by Common Koel (*Eudynamis scolopacea*).

Movements. Sedentary, with local nomadic movements in search of fruiting trees; small flocks containing older individuals are less mobile, whereas larger flocks of mostly younger individuals travel farther (longest recorded movement 105 km). Populations in extreme S of range possibly migratory. Hundreds may gather at roosting sites at dusk.

Status and Conservation. Not globally threatened. Common in parts of range, which is estimated to cover c. 1,000,000–10,000,000 km². Recorded density in eucalypt woodland in New Guinea 0.2 individuals/ha. A study in N Australia (Northern Territory) showed species' presence is dependent mostly on availability of fruit and only to lesser extent on size and interconnectivity of rainforest patches. Occurs in various protected areas. Sometimes seen as a pest in commercial orchards.

Bibliography. Barrett *et al.* (2003), Bèland (1977), Bell (1983c), Beruldsen (1980), Blakers *et al.* (1984), Coates (1990), Coates & Bishop (1997), Crouther (1985), Dickinson (2004), Dunning (2008), Ford, J.R. (1975, 1983a), Gosper (1996), Hall & Carline (1974), Higgins *et al.* (2006a), Holland (1962), Macdonald (1973), Mathews (1921), North (1902), Noske (1997), Price (2006), Price *et al.* (1999), Rand & Gilliard (1967), Schodde & Mason (1999), Schodde & Tidemann (1990), Schönwetter & Meise (1983), Shingleton (2006), Simpson *et al.* (2004), Slater *et al.* (2003), Turner (1995), Woodall (1980).

Genus *ORIOLOS* Linnaeus, 1766

4. Brown Oriole

Oriolus szalay

French: Lorient papou

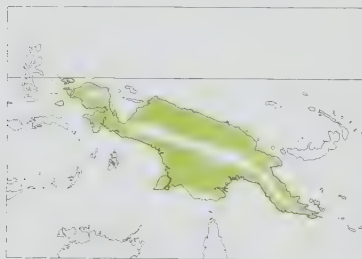
German: Grantpirol

Spanish: Oropéndola Papú

Other common names: Striated/New Guinea Oriole

Taxonomy. *Mimeta szalay* Madarász, 1901, Finschhafen, Huon Gulf, north-east New Guinea. Forms a superspecies with *O. phaeochromus*, *O. forsteni*, *O. bouroensis*, *O. melanotis* and *O. sagittatus*, all of which, together with more distantly related *O. flavocinctus*, were formerly placed in the alternative genus *Mimeta* on basis of skull characteristics. Monotypic.

Distribution. New Guinea and West Papuan Is (Waigeo, Batanta, Salawati, Misool).



Descriptive notes. 25–28 cm; 79–115 g. Visual and vocal mimic of Helmeted Friarbird (*Philemon buceroides*), and is itself mimicked visually and vocally by Streak-headed Honey-eater (*Pycnopygius stictocephalus*). Plumage is medium-brown above, paler on head, heavily streaked with black on crown, less so on mantle; face and ear-coverts black, streaked whitish, contrasting with lighter side of neck and hindcrown; upperwing dark brown; tail dark brown, all except central feathers with indistinct paler tips on inner webs; buff below, chin, throat and chest heavily streaked black, belly less heavily so; iris deep red-brown; bill blackish. Sexes alike. Immature has prominent white supercilium and tawny edges of upperwing-coverts; iris brown, bill black. Voice. Varied short, loud phrases including fluty whistles, beginning with one or two pairs of descending short notes and ending with rising disyllabic slur, “titu-witu-whiew”, “tip-top-tertert” or “nn-dudu-tiew”; also a friarbird-like “du-du-hoo”, and clear vocal mimicry of many other bird species. Other calls include high-pitched falling and rising “hiiewee” whistle, sometimes “ch-hiiewee”, “prrr-hiiewee” or “trr-oooueei”; also 1–2 descending notes followed by longer downslurred note “(dop)-dop-houw”. Duetting common but poorly synchronized, one bird giving lower-pitched friarbird-like phrase and the other high-pitched loudly whistled notes.

Habitat. Mainly disturbed areas, e.g. forest edges and second growth; also lowland and foothill rainforests, monsoon forest, swamp-forest, gallery forest and scrub, dense savannas, mangroves, and plantations, e.g. teak (*Tectona*), rubber, *Aracaria* pine, and gardens. Lowlands to 1850 m, usually below 1200 m.

Food and Feeding. Fruits, insects (e.g. caterpillars, pupae), also some grass seeds and probably nectar. Forages alone, in pairs or in small groups, mainly in canopy.

Breeding. Nest-building reported in Aug–Sept, egg-laying in Apr–May and Sept–Nov, brooding adult in Apr, nestlings in Jan and fledgling in Sept. Rough open cup-nest woven from bark strips and sometimes also bark flakes and other fibres, lined with fine grasses and small stems, suspended hammock-like from thin, horizontal forked branch 2.5–15 m above ground; often near colony of Helmeted Friarbirds, and sometimes near Hooded Butcherbird (*Cracticus crassius*) nest. Clutch 1–2 eggs, brownish yellow-white with chocolate-brown, olive-brown and greyish spots concentrated on obtuse end, dimensions 31–32.3 × 20.9–22.8 mm; nestlings fed with fruits and probably larvae; no information on duration of incubation and nestling periods.

Movements. Sedentary.

Status and Conservation. Not globally threatened. Common in parts of range, which estimated to cover c. 100,000–1,000,000 km². Estimated densities of 0.4 individuals/ha in lowland rainforest and 0.07 individuals/ha in coastal savanna.

Bibliography. Beecher (1978a), Beecher *et al.* (1986), Clapp (1986a, 1990), Coates (1990), Diamond (1972a), Dunning (1993, 2008), Majnepe & Bulmer (1977), Mees (1965a), Rand & Gilliard (1967), Schönwetter & Meise (1983), Stresemann & Paludan (1932a).

5. Dusky-brown Oriole

Oriolus phaeochromus

French: Lorient d'Halmahera

German: Halmaherapirol

Spanish: Oropéndola de Halmahera

Other common names: Halmahera/Dusky/Ruddy/Moluccan/Gray's Oriole

Taxonomy. *Oriolus phaeochromus* G. R. Gray, 1861, Halmahera Is., Indonesia.

Forms a superspecies with *O. szalay*, *O. forsteni*, *O. bouroensis*, *O. melanotis* and *O. sagittatus*, all of which, together with more distantly related *O. flavocinctus*, were formerly placed in the alternative genus *Mimeta* on basis of skull characteristics. Monotypic.

Distribution. Halmahera, in N Moluccas.



Descriptive notes. 26 cm. A close visual mimic of Dusky Friarbird (*Philemon fuscicapillus*), from which difficult to distinguish in the field. Plumage is more or less uniformly plain dark brown throughout, slightly paler and greyer on forehead, chin to chest and sides of neck, and flight-feathers and tail; primaries edged pale brown; iris dark brown; bill and legs black. Sexes alike. Immature undescribed. Voice. Not certainly recorded; call attributed to this species a moderately loud, liquid, 2-note whistle 0.75 seconds in duration (preceded by almost inaudible “k’k’-wheou”), repeated at intervals of c. 8 seconds.

Habitat. Primary forest and mature secondary forest from lowlands up to 1200 m; found also in agricultural and other cultivated lands.

Food and Feeding. Arthropods and small fruits. Forages alone or sometimes in pairs, from middle storey to canopy; sometimes joins mixed-species flocks.

Breeding. No information.

Movements. Presumed sedentary.

Status and Conservation. Not globally threatened. Restricted-range species: present in Northern Maluku EBA. Moderately common to frequent in parts of its range of c. 20,000–50,000 km². Extensive forest tracts remain on Halmahera, and the Aketajawe-Lolobata National Park, covering 1673 km² of hill and lowland rainforest of exceptional biodiversity importance, was declared in 2004; several other protected areas have been proposed. Most of the remaining forest, however, is covered by timber concessions, and plans for agricultural development further endanger the long-term future of Halmahera's forest habitats.

Bibliography. Coates & Bishop (1997), Heinrich (1956), Meinertzhagen (1923), Poulsen & Lambert (2000), Salvadori (1875), Stattersfield *et al.* (1998), White & Bruce (1986).

6. Grey-collared Oriole

Oriolus forsteni

French: Lorient de Céram

German: Forstenpirol

Spanish: Oropéndola de Seram

Other common names: Seram/Ceram/Forsten's/Grey-necked Oriole

Taxonomy. *Mimeta forsteni* Bonaparte, 1850, Seram, south Moluccas.

Forms a superspecies with *O. szalay*, *O. phaeochromus*, *O. bouroensis*, *O. melanotis* and *O. sagittatus*, all of which, together with more distantly related *O. flavocinctus*, were formerly placed in the alternative genus *Mimeta* on basis of skull characteristics. Monotypic.

Distribution. Seram, in S Moluccas.



Descriptive notes. 31 cm; 105–113 g. A close visual mimic of Seram Friarbird (*Philemon subcorniculatus*), from which very difficult to distinguish in the field. Plumage is olive-brown above, crown paler with dark streaking and separated from unstreaked darker olive mantle by grey nuchal collar; side of face darker grey-brown, area of greyish bare skin around eye; upperwing dark olive, remiges edged greenish-yellow; tail dark olive-brown, paler and greyer on underside, with paler tips on inner webs; chin and throat grey-green with darker streaks; chest warm golden-olive, mottled darker and merging into paler buffy belly and undertail-coverts; iris light brown to reddish-brown; bill black; legs blackish-brown. Sexes alike. Immature undescribed. Voice. Poorly known; calls said to be made by this species are a series c. 1 second in duration of 3–4 rising musical notes with liquid, warbling quality, repeated at intervals of 6–7 seconds; also a drawn-out melodious disyllabic whistle, repeated at intervals of 3–4 seconds for long periods; also a fluted 2-note “whee-who”, second note lower than first; single nasal downslur; short unmusical notes more or less identical to those of Seram Friarbird.

Habitat. Occurs in lowland and montane primary forest, up to 1100 m; less common at higher altitudes.

Food and Feeding. Stomach contents of specimens included many insect remains, also some remains of fleshy red fruits and their seeds. Forages alone or in pairs, from middle storey to canopy; sometimes joins mixed-species flocks.

Breeding. No information.

Movements. Sedentary.

Status and Conservation. Not globally threatened. Restricted-range species: present in Seram EBA. Moderately common to frequent in parts of its range, which covers 20,000–50,000 km². Not currently at risk as Seram is still well forested, although some coastal lowland forests have been cleared. Potential threats include timber extraction, oil-drilling operations, and hydro-electricity schemes. Manusela National Park protects c. 10% of Seram's land area and all of its forest ecosystems.

Bibliography. Bowler & Taylor (1989a), Coates & Bishop (1997), Meinertzhagen (1923), Stattersfield *et al.* (1998), Stresemann (1914a).

7. Black-eared Oriole

Oriolus bouroensis

French: Lorient de Buru

German: Burupirol

Spanish: Oropéndola de Buru

Other common names: Dark-eared/Black-faced/Buru Oriole; Tanimbar Oriole (*decipiens*).

Taxonomy. *Philedon bouroensis* Quoy and Gaimard, 1830, Buru Island, south Moluccas.

Forms a superspecies with *O. szalayi*, *O. phaeochromus*, *O. forsteni*, *O. melanotis* and *O. sagittatus*, all of which, together with more distantly related *O. flavocinctus*, were formerly placed in the alternative genus *Mimeta* on basis of skull characteristics. Two subspecies recognized.

Subspecies and Distribution.

O. b. bouroensis (Quoy & Gaimard, 1830) – Buru, in S Moluccas.

O. b. decipiens (P. L. Slater, 1883) – Tanimbar Is, in E Lesser Sundas.



Descriptive notes. 23–32 cm. A close visual mimic of Black-faced Friarbird (*Philemon moluccensis*), from which it is difficult to distinguish in the field. N nominate race has blackish-brown facial patch with pale whitish-brown superciliary stripe, whitish side of neck behind ear-coverts; otherwise dark brown above, including wing and tail, with darker streaking on crown, paler terminal spots on tail (barely visible); paler below, chin and throat whitish with darker streaking, chest and rest of underparts plain tawny-olive; iris reddish-brown; bill black; legs black, toes lead-grey. Sexes alike. Immature has rufous edges on

wing feathers. Race *decipiens* differs from nominate in having black ear patch less developed, faint grey nuchal collar, heavier streaking (almost spotted) on throat, and is darker brown below. **VOICE.** N nominate race said to mimic Black-faced Friarbird, but voice not certainly recorded. Race *decipiens* has a single rich, slightly drawn-out, downslurred musical note, loud and clear, repeated at intervals of 12–30 seconds; also a disyllabic whistle, first part of which is nasal and somewhat grating, second part resembling the call, repeated at 12–20 seconds; also described as a clear whistle dropping in pitch, then quickly inflected upwards again, typical of genus.

Habitat. Lowland and montane forests, deciduous monsoon forest, secondary woodland, mangroves, and lightly wooded cultivation, to 1460 m.

Food and Feeding. No information on dietary details. Forages alone or in pairs, often together with Black-faced Friarbirds.

Breeding. No information.

Movements. Presumed sedentary.

Status and Conservation. Not globally threatened. Restricted-range species: present in Banda Sea Islands EBA and in Buru EBA. Moderately common in parts of its range, which extends over c. 20,000–50,000 km². Most forests in Tanimbars still remain, although a logging concession covers S Tanimbar; the small Nustamar and Pulau Nuswotar Nature Reserves protect some forests in these islands. On Buru, most coastal lowland forests have been cleared, and forests in N of island have been degraded by selective logging and slash-and-burn agriculture, leaving few patches of lowland forest intact, while montane forests remain largely undisturbed. No protected area exists on Buru, although the proposed Gunung Kelapmatada Game Reserve would protect large areas of both lowland and montane forests.

Bibliography. Bishop & Brickley (1999), Coates & Bishop (1997), Dickinson (2004), Hartert (1900c, 1901), Jepson (1993a), Meinertzhagen (1923), Poulsen & Lambert (2000), Slater (1883), Siebers (1930), Stattersfield *et al.* (1998), Stresemann (1914b), Wallace (1863).

8. Olive-brown Oriole

Oriolus melanotis

French: Loriot de Timor

German: Sundapirol

Spanish: Oropéndola Olivácea

Other common names: Timor/Sunda/Dark Oriole

Taxonomy. *Mimeta melanotis* Bonaparte, 1850, “Nova Guinea” = Timor.

Species sometimes referred to by the name *O. viridifuscus*, but current name has priority over that. Forms a superspecies with *O. szalayi*, *O. phaeochromus*, *O. forsteni*, *O. bouroensis* and *O. sagittatus*, all of which, together with more distantly related *O. flavocinctus*, were formerly placed in the alternative genus *Mimeta* on basis of skull characteristics. Birds of this species on Atauro I, off N Timor, of uncertain racial affinity, provisionally placed with *finschi* but possibly an undescribed race; further study required. Two subspecies recognized.

Subspecies and Distribution.

O. m. finschi E. J. O. Hartert, 1904 – Wetar I and Atauro I, in Lesser Sundas.

O. m. melanotis (Bonaparte, 1850) – Timor, Roti and Semau, in Lesser Sundas.



Descriptive notes. 25 cm. Female is a visual mimic of Helmeted Friarbird (*Philemon buceroides*), but male less so (race *finschi*) or not at all (nominate). Male nominate race is dark olive above, crown and mantle with faint darker streaking; upperwing dark brown, coverts fringed pale; tail dark brown, underside paler, feathers with whitish terminal patches on inner webs; face blackish, throat and chest greyish, side of chest washed olive-green, belly and undertail-coverts grey-buff; iris red; bill dark red; legs dark grey. Female is lighter brown above than male, rump paler, crown streaked darker brown, whitish supercilium

behind eye; face and side of neck black; dirty white below, streaked brown, especially on breast; bill blackish-brown. Immature is like female, but with more chest streaking. Race *finschi* resembles female of nominate but lacks olive wash above, male slightly darker and with upperparts greyer, both sexes with head pattern less distinct, face, ear-coverts, chin and throat darker than nominate, rest of underside medium-brown, iris light brown. **VOICE.** Utters liquid whistles, e.g. “ti-ti-lu-i”, but with many variations; also a long ringing “ti-u”, two individuals often call antiphonally, at intervals of 6–7 seconds. Calls on Atauro I described as “wee-oww” or “wee-ole”, “wick-wick wow” and “sweet-ow”, apparently different from those of nominate race.

Habitat. Remnant patches of primary and secondary deciduous monsoon forests, open woodland, mangroves, partially wooded cultivation, and other disturbed habitats, to 300 m. On Atauro I found in closed-canopy forest from sea-level to 970 m, and especially common in montane forest above 750 m.

Food and Feeding. No information on diet. Forages alone or in pairs, from middle storey to canopy.

Breeding. No information.

Movements. Sedentary.

Status and Conservation. Not globally threatened. Restricted-range species: present in Timor and Wetar EBA. Generally uncommon and rather sparsely distributed within its range of 20,000–50,000

km². In 2004 found to be common, and abundant at higher elevations, on Atauro I. Although significant, but increasingly isolated, forest patches remain in this species’ range, its population should be monitored, as large areas of forest on Timor, mostly in lowlands and valleys, have already been converted to agriculture; only a few small protected (but unmanaged) areas exist on Timor, and none on Wetar. A new BirdLife-managed project is aimed at establishing Timor-Leste’s first national park, probably in the Lore–L Lalalalo–Jaco I region, an Important Bird Area.

Bibliography. Coates & Bishop (1997), Finsch (1898), Hellmayr (1914), Mayr (1944a), Stattersfield *et al.* (1998), Trainor & Soares (2004), White & Bruce (1986).

9. Olive-backed Oriole

Oriolus sagittatus

French: Loriot sagittal

German: Streifenpirol

Spanish: Oropéndola Estriada

Other common names: Australian/Green-backed/Northern/White-bellied Oriole, Green Oriole(!), Cedar Bird, Green Thrush

Taxonomy. *Coracias sagittata* Latham, 1801, “Nova Wallia Australi” = Sydney, Australia.

Forms a superspecies with *O. szalayi*, *O. phaeochromus*, *O. forsteni*, *O. bouroensis* and *O. melanotis*, all of which, together with more distantly related *O. flavocinctus*, were formerly placed in the alternative genus *Mimeta* on basis of skull characteristics. Races probably intergrade, but more study needed. Four subspecies recognized.

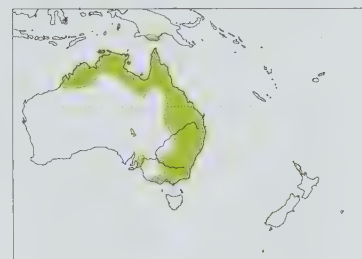
Subspecies and Distribution.

O. s. magnirostris van Oort, 1910 – SC New Guinea.

O. s. affinis Gould, 1848 – NW and NC Australia (E to S Gulf of Carpentaria).

O. s. griseescens Schodde & Mason, 1999 – NE Australia (Cape York, in N Queensland).

O. s. sagittatus (Latham, 1801) – NE Australia (except Cape York) S to Victoria and SE South Australia; many migrate N in winter.



Descriptive notes. 25–28 cm; 93.5–104 g. Male nominate race has head and upperparts rich olive-green, mantle and scapulars finely streaked black, uppertail-coverts olive-grey, spotted whitish (when plumage fresh); upperwing feathers bluish-grey with blackish centres, edged and tipped cream or whitish; tail grey, paler on outer webs of feathers, with greenish wash above, paler below, with conspicuous large white terminal patches on inner webs; chin and throat olive-washed grey with narrow blackish streaks, underparts creamy or white, heavily streaked black, side of breast washed olive, vent and undertail-coverts plain white or nearly so; iris

red or orange; bill orange-red to deep pink; legs grey or blue-grey. Female is greyer and more heavily streaked above than male, including on crown; wing has cinnamon edging and tail has cinnamon wash on white feather tips; chin grey, and side of throat more heavily streaked. Immature has olive-grey crown and upperparts, narrow buff eyebrow and eyering; wing and tail dull brown, wing feathers all edged cinnamon and with light cinnamon-buff wash on underwing, tail with whitish tips smaller than adult’s; breast and belly white, strongly streaked black; iris dark brown, bill dark brown to dark grey. Race *affinis* is slightly smaller than nominate, with longer and more slender bill, male generally brighter green and with faint streaking above, less heavily streaked below, tail spots small; *griseescens* is smaller still but with long and slender bill, male much greyer above and distinctly streaked, tail spots medium-sized; *magnirostris* is smallest and is paler, with uniform heavy wedge-shaped streaks above, tail spots small. **VOICE.** Song of rich, varied and melodious loud whistles based on “orry-orry-ole” or “or-ee-ee”; subsong quieter. Calls include harsh notes and a sneezing “chee-et”; various squeaks and chatters uttered during foraging. An excellent mimic of other birds.

Habitat. Most semi-open wooded areas, e.g. eucalypt (*Eucalyptus*) forests and paperbark (*Melaleuca*) woodlands, also native tree plantations, rainforest edges, and large trees alongside rivers and in savannas, parks and gardens; sometimes in mangroves.

Food and Feeding. Fruits, berries and small arthropods, also seeds and nectar; nestlings of small birds taken rarely. Berries, fruits and seeds include those of e.g. alien mulberries (*Morus*), inkweed (*Phytolacca octandra*) and Japanese peppers (*Zanthoxylum*), native olives (*Olea*), berries of white cedar (*Melia azedarach*), of camphor laurel (*Cinnamomum camphora*) and of the mistletoe *Amyema cumbagei*, but especially figs (*Ficus*); sometimes raids grape (*Vitis*), cherry (*Prunus*), peach (*Prunus persica*), banana (*Musa*) and paw-paw (*Asimina*) orchards. Arthropods taken include spiders (Araneae) and insects such as e.g. leaf beetles (Chrysomelidae), ants (Formicidae), mantids, lepidopteran caterpillars. Forages alone or in pairs, during non-breeding season also in small flocks; sometimes joins foraging groups of *Speothoerpes vielloti*. Feeds mainly in canopy, sometimes descending to ground. Animal items obtained mostly by gleaning from twigs and foliage; sometimes captures insects by aerial flycatching, and takes nestlings of e.g. honeyeaters (Meliphagidae).

Breeding. Breeds in all months, mainly Aug–Jan; sometimes two broods. Territorial, sings regularly throughout year. Nest built by female, within period of 2 weeks, a deep cup-shaped structure woven from bark strips, leaves, vine tendrils, grasses, plant wool, hair and other soft plant materials, lined with softer grasses and bark, often decorated with spider webs, bark or bearded lichen (*Usnea barbata*), external diameter 14–19.1 cm, height 10.2–15.2 cm, internal diameter 8.3–11.4 cm, depth 6.4–7.6 cm, bound with cobweb to thin horizontal fork in outer foliage of tree or shrub at variable height; often nests in or near colonies of *Speothoerpes vielloti*. Clutch 2–3 eggs, sometimes 4, creamy yellowish-white to pale creamy brown with greyish, purplish-grey and brownish-olive spots and blotches sometimes concentrated at obtuse end, dimensions 31–38 × 21–25 mm; incubation by female, period 16–18 days; chicks fed by both parents, with regurgitated food, fledge after 15–17 days; young disperse as soon as they become independent; if two broods, male may take care of older fledglings while female begins second nest. Nest sometimes parasitized by Common Koel (*Eudynamis scolopacea*).

Movements. In most of range locally nomadic in response to food-supply fluctuations. In S of range (S of c. 27° S), many (not all) individuals migrate N to C & NE Queensland in autumn (when vagrants recorded even in unusually dry habitats), returning S in spring; longest recorded movement 644 km. Possibly some limited movement between Australia and S New Guinea, perhaps by migrants moving N from SE Australia. Single vagrants recorded on Luang, in E Lesser Sundas (in 1905), and on New Britain, off NE New Guinea.

Status and Conservation. Not globally threatened. Common in parts of its range, which estimated to cover 1,000,000–10,000,000 km². Recorded densities 0.02–1 individuals/ha. Occurs on forest patches larger than 5 ha in extent, although sometimes visits smaller patches. Dependent in various protected areas, and therefore not reckoned to be at any immediate risk. Sometimes considered a pest in gardens and commercial orchards, where it takes soft fruits.

Bibliography. Barrett *et al.* (2003), Béland (1977), Beruldsen (1980), Blakers *et al.* (1984), Coates (1990), Frith (1969), Hall & Carline (1974), Higgins *et al.* (2006a), Klapste (1982), Liddy (1982b), Loyn (1985b), Macdonald (1973), Mathews (1926), North (1902), Rand & Gilliard (1967), de Ruiter (1995), Schodde & Mason (1999), Schodde & Tidemann (1990), Schönwetter & Meise (1983), Simpson *et al.* (2004), Slater *et al.* (2003), Sontner (1984).

10. Green Oriole

Oriolus flavocinctus

French: Lorient verdâtre **German:** Mangrovepirol **Spanish:** Oropéndola Verdosa
Other common names: Yellow-bellied/(Australian) Yellow Oriole

Taxonomy. *Mimetes* [sic] *flavocinctus* P. P. King, 1826, Northern Territory, Australia.

Was formerly placed, together with superspecies formed by *O. szalayi*, *O. phaeochromus*, *O. forsteni*, *O. bouroensis*, *O. melanotis* and *O. sagittatus*, in the alternative genus *Mimeta* on basis of skull characteristics. Geographical variation poorly marked and races intergrade; races *migrator* and *muelleri* considered untenable by some authors, or sometimes species even treated as monotypic. Six subspecies currently recognized.

Subspecies and Distribution.

O. f. migrator E. J. O. Hartert, 1904 – Roma, Leti and Moa, in E Lesser Sundas.

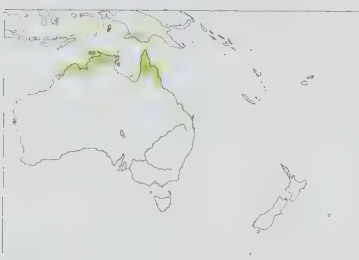
O. f. muelleri (Bonaparte, 1850) – Aru Is and SC New Guinea.

O. f. flavocinctus (P. P. King, 1826) – N Western Australia (Kimberley) and Northern Territory (Arnhem Land and Groote Eylandt).

O. f. tиви Schodde & Mason, 1999 – Bathurst I and Melville I (off NW Northern Territory).

O. f. flavotinctus Schodde & Mason, 1999 – NE Australia (Cape York Peninsula, in N Queensland).

O. f. kingi Mathews, 1912 – coastal zone of NE Queensland from Trinity Bay S to Halifax Bay.



Descriptive notes. 25–30 cm; male 83–125 g, female 73–116 g. Male nominate race is yellowish-olive above, with light dusky streaking on crown, heavier streaking on mantle; lores dark; upperwing dark, wing-coverts edged and broadly tipped creamy white to yellow (appearing as wingbars on folded wing), secondaries and greater coverts edged greenish-olive; tail blackish-brown, feathers tipped creamy white to yellow, pale tips larger on inner webs; chin olive, mottled dark, throat and chest olive with dark streaks, becoming lighter and yellower and variably streaked on lower breast and belly; undertail-coverts pale

yellow with greyish-olive feather centres (appearing variably mottled); iris red to bright orange; bill orange or red; legs grey. Female resembles male, but duller and rather more streaked. Immature has narrow yellow supercilium, more heavily streaked crown, nape and back, back duller green, underparts yellower, heavier black streaks from chin to upper belly, and yellow tail tips smaller;

eye grey-brown, bill blackish. Race *flavotinctus* is larger than nominate, much brighter yellow, and much less heavily streaked above, with large yellow tail tips; *kingi* also is large, but paler yellow than previous and moderately spotted; *tivi* is slightly smaller than nominate, slightly duller yellowish-olive, including on belly, with bolder blackish-brown or blackish streaking on crown and upperparts, slightly bolder blackish-brown streaking on underparts; *migrator* resembles last, but with smaller yellow tail tips; *muelleri* is poorly known, is smaller than nominate, with edgings and tips of wing-coverts pure white. **VOICE.** Song a melodious roll of 3–4 loud bubbling notes, e.g. as phrase of 3 notes the last of which a gurgling sound, or as liquid “cholonk cholonk”; also a soft warbling subsong. Call a harsh sneezing sound and loud 2-note sneer.

Habitat. Rainforest, gallery forest, gallery scrub forest, lightly wooded cultivation, coastal brush, and vine thickets, especially those along permanently running streams; usually in wetter and more closed forest habitats than those occupied by *O. sagittatus*. Dispersing young may also be found in more marginal habitats, such as mangroves, paperbark (*Melaleuca*) galleries, parks, orchards and gardens, and they often move inland along streams, whereas majority of population is found in coastal areas.

Food and Feeding. Chiefly fruits, also some seeds and nectar; some insects; rarely, nestlings of small birds. Berries and fruits include especially figs (*Ficus*), but also paw-paws (*Asimina*), and alien mulberries (*Morus*) and Japanese peppers (*Zanthoxylum*), among others. Insects recorded in diet are the ant *Oecophylla smaragdina* and lepidopteran caterpillars. Recorded as taking Olive-backed Sunbird (*Cinnyris jugularis*) nestlings as food in NE Australia. Forages alone, in pairs or in small groups, from middle storey to canopy; visits orchards. Sometimes small groups of up to eight individuals gather in fruiting trees, especially towards end of dry season when resources are scarce. Sometimes joins foraging *Sphecotheres vieilloti* and Great Bowerbird (*Chlamydera nuchalis*) groups, especially in fruiting trees.

Breeding. Breeds Aug–Jan, sometimes Feb–Mar and Jul; probably single-brooded. Male sings throughout year to mark territory. Deep cup-shaped nest woven from bark fibres, grasses, leaves, twigs and vine tendrils, lined with wool, hair and finer plant material, external diameter 12.7–20.3 cm, height 7.6–12.7 cm, internal diameter 7.6–10.2 cm, cup depth 5.1–7.6 cm, bound with cobweb to thin horizontal fork 2–20 m above ground in outer tree branches, often overhanging water. Clutch 2–3 eggs, creamy yellowish-white to pale creamy brown with greyish, purplish-grey and blackish-brown spots and blotches concentrated at obtuse end, dimensions 31–35 × 21.8–24 mm; incubation of eggs and brooding of chicks mainly by female, male helping occasionally, but both sexes feed chicks with regurgitated food; no information on duration of incubation and nestling periods; fledglings remain with parents in family group for a few weeks.

Movements. Mainly sedentary. Dispersing young may roam widely, with wanderers recorded in wet forests and mangroves; no records in extreme W part of range in Mar–May and Dec–Feb.

Status and Conservation. Not globally threatened. Common in parts of its range, which estimated to cover 100,000–1,000,000 km². Occurs in various protected areas, and not therefore at any immediate risk. Is, however, to some degree dependent on large tracts of undisturbed rainforest, and apparently cannot survive in small and isolated rainforest remnants.

Bibliography. Barrett *et al.* (2003), Beruldsen (1980), Blakers *et al.* (1984), Coates & Bishop (1997), Dunning (2008), Hall & Carline (1974), Higgins *et al.* (2006a), Mathews (1926), Meinertzhagen (1923), Merrall (1987), North (1902), Price *et al.* (1999), Rand & Gilliard (1967), Schodde & Mason (1999), Schodde & Tidemann (1990), Schönwetter & Meise (1983), Simpson *et al.* (2004), Slater *et al.* (2003).



11. Dark-throated Oriole

Oriolus xanthonotus

French: Loriot à gorge noire **German:** Gelbmantelpirol **Spanish:** Oropéndola Gorjinegra
Other common names: Black-headed/Black-throated/Malaysian Oriole

Taxonomy. *Oriolus xanthonotus* Horsfield, 1821, Java.

Sister-species to and formerly treated as conspecific with *O. steerii*, both possibly forming a superspecies with *O. isabellae*; all three were formerly placed in the alternative genus *Xanthonotus*. Proposed race *palawanus* has same type locality (Puerto Princessa, on Palawan) as *persuasus*, of which it is a junior synonym. Four subspecies recognized.

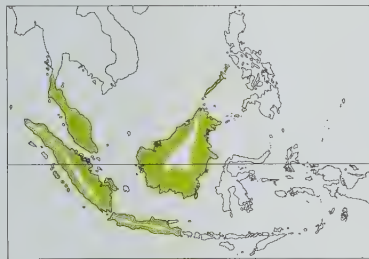
Subspecies and Distribution.

O. x. xanthonotus Horsfield, 1821 – extreme S Myanmar (S Tenasserim), S Thailand, Peninsular Malaysia, Sumatra, Bangka, Java and SW Borneo.

O. x. mentawi Chasen & Kloss, 1926 – Mentawai Is (Siberut, Sipura, Pagai Is), off W Sumatra.

O. x. persuasus Bangs, 1922 – Culion I and Palawan, in W Philippines.

O. x. consobrinus R. G. W. Ramsay, 1880 – N, C & E Borneo and adjacent islands.



Descriptive notes. 17.5–19 cm; 30–48 g. Male nominate race has head to neck, upper mantle and breast all black, rest of mantle to uppertail-coverts golden-yellow; upperwing black, primaries narrowly fringed whitish, secondaries indistinctly edged yellowish; tail black, all except central feathers with yellow terminal patch on inner webs; border of black chest tinged yellow on sides, belly creamy white and heavily streaked black, undertail-coverts golden-yellow; iris blood-red; bill dull orange, red or red-brown; legs blue-grey. Female has crown olive, lightly streaked greyish, mantle yellowish-olive and rump yellower, uppertail

olive-green; upperwing dark, primaries edged whitish, secondaries, tertials and upperwing-coverts dull olive, fringed brighter olive; whitish or creamy below, throat and breast suffused with dark grey, belly heavily streaked dark brown (almost as heavily as on male), blacker on flanks, undertail-coverts yellow, undertail as male. Immature is like female, but throat whitish and only faintly streaked, rufous edges on greater upperwing-coverts, iris pinkish. Race *mentawi* is smaller than nominate, and female has darker crown with much broader blackish feather centres; *consobrinus* is larger than nominate, male greener above, yellow tips on rectrices larger, lacks yellow wash on side of black chest, female has darker grey-green (sometimes blackish) crown contrasting more strongly with mantle than in nominate female; *persuasus* male is like previous in lacking yellow wash bordering black breast, but has underparts greyer (not creamy white). Voice. Song a rich and melodious fluty “tu-u-liu” with upward inflection on last note; also as 4-note “peu-peu-peu-poh”, the first 3 notes level and with liquid and melodious quality, the last a descending nasal rasp; also as “eeeeee-yopp” or “kou-wit”, first syllable rising and second descending, repeated every 2–4 seconds, sometimes for several minutes, accompanied by tail-flicking. Call a descending “phee-u”.

Habitat. Primary and tall secondary evergreen forests, e.g. mixed dipterocarp forest, also forest edges, second growth, kerangas, tall plantations, peatswamp-forest, and tall trees in clearings. To 1220 m, usually below 300 m.

Food and Feeding. Berries, e.g. of jambu tree (*Eugenia jambos*) and fig trees (*Ficus*); also insects, e.g. fly larvae (Diptera) and adult and larval moths and butterflies (Lepidoptera). Forages alone or in pairs, from middle storey to canopy; sometimes joins mixed-species flocks.

Breeding. Nesting recorded in May in extreme S Thailand (Narathiwat), and in Feb (Perak) and Jun (Johor) in Peninsular Malaysia, where also begging juveniles in Aug (Negeri Sembilan); nestling in Jun in Sumatra (Bengkulu); season Feb–Aug/Sept in Borneo; males with enlarged gonads in Apr–May in Philippines. Two nests from Perak were each a deep open-cup structure of grasses and bamboo and other leaves, suspended hammock-like high in forest-edge tree, one on a creeper and the other on a branch; one nest in N Borneo (Sabah) was composed of fine pliable twigs, strips of paper-like bark and other vegetable fibres, lined with finer material, exterior decorated with pieces of lichen and spider cocoons or egg sacs, slung between twigs of a forked outer branch 6 m above ground in a flamboyant tree (*Delonix regia*). Clutch 2 eggs, white to pale creamy pink, with yellowish-brown, chestnut-brown or dark purplish-brown spots with underlying lavender concentrated at obtuse end, dimensions 24.8–26 × 17.8–19.8 mm; both adults incubate. No other information.

Movements. Sedentary.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Fairly common and widespread in evergreen forests. Despite its relatively large area of distribution, habitat loss, degradation and fragmentation in its range have been so extensive, especially in lowlands, that almost all primary forests expected to have disappeared by 2010. Although it utilizes submontane and secondary forests and forest edges, which are less threatened, this species' abundance is lower in these habitats than in its core lowland-forest habitat. Owing to habitat loss, it has been extinct in Singapore since 1941 and is much reduced in Thailand and Peninsular Malaysia, where it is considered “Vulnerable”. Sometimes sold in cagebird trade. Occurs in various protected areas, e.g. Hala-Bala Wildlife Sanctuary, in Thailand, Taman Negara National Park and Pondok Tanjung Forest Reserve, in Peninsular Malaysia, Way Kambas National Park, in Sumatra, Gunung Gading National Park and Danum Valley Conservation Area, in Borneo, and St Paul Subterranean River National Park, in Philippines.

Bibliography. Anon. (2007g), Butchart & Stattersfield (2004), Collar *et al.* (2001), Dickinson *et al.* (1991), Dunning (2008), Glenister (1985), Jeyarajasingam & Pearson (1999), Kennedy *et al.* (2000), Lekagul & Round (1991), MacKinnon & Phillips (1993), van Marle & Voous (1988), McGregor (1909), Medway & Wells (1976), Meinertzhagen (1923), Rand & Rabor (1960), Schönwetter & Meise (1983), Sheldon *et al.* (2001), Shepherd *et al.* (2004), Smythies & Davison (1999), Stattersfield & Capper (2000), Strange & Jeyarajasingam (1993), Stuart Baker (1926), Wells (2007).

12. Philippine Oriole

Oriolus steerii

French: Loriot des Philippines **German:** Philippinenpirol **Spanish:** Oropéndola Filipina

Other common names: Grey-throated Oriole; White-lored Oriole (*albiloris*)

Taxonomy. *Oriolus steerii* Sharpe, 1877, Negros and Basilan = Negros, Philippines.

Sister-species to and formerly treated as conspecific with *O. xanthonotus*, both possibly forming a superspecies with *O. isabellae*; all three were formerly placed in the alternative genus *Xanthonotus*. Race *albiloris* sometimes treated as a separate species, with closer relationship to *O. isabellae*; sometimes misspelt “*albiloris*”. Proposed race *O. s. nigrostriatus* (from Negros and Masbate) is synonymized with nominate. Six subspecies recognized.

Subspecies and Distribution.

O. s. albiloris Ogilvie-Grant, 1894 – mountains of N & WC Luzon (provinces of Benguet, Cagayan, Ilocos Norte, Nueva Ecija and Bataan), in N Philippines.

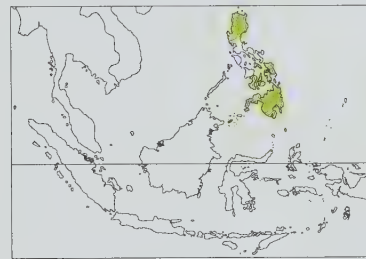
O. s. steerii Sharpe, 1877 – Masbate and Negros, in C Philippines.

O. s. assimilis Tweeddale, 1878 – Cebu, in C Philippines.

O. s. samarensis Steere, 1890 – Samar, Leyte, Bohol and E Mindanao, in EC & SE Philippines.

O. s. basilanicus Ogilvie-Grant, 1896 – Basilan and W Mindanao, in S Philippines.

O. s. cinereogenys Bourns & Worcester, 1894 – Sulu Archipelago (Tawi-Tawi and Bongao, possibly also Baliungan).



Descriptive notes. 18–20 cm; 45–48 g. Nominant race has crown, neck and most of upperparts bright olive-green, rump yellow; lores grey, ear-coverts washed greenish; upperwing grey, primaries edged greyish-white, secondaries dull greenish, wing-coverts grey; central tail feathers blackish-green, other rectrices black with yellow terminal patch on inner webs; chin, throat and upper breast uniform grey, lower breast and belly white, boldly streaked black, undertail-coverts yellow; iris red; bill dark red or red-brown; legs dark grey. Sexes alike, female slightly smaller than male. Immature undescribed. Race *assimilis* is uni-

formly darker olive-green above than nominate, has lower breast and belly greyer, ear-coverts dark grey, tail all black with only very small terminal yellowish-white spots on inner webs; *samarensis* is yellower above than nominate, so that rump only slightly yellower than mantle and back, has upper chest paler grey and slightly mottled brown, lower chest and flanks washed with yellow, wing-coverts and edging of remiges concolorous with back; *cinereogenys* is similar to previous, but yellower above, especially on rump (which also streaked with olive), ear-coverts grey (not grey-green), much whiter below, but streaked greyish on chin, throat and upper breast; *basilanicus* is similar to nominate but rather smaller, and rump duller yellow; *albiloris* is distinctive, upperparts uniformly yellowish-olive, lores whitish, chin white, throat and underparts uniformly yellow, lightly streaked with olive on lower chest and flanks, wing dark, remiges edged yellowish-olive and inner edges of secondaries yellowish, tail yellow-olive above and yellower below, all except central pair of rectrices tipped broadly yellow on inner web and narrowly yellow on outer web. Voice. Loud, hollow and melodious. Nominant race has trumpet-like high-pitched “per-jek”, repeated continuously but speeding up, and a resonant “eeerk eeerk eeerk” or “kok-kok-kok-kok”; also “hoouoo-op”, first note rising slightly. Race *albiloris* a fluty, slightly mournful slow “chow-wooooo”, final note rising, repeated every 2 seconds; also a rapid staccato “chup chup chup” (3–6 notes), repeated continuously. Variety of other calls, all fluty and rhythmic, e.g. “da de hoouu”, “chit-di-di hoouoi” and “chip wuuu wu”.

Habitat. Forest, forest edge and second growth, below 1200 m.

Food and Feeding. No information on diet. Forages alone, in pairs or in small flocks, mainly in canopy; sometimes joins mixed-species flocks.

Breeding. Birds with enlarged gonads in May–Jun and almost grown young seen in Aug on Luzon (race *albiloris*). No other information.

Movements. Sedentary.

Status and Conservation. Not globally threatened. Race *albiloris* (sometimes treated as separate species) a restricted-range taxon: present in Luzon EBA. Species is fairly common to common in parts of its range, which extends over an estimated 100,000–1,000,000 km². Race *assimilis* was thought probably extinct; last recorded on Cebu in 1906, but unconfirmed reported sighting there in 2000. Although relatively large forest tracts remain in N Luzon, where race *albiloris* can also utilize degraded forests, this race presumed to have undergone a population decline since only c. 25% of original forest cover on Luzon remained by 1988, with lowland forests particularly affected, and most surviving forest areas under logging concessions; even montane forest above 650 m is beginning to suffer from human encroachment, further increasing forest loss, degradation and fragmentation. Race *albiloris* occurs in several protected areas, e.g. the Northern Sierra Madre Protected Area, Quezon National Park, and the lowland forest in the Subic Bay Protected Area.

Bibliography. Bourns & Worcester (1894), Dickinson (2004), Dickinson & Kennedy (2000), Dickinson *et al.* (1991), Gilliard (1950a), Kennedy *et al.* (2000), McGregor (1909), Meinertzhagen (1923), Ogilvie-Grant (1896a), Parkes (1971), duPont & Rabor (1973a), Stattersfield *et al.* (1998).

13. Isabela Oriole

Oriolus isabellae

French: Loriot d'Isabela **German:** Isabellpirol **Spanish:** Oropéndola de Isabel
Other common names: Isabella/Green-lored/Olive-lored Oriole

Taxonomy. *Oriolus isabellae* Ogilvie-Grant, 1894, “Mountains of northern Luzon” = Isabela Province, north Luzon, Philippines.

Possibly forms a superspecies with *O. xanthonotus* and *O. steerii*, and all three were formerly placed in the alternative genus *Xanthonotus*. Sometimes considered closest to race *albiloris* of *O. steerii*. Monotypic.

Distribution. Mountains of N & W Luzon, in provinces of Bataan (probably extinct), Cagayan, Quirino and Isabela, in N Philippines.

Descriptive notes. 21–23 cm; 42–50 g. Plumage is uniformly yellowish-olive above; indistinctly brighter yellow around eye, lores yellowish-olive (as crown); upperwing yellow-olive, remiges with dull brown inner webs; tail uniform yellowish-olive above, yellower below, narrowly tipped



pale yellowish; chin, throat and underparts uniformly plain yellow; iris dark brown to reddish-brown, grey orbital ring; bill bluish-grey, paler along cutting edges; legs grey to bluish-grey or greyish-horn. Sexes alike. Immature undescribed. Voice. No information available.

Habitat. Lowland rainforest, especially thick bamboo forest, also second growth and forest edge; recorded up to 440 m. Recent recorded sites include edge of a small secondary-forest remnant near a plantation, edge of a logging road, and degraded forest with extensive bamboo stands.

Food and Feeding. Fruits; also insects and their larvae, e.g. caterpillars. Forages alone, in pairs or in small groups, from middle storey to canopy, often in fruiting trees; often joins mixed-species flocks.

Breeding. Five of six specimens from Cagayan Province had enlarged gonads in Apr; in May, three of five male specimens from Isabela Province had enlarged testes, one of five female specimens was "breeding", and one young female was being fed by an adult female. No other information.

Movements. Presumed sedentary.

Status and Conservation. CRITICALLY ENDANGERED. Restricted-range species: present in Luzon EBA. Rare. Presumably small and rapidly declining population owing to extensive and ongoing habitat loss, degradation and fragmentation within its relatively small range of c. 90,000 km². Known from only three localities in Bataan Province and three in Cagayan Province, and one in each of Isabela and Quirino Provinces. Latest specimen records are from 1960 and 1961, when eleven collected within twelve days in 1961 near San Marino (Isabela Province), indicating that the species was reasonably common in suitable habitat at that time; rapid habitat loss since then, and the scarcity of records despite searches by increasing number of fieldworkers, imply that this species has undergone a rapid population decline. Probably extinct in SW Luzon, as no records from Bataan Province since 1947. Nevertheless, it survives in NE Luzon, as evidenced by sight records in 1993, 1994, 2003 and 2004, with one individual also captured in last-mentioned year. Loss of lowland forest assumed to be the primary threat, and by 1988 only c. 25% of Luzon's forest cover remained, most of these areas under logging concessions, and logging occurring even within reserves. Two of the historic sites are now largely deforested, and the 1993 sight record was from an isolated and degraded forest tract of only c. 100 km², probably offering no long-term prospects for the species. Several recent records, however, were from the Northern Sierra Madre Natural Park, and the species may remain within the few surviving intact forests and even use some second-growth habitats.

Bibliography. Anon. (2007g), Butchart & Stattersfield (2004), Collar (1998a), Collar, Andreev *et al.* (2001), Collar, Crosby & Stattersfield (1994), Collar, Mallari & Tabaranza (1999), Dunning (2008), Gamauf & Tebbich (1995), Gilliard (1950a), Kennedy *et al.* (2000), van der Linde (1995), McGregor (1909), Stattersfield & Capper (2000), Stattersfield *et al.* (1998), van Weerd & Hutchinson (2004).

14. Eurasian Golden Oriole

Oriolus oriolus

French: Loriot d'Europe

German: Pirol

Spanish: Oropéndola Europea

Other common names: (European) Golden Oriole

Taxonomy. *Coracias oriolus* Linnaeus, 1758, "in Europe and Asia" = Sweden.

Closely related to *O. kundoo* and *O. auratus*, and until recently considered to be conspecific with former; all three form a superspecies, perhaps also including *O. tenuirostris* and *O. chinensis* as members. Two proposed geographical races, *caucasicus* (from Gilan, in N Iran) and *sibiricus* (from Omsktschennaja, in Krasnoyarsk District of SC Siberia), considered inseparable from birds in rest of species' range. Monotypic.

Distribution. Breeds in W & S Europe (S from S Finland) and N Africa E to Altai Mts (S Siberia and extreme NW China) and, in S, to N Iran; non-breeding in sub-Saharan Africa.

Descriptive notes. 24–25 cm; 42–102 g. Male has head, upperparts and entire underparts rich golden-yellow; lores black; wing velvet-black.

broad yellow tips on primary coverts (forming small carpal patch on folded wing), remiges with narrow yellowish-white tips, outer primaries and outer secondaries with narrow yellowish-white edges on outer webs, when fresh; tail velvety black, central pair of feathers with narrow yellow tips, terminal third of outer feathers conspicuously golden-yellow; underwing-coverts yellow; iris red-brown to deep maroon or dark blood-red; bill dark pink; legs slaty blue. Female rather variable; commonly has head, neck, mantle and back bright greenish-yellow, rump yellower, lores golden-yellow; underparts with yellowish tips; chin to upper breast pale grey, becoming yellowish-white on belly, all streaked blackish (most heavily on chest), undertail-coverts bright yellow-green; bare parts as male, but duller; some (older) females are similar to males but duller yellow and usually with at least faint streaking on underparts. Immature is similar to female, but generally duller above and more heavily streaked below. Voice. Loud, melodious, liquid, fluty whistles, e.g. "weeka-laweela-weeo", "weelo-wallo-weelyo", "tilly-cleocleoo", "teeloo-hoh-weeyo"; also quiet antiphonal duet, whistling song of male answered by female with short song, "skweeewer", or call like that of a falcon (*Falco*). Aggressive or alarm call "skaaaa" or "kweeer".

Habitat. In W Europe, usually in semi-open, mixed broadleaf woodlands and plantations, riverine forests with tall willows (*Salix*) and poplars (*Populus*), forested steppes, groves, copses, orchards, parks, large gardens, windbreaks, avenue trees, and other tree clumps in cultivated areas, also in larger and more continuous deciduous, coniferous or mixed forests in E Europe; usually below 600 m, but up to 1300 m in Alps, 1800 m in Morocco, and 2000 m in Russia. Usually avoids treeless habitats, but forages in treeless heath and in sand dunes on almost treeless islands. In Asia, found also in floodplain woods and groves, riverine vegetation, open deciduous woods, village plantations, taiga edges and oases, to 2150 m. In African non-breeding quarters, in semi-arid to humid deciduous woodlands, e.g. miombo (*Brachystegia*) and mopane (*Colophospermum*), forest edges, tall closed-canopy gallery forest, riverine acacias (*Acacia*), forest-savanna mosaics, tree savannas, exotic plantations, windbreaks, orchards, gardens, up to 1500 m. On migration, also in

drier, more open bush and savannas, gardens, isolated fig trees (*Ficus*), and oases, to 2200 m; has been observed roosting during midday in the shade of fissures on rock faces during spring migration in N Cameroon.

Food and Feeding. Mainly small invertebrates and fruits; occasionally seeds, nectar, pollen; rarely, small lizards, small mammals, eggs and nestlings. Diet during early part of breeding season mainly invertebrates and especially their larvae, e.g. earthworms (Oligochaeta), leeches (Hirudinea), snails (Gastropoda), spiders (Araneae), damselflies and dragonflies (Odonata), crickets, katydids and grasshoppers (Orthoptera), termites (Isoptera), shield bugs (Acanthosomatidae), jewel bugs (Scutelleridae), stink bugs (Pentatomidae), cicadas (Cicadidae), beetles (Coleoptera), snakeflies (Raphidioptera), mantid flies (Mantispidae), caddis flies (Trichoptera), gadflies (Tabanidae), hoverflies (Syrphidae), crane flies (Tipulidae), Hymenoptera (sawflies, wasps, hornets, bumblebees, bees, ants), moths and butterflies (Lepidoptera, especially their caterpillars); during later part of breeding season (when young 8–10 days old), during migration and on wintering grounds consumes more fruits and berries (diet in Kenya 75% fruits), e.g. bilberries (*Vaccinium*), blackberries (*Rubus*), elderberries (*Sambucus*), mulberries (*Morus*), raspberries (*Rubus idaeus*), strawberries (*Fragaria*), blackcurrants (*Ribes nigrum*), redcurrants (*Ribes rubrum*), cherries (*Prunus*), dates, figs, grapes (*Vitis*), loquats (*Eriobotrya japonica*), olives (*Olea*), peaches, pears, plums, European yew (*Taxus baccata*), rowan (*Sorbus aucuparia*), wild service tree (*Sorbus terminalis*), Transvaal saffronwood (*Cassine transvaalensis*) and exotic neem (*Azadirachta indica*). Rarely, takes barley, oats, seeds, oak (*Quercus*) flowers, flowering shoots, leaf buds, pollen, nectar; rarely, also lizards e.g. *Lacerta vivipara*, small mammals e.g. *Apodemus* mouse that had been speared by Red-backed Shrike (*Lanius collurio*), and bird eggs and nestlings. Forages alone or in pairs, also in small groups after breeding season; sometimes joins mixed-species flocks during non-breeding season. Mainly in canopy, sometimes in small to large groups in fruiting trees, especially figs. Sometimes flycatches insects (e.g. flying termites) in air or forages on ground (e.g. for earthworms, caterpillars, beetles); may hover briefly before dropping to ground in manner of kestrel (*Falco*), especially in treeless areas. Hairy caterpillars vigorously shaken and beaten against vegetation to remove hairs before consumption.

Breeding. Egg-laying mainly in May–Jun, sometimes early Jul. After arriving on territory, male starts singing and chases away intruders, including conspecifics and potential mammalian and avian predators; female arrives later, and courtship displays involve vigorous chases and vocal duets. Nest built exclusively (or almost exclusively) by female in 6–15 days (exceptionally 28 days), although male may collect some material; a shallow to deep open-cup structure woven from grass, sedges, reeds, leaves, twigs, cloth, string, paper and plastic strips, strips of bark and other plant fibres, lined with fine fibres, roots and grasses, feathers, cocoons, cobweb, down, cotton, fur, wool, moss, lichens, straw and small pieces of paper, external diameter 8–20 cm, height 6–15 cm, internal diameter 7–13 cm, depth 3–13 cm, thickness 1–5 cm, dry weight 20–30 g; suspended hammock-like in thin, horizontal forked branch (diameter 0.6–2.5 cm) usually high in outer edge of well-foliaged tree canopy (rarely, wedged in between trunk and a branch) and often near but rarely over water. Clutch 2–6 eggs, usually 3–5, white, pinkish-white or creamy with brownish-grey or purplish-black spots and streaks, these sometimes concentrated at obtuse end, size 26.5–36 × 19.4–23.5 mm; replacement laid only after early loss; incubation by both sexes, mostly by female, period 13–20 days, mostly 16–17 days; chicks hatch within 2–3 days of each other, brooded almost exclusively by female, but fed by both sexes (mostly with invertebrates of increasing size as young grow, later also with berries and fruits), nestling period 13–20 days, generally 16–17 days; fledglings may be accompanied and fed by parents until Aug–Sept, just prior to migration. One record of nest being parasitized by Common Cuckoo (*Cuculus canorus*). Age of first breeding 2–3 years.

Movements. Migratory. Migrates mostly at night, but spring passage also during day. In autumn (Jul–Sept) all populations head towards E Mediterranean (where often gorge on fruits), and from then until Dec move S through E Africa towards main wintering areas in Cameroon and Central African Republic, and all moist deciduous woodlands S of 5° S, where present Oct–Apr; individuals often return to same locality year after year. Spring migration, beginning in Feb, is faster and more direct, many individuals crossing Sahara as far W as E Morocco, reaching Palearctic breeding grounds in Apr–May; older males arrive in Europe c. 2–10 days (exceptionally 20 days) before females and young males. Recorded as autumn vagrant in NW Afghanistan, Ladakh, coastal Pakistan and Sri Lanka. Sight records from Maldives and Andamans may refer either to present species or to *O. kundoo*.

Status and Conservation. Not globally threatened. Estimated European population of 6,700,000–14,000,000 individuals and a large range of c. 10,000,000 km² make this a species of least conservation concern. N limit of range has moved slowly N, e.g. first breeding observed in Denmark in middle of 19th century, in Sweden in 1932, in UK in 1960s, and in Norway in 1972, possibly a result of increase in temperatures. Occurs in many protected areas throughout breeding and non-breeding ranges. In non-breeding quarters average 0.1 individuals/ha in Tsavo East National Park, in Kenya, with up to 0.7 individuals/ha in riverine forests, but average of only 0.001 individuals/ha in deciduous broadleaf woodlands in Zimbabwe. Can cause some damage in commercial fruit orchards; in particular, autumn migrants gathering in E Mediterranean considered a pest by some fruit-farmers, as they consume large quantities of fruit.

Bibliography. Archer & Godman (1961), Bannerman (1953), Baumann (1999a, 1999b, 2000, 2001), Bezzel (1989), Brooke (1970a), Burfield & van Bommel (2004), Cooper (1969), Cramp & Perrins (1993), Creutz (1988), Dementiev *et al.* (1954a, 1970), Dunning (2008), Durango (1955), Feige (1986, 1995), Frandsen (1982), Fry *et al.* (2000), Ginn *et al.* (1989), Goodman & Meininger (1989), Haffer (1993g), Harrison *et al.* (1997), Hartert (1903a), Hockey, Dean & Ryan (2005), Hockey, Underhill *et al.* (1989), King (1984b), Lack (1985), Mackworth-Praed & Grant (1960, 1963), Martin & Tyler (1966), Mason (2004), Meinertzhagen (1923, 1954), Melnikov (1998), Meyer de Schauensee (1984), Milwright (1988), Paz (1987), Plucinski (1982), Prokop (1982), Rasmussen & Anderton (2005b), Rauls (1953), Reade & Hosking (1967), Reinhardt (1986), Reinsch (1959a, 1959b, 1961), Reinsch & Warnecke (1971), Robertson (1980), Rogacheva (1992), Schneller (1980), Schönwetter & Meise (1983), Skinner (1985), Stark (1900), Stuart Baker (1926), Thévenot *et al.* (2003), Uhlenhaut (1999), Vaurie (1958, 1959), Voous (1960), Wassmann (1986a, 1986b, 1993, 1997a, 1997b, 2004), Wassmann & Böhm (1995a, 1995b), Zimmerman *et al.* (1996), Zippelius (1972).

15. Indian Golden Oriole

Oriolus kundoo

French: Loriot indien

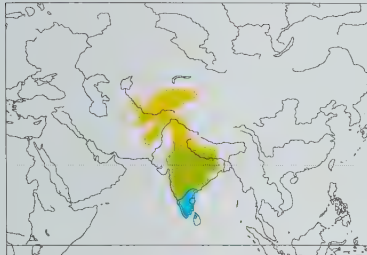
German: Indienpirol

Spanish: Oropéndola India

Taxonomy. *Oriolus Kundoo* Sykes, 1832, Dukhun (= Deccan), India.

Closely related to *O. oriolus* and *O. auratus*; until recently considered to be conspecific with former, but differs in morphology and vocalizations and the two appear not to intergrade; all three form a superspecies, perhaps also including *O. tenuirostris* and *O. chinensis* as members. Three proposed geographical forms, *yarkandensis* (from Yarkand, in E Turkestan), *turkestanica* (Turkestan City) and *baltistanicus* (Dagoni, in Baltistan), are considered untenable. Monotypic.

Distribution. Breeds Uzbekistan, E Turkmenistan, SE Kazakhstan, Kyrgyzstan, Tajikistan, extreme W China (Tien Shan), Baluchistan hills and from N & E Afghanistan E in Himalayas to Nepal, and S through most of peninsular India; non-breeding also farther S in India and in Sri Lanka.



Descriptive notes. 24–25 cm; 60–95 g. Male has head, upperparts and entire underparts rich golden-yellow, black of lores extending as narrow black streak around and behind eye; upperwing velvety black, with broad yellow tips to primary coverts forming large yellow carpal patch on folded wing, remiges with yellowish-white tips, outer primaries and outer secondaries with narrow yellowish-white edges on outer webs (those of secondaries sometimes well marked), outermost tertial tipped yellowish-white; tail velvety black, central pair of feathers with narrow yellow tips, terminal two-thirds of outer feathers conspicu-

ously golden-yellow; underwing-coverts yellow; iris red; bill dark pink; legs slaty blue. Distinguished from *O. oriolus* mainly by black eye patch, much more yellow in wing, including larger yellow carpal patch, and longer bill. Female variable; commonly has head, neck, mantle and back bright yellowish-green, rump yellow; lores dark, wing green or brownish, tail olive, outer rectrices with yellowish tips; chin to upper breast pale grey, becoming yellowish-white on belly, all streaked blackish (streaking heaviest on chest), undertail-coverts bright yellow-green; bare parts as male but duller; sometimes more similar to male. Juvenile has bright golden-yellow face and upperparts, yellowish supercilium, usually hint of long dark eye patch, outer rectrices extensively (more than a third) tipped yellow, very heavy black streaking below, bill black; first-year male as female, but often with mix of adult and immature characters. **Voice.** Song a flute melodious “pee-lo” or “pee-lo-lo”, “who-he-heer” or “weela whee-oh”, generally similar to that of *O. oriolus* but more complex, with shorter, mellower strophes and narrower range of pitch; may give a sweet, prolonged subsong. Calls most commonly a harsh “chee-ah” or “kaach”; also a nasal hiss “ka-a-lee-aa” or a very loud, nasal, upslurred miaowing that begins clearly but ends in harsh screeching sound; sometimes a rapid “tur-tur-tur-tur”.

Habitat. Open deciduous and semi-evergreen forests, forest edge, woodland, thorny forest, thickets, poplar (*Populus*) plantations, avenue trees, mangoes (*Mangifera*), orchards, village groves, parks, gardens, and fairly open country with scattered trees, e.g. riverine vegetation; to 4400 m in Himalayas, but usually below 1800 m.

Food and Feeding. Berries, e.g. of *Lantana*, and fruits, e.g. cherries (*Prunus*), mulberries (*Morus alba*), silk-cotton tree (*Bombax malabarica*), neem (*Azadirachta indica*), and figs (*Ficus*), but especially mangoes; also buds, nectar, e.g. of *Salmalia malabarica* and *Erythrina indica*. Also invertebrates, e.g. spiders (Araneae), praying mantises (Mantodea), flies (Diptera), beetles (Coleoptera), tree grasshoppers (Orthoptera), cicadas and cicada eggs (Cicadidae), other bugs (Hemiptera), ants (Formicidae), and especially caterpillars. Once seen with flying lizard (*Draco*). Forages alone, in pairs and sometimes in small groups; sometimes joins mixed-species flocks. Mostly in dense canopy of trees; may drop to ground to catch insects.

Breeding. Breeds in Jun in Afghanistan, May–Jun in Nepal and Apr–Sept in India. Male calls constantly on territory during breeding season; female arrives a few days later, and courtship displays involve vigorous chases. Nest built exclusively (or almost exclusively) by female, male may collect some material; a moderately deep open cup woven from fine grass stems, leaves, hemp stems, fine roots, seed down, slender strips of bark and sometimes other materials (e.g. snakeskin, hair, feathers, cotton, wool, fur, strips of paper, cloth, thread and string, and other vegetable fibres), lined with fine grass, vegetable down, hair and feathers, bound with small amounts of spider web, often draped on outside with cobwebs, bits of papery bark, rags and other rubbish, external diameter 12.2–13 cm, internal diameter 6.4–9.1 cm, internal depth 3.8–7.6 cm, thickness 2–3 cm; suspended hammock-like in thin, horizontal forked branch at variable height, usually high in outer edge of well-foliaged tree canopy (but sometimes as low as 3 m), and usually near and sometimes above water, e.g. in willow (*Salix*) surrounded by water; often close to nest of aggressive Hair-crested Drongo (*Dicrurus hottentottus*) or Black Drongo (*Dicrurus macrocerus*). Clutch 1–5 eggs, usually 2–4, white, with a few pale yellowish-brown, deep purplish-brown, deep reddish-brown or blackish spots (sometimes with brownish-pink haloes) concentrated at obtuse end, dimensions 25–34 × 19–22.3 mm; incubation by female, male sometimes helping a little, period 14–15 days; chicks brooded exclusively (or almost exclusively) by female, fed by both sexes (first with tiny insects and caterpillars, later with much larger invertebrates), nestling period 14–15 days; young stay with parents for c. 1 month after fledging. One record of adult feeding a fledgling cuckoo (of genus *Cuculus*).

Movements. Resident in C and parts of N India, with local movements depending on fruit availability. Breeding summer visitor in C Asia, Afghanistan and N Indian Subcontinent; in N India, arrival Apr–May (when mangoes ripen) and departure Aug–Sept; present late Mar to Aug in W & N Pakistan and Mar–Nov in Nepal. Winter visitor in S India as far S as Cape Comorin and in Sri Lanka (Dec–Mar). Males usually arrive back on breeding territories a few days before females. Sight records from Maldives and Andamans may refer either to present species or to *O. oriolus*.

Status and Conservation. Not globally threatened. Fairly common to locally common. Occurs over large range, which includes various protected areas.

Bibliography. Ali & Ripley (1972a), Bates & Lowther (1952), Chen Fuguan *et al.* (1998), Cramp & Perrins (1993), Dementiev *et al.* (1954a, 1970), Dharmakumarsinhji (1954), Feige (1995), Fleming *et al.* (1976, 1984), Grewal (1993), Grimmett *et al.* (1998), Hartert (1903a), Henry (1998), Hume & Oates (1889), Inskipp & Inskipp (1991), Lowther (1949), Meinertzhagen (1923), Rasmussen & Anderton (2005b), Ripley (1982), Roberts (1992), Schönwetter & Meise (1983), Stuart Baker (1926), Vaurie (1958, 1959), Whistler & Kinnear (1949), Yahya (1981).

16. African Golden Oriole

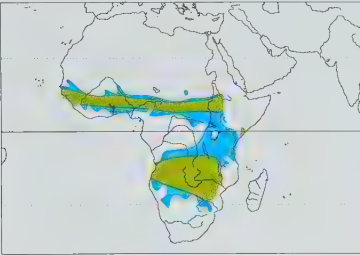
Oriolus auratus

French: Lorient doré **German:** Schwarzzihrpirol **Spanish:** Oropéndola Africana
Other common names: African Oriole

Taxonomy. *Oriolus auratus* Vieillot, 1817, Africa = Ghana. Closely related to *O. oriolus* and *O. kundoo*, with which it forms a superspecies, perhaps including also *O. tenuirostris* and *O. chinensis* as members. Two subspecies recognized.

Subspecies and Distribution.
O. a. auratus Vieillot, 1817 – breeds in N African tropics in broadleaf savanna woodland from Senegambia E to Sudan and W Ethiopia, and in S Somalia; seasonal movements N & S of breeding range include N Uganda and W Kenya.

O. a. notatus W. K. H. Peters, 1868 – breeds S African tropics in broadleaf savanna woodland from Angola E to C Mozambique; seasonal movements N & S of breeding range include E Africa and coastal islands.



Descriptive notes. 20 cm; 60–80 g. Male nominate race is bright golden-yellow above and below, except for black on lores and extending backwards as black stripe through eye above ear-coverts and narrowing onto side of nape; upperwing black, primaries and outer secondaries with pale yellow tips and narrow whitish edging, inner secondaries, tertials and greater coverts with broader yellow edges and tips, primary coverts narrowly tipped yellow, other upperwing-coverts also yellow; central pair of tail feathers blackish with yellow tips, remaining rectrices almost entirely yellow; underwing silvery grey; iris red; bill brownish-

pink, brownish-red or red; legs bluish-grey. Female is greenish-yellow above, dull yellow faintly streaked olive below; lores and area around eye dusky olive, wing brownish-black, primaries narrowly edged whitish, secondaries and tertials washed with olive and more broadly tipped and edged yellow, primary coverts with yellow edges and tips, tail dark olive or brown with yellow tips on all feathers except central pair; chin to breast whitish to pale yellow with grey streaks, belly pale yellow with darker streaks, streaking fainter on lower belly, undertail-coverts bright yellow; bare parts as male. Immature is like female, but yellower olive above and less streaked below. Race *notatus* male has broader yellow edges and tips on secondaries, tertials and primary coverts, so that the closed wing looks even yellower than that of nominate. **Voice.** Song “weelo-tyoo-tyoo-wo” or “weelo-lo-weeluweeyu”; in display higher-pitched phrases and a long-drawn “du-wee-weeeyr”.

Aggression or alarm call a harsh “rrraaaaah” or mewing “myaaaceeh”. Vocalizations very similar to those of *O. oriolus*. Once recorded mimicking call of Black-crowned Tchagra (*Tchagra senegalus*).

Habitat. Tall mesic broadleaf deciduous savanna woodlands, especially miombo (*Brachystegia*, *gusu* (*Baikiaea*) and mopane (*Colophospermum*), also dense closed-canopy broadleaf *Burkea africana* woodland, thick bushes around rocky hills, semi-evergreen gallery forest along major rivers; also swamp-fringing woodlands bordering the Okavango in N Botswana. Sometimes uses evergreen forest, forest edge, well-timbered farmland and gardens, and more arid thorn-scrub savanna. Sea-level to 2300 m.

Food and Feeding. Fruits and berries, e.g. of mulberries (*Morus*), neem (*Azadirachta indica*), *Euclea*, figs (*Ficus*); also various invertebrates, e.g. insect eggs and larvae, beetles (Coleoptera), flies (Diptera), ants (Formicidae), termites (Isoptera), locusts (Acrididae), and caterpillars; nectar taken rarely. Forages alone, in pairs or in small groups; often joins mixed-species flocks. Mostly in dense canopy, but sometimes on ground; sometimes in small groups in fruiting trees. Invertebrate items gleaned from substrate, and some (e.g. flying ants or termites) caught by aerial flycatching. Caterpillars habitually beaten against branches before being consumed.

Breeding. In N of range (nominate race) season Jul–Aug in Senegal, Apr–Jul in Gambia, Mar–Nov in Mali, May–Aug in Togo and Mar–Apr in Nigeria; in S (*notatus*) Aug–Nov in Angola, Dec–Apr in DR Congo, Sept–Nov in Zambia, Oct–Dec in Malawi, Mar–May in Botswana, Aug–Jan in Zimbabwe and Sept–Jan in Mozambique. Deep, fairly thin-walled open cup-nest woven from dry grasses, stems, leaves, rootlets, tendrils, *Usnea* lichens, woolly plant down and strands of pliable inner bark, with small amounts of spider web used for binding, internal diameter 8–10 cm, depth 5–5.8 cm, thickness 7.5 cm, suspended hammock-like in horizontal fork of thin branch usually high in well-foliaged tree canopy, typically *Brachystegia* but also alien such as eucalypt (*Eucalyptus*), usually close to centre of tree. Clutch 1–5 eggs, usually 2–3, buffy pink or creamy white, with blackish-brown, reddish-brown and purplish-grey spots and streaks with deep rose-coloured haloes concentrated at obtuse end, dimensions 26–33.3 × 19.2–21.8 mm; incubation period 16–17 days; chicks brooded mainly or entirely by female, but fed by both sexes (mostly with invertebrates, e.g. caterpillars), nestling period c. 15 days. Nests parasitized rarely by cuckoos (Cuculidae). Average breeding success in Zimbabwe study 0.4 fledglings per nesting attempt.

Movements. Intra-African migrant, with post-breeding movements into more arid habitats both farther N & S of breeding ranges of both races; movements not well understood, and populations in some areas resident or only partially migratory. Heavy deposits of fat in neck and abdomen of two specimens may indicate fat deposition in preparation for long-distance migration.

Status and Conservation. Not globally threatened. Common in parts of its range, which covers c. 5,000,000 km². Average density in seven woodland types in N Botswana 0.09 individuals/ha. Increasing loss, degradation and fragmentation of suitable woodlands is of some concern, as illustrated by e.g. loss of miombo woodlands in Zimbabwe, and has led to some population decreases, but not sufficient to require conservation action. Occurs in various protected areas, e.g. Boucle du Baoulé Reserve, in Mali, Comoé National Park, in Ivory Coast, Kalamaloué National Park, in Cameroon, Quicama National Park, in Angola, Dzalanyama Reserve, in Malawi, and Gorongosa National Park, in Mozambique.

Bibliography. Ash & Miskell (1998), Bannerman (1939), Baumann (2001), Borrett (1972), Borrow & Demy (2001), Brooke (1965, 1970a, 1986), Chapin (1954), Dowsett *et al.* (2008), Dowsett-Lemaire (1989b), Dowsett-Lemaire & Dowsett (2006), Fry *et al.* (2000), Ginn *et al.* (1989), Harrison *et al.* (1997), Hockey *et al.* (2005), Irwin (1981b), Mackworth-Præd & Grant (1960), Marshall (1959), Meinertzhagen (1923), Nikolaus (1987), Oatley (1969), Payne & Payne (1967), Pettet (1977), Riddell (2000), Schönwetter & Meise (1983), Short & Horne (2006), Sinclair *et al.* (2002), Skinner (1989, 1995), Tarboton (2001), Vincent (1936).

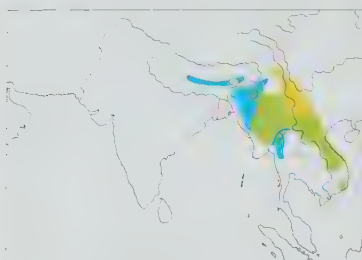
17. Slender-billed Oriole

Oriolus tenuirostris

French: Lorient à bec effilé **German:** Dünnschnabelpirol **Spanish:** Oropéndola Picofina
Other common names: Slender-billed Black-naped Oriole

Taxonomy. *Oriolus tenuirostris* Blyth, 1846, central India; error = Assam. Closely related to and sometimes treated as conspecific with *O. chinensis*, the two forming a superspecies; alternatively, both sometimes considered to belong to the superspecies formed by *O. oriolus*, *O. kundoo* and *O. auratus*. Race *invisus* regarded by some authors as being of doubtful validity. Ranges listed are tentative, as status in many areas poorly known, partly because of taxonomic uncertainties (and confusion with *O. chinensis*). Two subspecies currently recognized.

Subspecies and Distribution.
O. t. tenuirostris Blyth, 1846 – breeds Bhutan and NE India E to S China (SW Yunnan), Myanmar, Laos, NC Thailand and N & C Vietnam; non-breeding also W to E Nepal and S to S Myanmar and W Thailand.
O. t. invisus Riley, 1940 – S Vietnam (S Annam).



Descriptive notes. 21–25 cm; 72–92 g. Male nominate race has head golden-yellow apart from broad black band extending from lores around eye and across back of head; mantle and back golden-olive, rump duller; remiges black, outer primaries tipped yellowish-white and narrowly edged white, inner primaries, secondaries and tertials broadly edged golden-olive and tipped bright yellow, upperwing-coverts golden-olive; tail has outermost rectrices mostly yellow and inner pair black, the intervening feathers with amount of yellow decreasing towards inner pair; throat and underparts entirely golden-yellow; iris red; bill

livid pink; legs slaty blue. Distinguished from very similar *O. chinensis* mainly by much narrower black band on nape, duller (not golden-yellow) mantle and back (but similar in colour to female of *O. chinensis*), and longer, more decurved and more slender bill. Female is very similar to male but slightly darker above, dark colour sometimes extending onto crown and obscuring nuchal band, rump olive; yellow underparts have narrow dark streaks. Immature is yellowish-green above, creamy white on chest to yellowish on belly, entire underside heavily streaked black; bill black. Race *invisus* is smaller than nominate, inner secondaries with larger yellow tips. **VOICE.** Song a variety of mellow fluty “wheow” notes usually preceded by 2 or 3 short high “kick” notes (like those of a *Dendrocopos* woodpecker), alternatively as “chuck, tarry-you”. Calls include a rather harsh mewling note, also short nasal notes and harsh snarling sounds.

Habitat. Montane forests, e.g. open pine (*Pinus*) forest, mixed pine-oak (*Pinus-Quercus*) forest, dry open semi-evergreen or broadleaf evergreen forests, also forest edge, bamboo, plantations, gardens, groves, tea-shaded trees, clearings and open country with scattered tree clumps; up to 1500 m in Thailand, but to 2100 m in India and Bhutan, and at 2500–4300 m in China. In non-breeding season found down to 600 m in open evergreen broadleaf forests and secondary growth.

Food and Feeding. Fruits, e.g. figs (*Ficus*) and *Trema orientalis*, also nectar, e.g. of *Salmalia* and *Erythrina*; also insects. Forages alone or in pairs high up in trees; rarely, descends to ground to take caterpillars.

Breeding. Season Apr/May–Jun. Nest a moderately deep open cup of grass stems, leaves, roots, seed down, slender strips of bark and other fine material, lined with fine grass, down, hair and feathers, suspended hammock-like from thin, horizontal forked branch at variable height, usually in outer edge of well-foliaged tree canopy, sometimes attached to creepers on oak, and often near nest of Black Drongo (*Dicrurus macrocerus*); nest and nest-site like those of *O. kundoo*. Clutch 2–4 eggs, very similar to those of *O. kundoo* but nearly always have a warm pink to yellowish-pink tinge with red, light chestnut, purple-brown or blackish spots, often with reddish haloes, 26.1–29.6 × 19–21.7 mm. No other information.

Movements. Generally resident, but some migratory; status in many areas poorly known, partly because of taxonomic uncertainties (formerly treated as conspecific with *O. chinensis*) and patchy records. Probably resident in Bhutan and NE India (Arunachal Pradesh, Nagaland); resident Myanmar, Laos, NW Vietnam and parts of Thailand; probably only a breeding visitor in China (Yunnan). Non-breeders occur to the W in E Nepal, Sikkim, hills of S Assam, possibly also Bihar, West Bengal and Bangladesh, and to the S in parts of Thailand and Indochina (limits uncertain).

Status and Conservation. Not globally threatened. Fairly common to common in much of range of c. 1,000,000–10,000,000 km². Almost extinct in some areas in China owing to hunting and to trapping for the cagebird trade and taxidermy. Occurs in various protected areas, e.g. Mae Wong National Park, in Thailand, and other reasonably secure sites, and thought therefore not to be at any immediate risk.

Bibliography. Ali & Ripley (1972a), Chen Fuguan *et al.* (1998), Cheng Tsohsin (1976, 1987), Dickinson (2004), Etchécopar & Hübner (1983), Grimmett *et al.* (1998), Herklots (1953), Kazmierczak (2000), King *et al.* (1975), Lekagul & Round (1991), MacKinnon & Phillips (2000), McCarthy (2006), Meyer de Schauensee (1984), Rand & Fleming (1957), Rasmussen & Anderson (2005b), Robson (2000b, 2005b), Schönwetter & Meise (1983), Smythies (1986), Stuart Baker (1926), Vaurie (1959).

18. Black-naped Oriole

Oriolus chinensis

French: Loriot de Chine **German:** Schwarzackenspirol **Spanish:** Oropéndola China
Other common names: Eastern Black-naped Oriole (*diffusus*); Andaman Black-naped Oriole (*andamanensis*); Nicobar Black-naped Oriole (*macrourus*)

Taxonomy. *Oriolus chinensis* Linnaeus, 1766, “China”; error = Manila, Philippines.

Closely related to and sometimes treated as conspecific with *O. temurostris*, the two forming a superspecies; alternatively, both sometimes considered to belong to the superspecies formed by *O. oriolus*, *O. kundoo* and *O. auras*. Geographical variation marked, and races almost certainly comprise several species; further study required. Race *diffusus* previously known by name *indicus* (based on birds from non-breeding range in SW India), but latter name invalid, as preoccupied. Other proposed races are *saani* (from Mayu I, in Moluccas), now synonymized with *formosus*, *macassariensis* (Makassar and Indragiri, in SW Sulawesi), included in *celebensis*, and *oscillans* (Tukangbesi Is, SE of Sulawesi), merged with *boneratisensis*; and, in Philippines, *palawanensis* (Puerto Princesa, on Palawan), *fugaensis* (Fuga I, off N Luzon) and *sorsogonensis* (Sorsogon, in S Luzon), all now subsumed in nominate. Twenty subspecies currently recognized.

Subspecies and Distribution.

O. c. diffusus Sharpe, 1877 – breeds SE Russia (Amurland), Korea and S throughout E half of China (E from W Sichuan and Yunnan) to Hainan, also SW Myanmar, N Laos and Taiwan; non-breeding mainly India, Bangladesh, Myanmar, Thailand and S Indochina.
O. c. andamanensis Beavan, 1867 – Andaman Is.
O. c. macrourus Blyth, 1846 – Nicobar Is.
O. c. maculatus Vieillot, 1817 – extreme S Thailand, Peninsular Malaysia, Singapore, mainland Sumatra, Bangka, Belitung, Java and Bali.
O. c. mundus Richmond, 1903 – Simelue and Nias, off W Sumatra.
O. c. richmondi Oberholser, 1912 – Siberut and Pagai Is, off W Sumatra.
O. c. sipora Chasen & Kloss, 1926 – Sipura, off W Sumatra.
O. c. lamprochryseus Oberholser, 1917 – Karamian and Masalembu Is, in E Java Sea.
O. c. insularis Vorderman, 1893 – Sapudi, Raas and Kangean Is, in Bali Sea.
O. c. chinensis Linnaeus, 1766 – N & W Philippines (Luzon, Mindoro, Palawan and surrounding smaller islands).
O. c. yamamurae Nagamichi Kuroda, 1927 – C & S Philippines (Tablas, Romblon, Sibuyan, Masbate, Panay, Samar, Negros, Cebu, Bohol, Leyte, Basilan, Mindanao and surrounding smaller islands).

O. c. suluensis Sharpe, 1877 – Sulu Archipelago (S from West Bolod and East Bolod), in SW Philippines.

O. c. melanisticus A. B. Meyer & Wilesworth, 1894 – Talaud Is (Karakelong, Salibabu, Kaburung), S of Philippines.

O. c. sangirensis A. B. Meyer & Wilesworth, 1898 – N Sangir Archipelago (Sangir I, Tabukan I), N of Sulawesi.

O. c. formosus Cabanis, 1872 – S Sangir Archipelago (islands of Sia, Tahulandang, Ruang, Biaro) and Mayu I (E of NE Sulawesi).

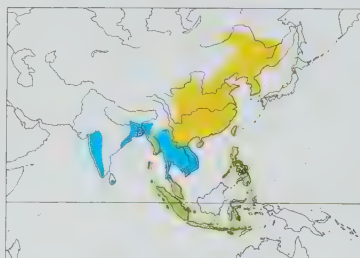
O. c. celebensis (Walden, 1872) – Sulawesi and surrounding islands (Talisei, Bangka, Lembeh, Kabaena, Muna, Butung, Tanakeke), including Togian Is.

O. c. stresemanni Neumann, 1939 – Peleng (in Banggai Archipelago).

O. c. frontalis Wallace, 1863 – Taliabu (in Sula Archipelago).

O. c. boneratisensis A. B. Meyer & Wilesworth, 1896 – islands in Flores Sea (Kayuadi, Tanahjampea, Kalao, Bonerate, Kalaotoa, Madu), and Tukangbesi Is (in W Banda Sea).

O. c. broderipii Bonaparte, 1850 – Lesser Sunda (Lombok, Sumbawa, Komodo, Rinca, Sumba, Flores, Paloe, Besar, Lomblen, Pantar, Alor).



Descriptive notes. 23–28 cm; 65–100 g. Male nominate race has head, upperparts and underparts entirely golden-yellow, apart from black on lores and in broad band through eye and across hindcrown; most of wing black, secondary coverts golden-yellow, primaries narrowly edged white, tertials tipped yellow; tail feathers black, outer pair with distal half yellow, central pair with yellow tips, other feather pairs with decreasing amount of yellow from outers inwards; iris reddish-brown or grey; bill livid pink, paler on cutting edges and tip; legs slaty blue. Female is similar to male, but mantle yellowish-olive. Immature has

upperparts yellowish-green, underparts creamy white with black streaks, undertail-coverts yellow; bill black. Races vary extensively in size and colour: *yamamurae* is like nominate but shorter-winged, and yellow tips of central tail feathers much narrower; *suluensis* has yellow on head confined to small forehead patch, mantle rather pale yellow, wing entirely black, extensive yellow on outer tail feathers; *diffusus* is like nominate, but tertials and inner secondaries entirely yellow on outer edge, yellow tips of primary coverts forming small yellow patch; *andamanensis* is much smaller, has yellow of crown extending much farther back onto nape, leaving only narrow black hindcollar; *macrourus* is slightly smaller than nominate, yellow of crown extending farther back to leave narrower hindcollar (but broader than in previous), wing feathers with narrow yellowish edging, primary coverts tipped yellow (small yellow wing spot); *maculatus* is smaller than nominate, with greater extent of yellow on crown as preceding race, but yellow upperparts tinged greenish, secondaries and tertials with broader yellow edging, yellow-tipped primary coverts form large patch; *mundus* differs from nominate in being slightly smaller and generally bright lemon-yellow; *sipora* is similar to last, but has more extensive yellow on crown, yellow primary-covert spot; *richmondi* has greater extent of yellow on hindcrown than nominate and posterior upperparts tinged olive, resembles *maculatus* but yellow of remaining upperparts more orange-tinged, wing shorter, secondaries and tertials less broadly edged yellowish; *lamprochryseus* is slightly smaller than nominate, resembles *maculatus* but less greenish above, primaries narrowly edged greyish-white, inner primaries tipped buff-white, secondaries and tertials broadly edged pale yellow, primary coverts less broadly tipped lemon-yellow; *insularis* has yellow of crown extending farther back to leave only narrow black hindcollar, yellow of upperparts and underparts suffused with orange; *melanisticus* is larger and with heavier bill than nominate, has entire crown and nape black, leaving only small area of yellow on forehead, broad yellow collar on hindneck, mantle black-mottled dark olive-green or sometimes entirely black, wing feathers all black; *sangirensis* resembles previous, but mantle dark greenish-yellow, secondaries and tertials broadly edged olive; *formosus* is very similar to last but slightly larger, with larger area of yellow on forehead; *celebensis* is smaller than nominate, has top of head entirely yellow so that black occipital band very narrow and sometimes broken on nape, mantle greenish-tinged yellow, primaries narrowly edged greyish-white, tertials broadly edged greenish-yellow; *stresemanni* is smaller and much shorter-billed than nominate, yellow on head confined to small forehead patch; *frontalis* is intermediate in size between nominate and previous, yellow on head confined to small forehead patch (as previous), mantle deeper golden-yellow, often with some orange suffusion, wing entirely black; *boneratisensis* is larger than nominate, yellow colour of crown, mantle and underparts often a pure orange; *broderipii* is same size as nominate, forehead patch small (as *frontalis*) but deep orange-yellow in colour, mantle and underparts also deep orange-yellow, primary coverts with yellow tips (forming wing spot), tertials tipped yellow. **VOICE.** Much variation, but geographical differences largely unstudied. Song a loud fluty whistle, “doo-dee-oo”, “ku-i-oo”, “kwia-lu” or descending “tu-u-liu”, last note longest, and a rich and fluty “tu-u-liu”, first note shortest and last note highest; race *andamanensis* said to give quite different “chee-e op”. Call a mewling “mee-aooww” and a loud, pleasant “pee-yaaaoooww” or “kee-aaaoooww” repeated every few seconds, often several birds calling together; scolding harsh “kyerrrr”, often repeated, and given by both sexes.

Habitat. Open primary and secondary evergreen forest, mixed broadleaf forest and deciduous forest, dryland forests, forest edge, forest groves (e.g. beach casuarinas, bamboo), plantations (e.g. coconut palm, rubber), parks, orchards, gardens, wooded suburbs; also mangroves, coastal forest and scrub, and even scattered trees in open country, along roads and in villages. Lowlands and hills, up to 1600 m in China and Thailand.

Food and Feeding. Berries and fruits, e.g. *Camposperma auriculata*, *Cinnamomum iners*, *Eugenia papillosa*, *Passiflora foetida*, *Ptychosperma macarthurii*, *Vitex pubescens*, *Macaranga*, papaya (*Carica*), mango (*Mangifera*), star-fruit (*Averrhoa carambola*), low fruiting ornamental palms, but especially figs (*Ficus*). Also insects and their larvae, e.g. alate termites (Isoptera), caterpillars, grasshoppers (Orthoptera), mantids; seen to make hole in wasp and hornet (Vespidae) nests in order to extract larvae. Observed also to take small vertebrates, including bird nestlings. Forages alone, in pairs or in small groups, usually in canopy; only rarely comes down quite low, when searching for insects and larvae. Sometimes joins mixed-species flocks in fruiting trees. Most items taken while perched, but some during hovering. Many insects are habitually wiped on branch before consumption.

Breeding. Breeds in May–Jun in N of range (SE Russia), Jun–Jul in China (May–Jul in Hongkong), Apr–Jun in Andaman Is, Dec–Jun (rarely to Sept) in Peninsular Malaysia, Mar–Aug in Sumatra, Feb–Jun (nests found also in Aug and Dec) in Java, and Feb–Jun in Philippines. During pair formation, male sings and chases after female while chasing away other males. Open cup-nest built solely by female, male sometimes collecting some material, made of leaves, grasses, strips of bark, straw, rootlets, fine banyan (*Ficus*) roots, pine (*Pinus*) needles and small twigs, bound with cobwebs, usually decorated on outside with small climbing asclepiad leaves, external diameter 10–13

cm, internal diameter 6·7–9 cm, internal depth 5 cm, suspended hammock-like in thin, horizontal forked branch, usually high up and well concealed in well-foliaged tree, and often close to nest of drongo (*Dicrurus*). Clutch 2–4 eggs, white or bluish-white to pale pink or salmon-pink, with small red, cinnamon-brown, dark chocolate-brown, purplish-brown, grey and black spots with a few grey or lavender haloes concentrated at obtuse end, dimensions 25·6–34·2 × 19·9–23·8 mm; incubation period 14 days; chicks tended by both parents, no information on duration of nestling period; both parents also tend fledglings, usually only two of which survive.

Movements. Mainland *diffusus* migratory, with N populations present on breeding grounds May–Sept, migrating S & SW to overwinter in SW India and NE Indian Subcontinent, Sri Lanka (very scarce) and much of mainland SE Asia; fairly common passage migrant N Vietnam; in Japan rare but annual spring migrant (May and early Jun, exceptionally to mid-Jul), mainly on islands in Sea of Japan, also autumn passage migrant. Nominate race a partial migrant; individual ringed on Palawan was recaptured 60 months later on Mindoro, several hundred kilometres to N. Other island populations resident. Resident also SW Myanmar, extreme S Thailand and Peninsular Malaysia S to Singapore.

Status and Conservation. Not globally threatened. Common to fairly common or frequent in various parts of its range of c. 1,000,000–10,000,000 km². Status in Borneo uncertain, and the

few records possibly involve migrants of nominate race from Philippines; two records from N Borneo (Sabah) considered likely to have involved escaped cagebirds. Is regularly sold in cagebird trade. May be a pest in some areas, where sometimes causes visible damage in commercial fruit orchards. Occurs in various protected areas throughout range, and considered not to be at any immediate risk.

Bibliography. Ali & Ripley (1972a), Allen (1957), Andronova (2003), van Bemmelen & Voous (1951), Blasius (1888b), Brazil (1991), Chen Fuguan *et al.* (1998), Cheng Tsohsin (1976), Cheong Weng Chun (2005), Coates & Bishop (1997), Dementiev *et al.* (1954a, 1970), Dickinson (2000, 2004), Dickinson *et al.* (1991), Dunning (2008), Ètchécopar & Hüe (1983), Eve & Guigüe (1996), Fleming *et al.* (1984), Flint *et al.* (1984), Gore & Won Pyong-Oh (1971), Grimmett *et al.* (1998), Hartert (1903a), Hemmingsen (1969), Herklots (1936, 1953), Hoogerwerf & Rengers Hora Siccama (1938), Indrawan *et al.* (2006), Jeyarajasingam & Pearson (1999), Kazmierczak (2000), Kennedy *et al.* (2000), Lee Woo-Shin *et al.* (2000), Lekagul & Round (1991), MacKinnon (1988), MacKinnon & Phillips (1993, 2000), van Marle & Voous (1988), McCarthy (2006), McClure (1998), Medway & Wells (1976), Meinertzhagen (1923), Meise (1929), Melnikov (1998), Meyer & Wigglesworth (1898b), Parkes (1965), Rand (1951a), Rasmussen & Anderton (2005b), Rensch (1931a), Robson (2000b, 2005b), Schönwetter & Meise (1983), Sheldon *et al.* (2001), Shepherd *et al.* (2004), Smythies & Davison (1999), Spennemann (1932), Strange & Jeyarajasingam (1993), Stuart Baker (1926), Tan (2001), Vaurie (1959), Wells (2007).



19. Green-headed Oriole

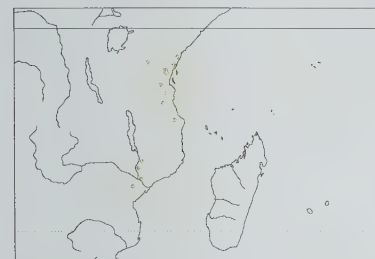
Oriolus chlorocephalus

French: Lorient à tête verte **German:** Grünkopfpfirl **Spanish:** Oropéndola Cabeciverde

Taxonomy. *Oriolus chlorocephalus* Shelley, 1896, Mount Chiradzulu, south Malawi. Despite being green-headed, this species is considered to be part of the "African black-headed group" along with *O. crassirostris*, *O. brachyrhynchus*, *O. monacha*, *O. percivali*, *O. larvatus* and *O. nigripennis*. Three subspecies recognized.

Subspecies and Distribution.

O. c. amani Benson, 1946 – patchily in SE Kenya and E Tanzania.
O. c. chlorocephalus Shelley, 1896 – S Malawi and C Mozambique (Mt Chipperone).
O. c. speculifer Wolters & Clancey, 1969 – SC Mozambique (Mt Gorongosa).



Descriptive notes. 21.5–24 cm. Male nominate race has head and neck to upper breast rich olive-green, separated from olive-green upperparts by bright yellow hindneck and upper mantle; lower breast to undertail-coverts bright yellow, thighs tinged olive; upperwing dark grey, primaries and secondaries having light grey outer webs with whitish edges (forming pale panel on closed wing), primary coverts bluish-grey, secondary coverts olive-green; tail has outermost feathers almost entirely yellow, central pair olive-green, the rest with yellow tips, amount of yellow decreasing inwards; iris red; bill deep red to

red-brown; legs light or dark bluish-grey. Female differs from male only in browner bill. Immature is like adult, but olive-green less intense, narrow ring of yellow feathers around eye; has mantle, chin and throat yellow-olive, breast dull yellow, mottled with olive, upper belly bright yellow with narrow olive streaks, secondaries edged and tipped white, primary coverts with broad white tips; bill blackish. Race *amani* differs from nominate only in smaller size; *speculifer* is same size as nominate, but has white tips on four primary coverts forming conspicuous white patch on closed wing. **VOICE.** Song "ku-wee-oo", "kwee-wo", "hweet-tyoo-hweedo" or "who-jo-koyyo", each phrase accompanied by quick fanning of tail, similar to that of *O. larvatus* but more liquid and less abrupt; also a simpler "cowoyo". Calls include insistent nasal mewling, louder in middle and changing in tone, "quarreeyaaa".

Habitat. Coastal forest patches in Kenya, up to 400 m. In Tanzania, primary lowland forest, rich woodlands and secondary growth with tall emergent trees, mainly between 200 m and 1000 m, but 1000–1300 m on Mt Nilo (E Usambaras). Primary submontane and riparian evergreen forests between 1000 m and 1450 m in Malawi and in C Mozambique (Mt Chipperone); primary evergreen montane forest at 750–2000 m on Mt Gorongosa, in S Mozambique, where sometimes in adjacent secondary forest and semi-open woodland.

Food and Feeding. Fruits, also some large hard seeds, and nectar; also various invertebrates, e.g. insects and their larvae. Forages alone or in pairs, from middle storey to canopy; sometimes in small groups in fruiting trees e.g. figs (*Ficus*) or in flowering trees, especially alien silky oak (*Grevillea*), where it is often found with *O. larvatus*. Sometimes joins mixed-species flocks.

Breeding. In Malawi, pair formation in Jun, calling Aug–Feb (silent Mar–Jun), and egg-laying mainly Aug–Nov; in Tanzania, a well-grown nestling observed in Nov; in Mozambique, birds with enlarged gonads and brood patches in Oct, and breeding recorded in Nov. Nest a deep, open thick-walled cup, mostly of old-man's beard lichen (*Usnea*) where available, also other plant fibres, suspended hammock-like in thin, horizontal forked branch high in well-foliaged tree canopy; territory 13–25 ha in Malawi. Clutch 2 eggs. No other information.

Movements. Resident, but may wander locally; some records in Malawi up to 40 km from nearest known population.

Status and Conservation. Not globally threatened. Fairly common to common in parts of its range of c. 22,000 km². Occurs in various protected areas, and considered therefore not at any immediate risk. In Kenya, local and uncommon in coastal forests of Arabuko-Sokoke Forest Reserve and Diani (unprotected), and locally fairly common in Jadini Forest in the Shimba Hills National Park. In Tanzania, common in Usambara Mts, and very common at Amani Nature Reserve. In Mozambique, common on Mt Gorongosa, with no evident change in numbers in recent times; incorporation of Mt Gorongosa into the adjoining Gorongosa National Park has been proposed. Less common in Malawi, where occurs at only four or five small localities, with estimated total of 55–60 pairs in 1983; continuing deforestation of remaining localities threatens the species' survival in this country.

Bibliography. Benson & Benson (1947), Britton (1977), Clancey (1985, 1996), Dowsett-Lemaire (1989b), Dowsett-Lemaire & Dowsett (2006), Fry *et al.* (2000), Ginn *et al.* (1989), Hall & Moreau (1970), Hockey *et al.* (2005), Mackworth-Præd & Grant (1960), Meinertzhagen (1923), Parker (2005), Tarboton (2001), Vincent (1936), Wolters & Clancey (1969), Zimmerman *et al.* (1996).

20. Sao Tome Oriole

Oriolus crassirostris

French: Lorient de Sao Tomé **German:** Sao-Tomé-Pfirl **Spanish:** Oropéndola de Santo Tomé

Taxonomy. *Oriolus crassirostris* Hartlaub, 1857, São Tomé.

A member of the "African black-headed group", which also includes *O. chlorocephalus*, *O. brachyrhynchus*, *O. monacha*, *O. percivali*, *O. larvatus* and *O. nigripennis*. Monotypic.

Distribution. São Tomé I, in Gulf of Guinea.

Descriptive notes. 23–24 cm; 50 g. A "washed-out" version of mainland orioles, and with more robust bill. Male has head and neck to upper breast black, throat freckled with white; mantle pale yellow, broadly streaked olive-grey, back greyish olive-green, rump paler with whitish patch at side; primaries narrowly edged white and with broad white crescent at tips, outer webs of secondaries blue-grey with white edges and tips, tertials grey-green, primary coverts black with white tips (forming conspicuous white patch on closed wing); upertail has central feathers dark olive, others black with long yellow tips, amount of yellow increasing towards outer feathers, underside of tail bright



long, mellow downslurred "tyeeow", "way-when-ya", "chip-aw-hah-aw" or "hik-kuway-kuwow" or an ascending "ko-ku-waayoo"; slower and deeper than those of other African orioles, richer and mellower than songs of other members of "African black-headed group". Scolding call a high-pitched, harsh "keea", shorter than equivalent calls of congeners.

Habitat. Inhabits primary forest up to 1600 m, also mature secondary forest and forest edge; sometimes in dry forest in N. Generally absent from cocoa plantations and from vicinity of human habitations.

Food and Feeding. Fruits, seeds; also invertebrates, e.g. hemipteran bugs, larval and adult beetles (Coleoptera). Forages alone or in pairs, from middle storey to canopy; sometimes joins mixed-species flocks.

Breeding. Breeds at least Aug–Jan, possibly as early as Jun and as late as Feb, as young observed in early Jul and Feb and juveniles during Jul–Aug and Dec–Mar, also a male with well-developed gonads in Feb. One nest, built by one individual in Sept, an open cup suspended hammock-like between two horizontal branches at height of 9 m; another was made out of leaves and shredded vegetation, and suspended between two twigs near leafy end of branch 11 m above ground. No other information.

Movements. Resident; may wander locally.

Status and Conservation. **VULNERABLE.** Restricted-range species: present in São Tomé EBA. Locally common in primary forest. Total population thought to be fewer than 1000 individuals, confined to c. 480 km² of suitable primary and mature secondary forest habitat. Recent surveys suggest it may occur at higher densities than previously believed, i.e. 0.2–0.7 birds/ha in central montane and high-altitude mist forests, and 3–2 birds/ha in remaining areas of lowland forest in SW. Historically, large areas of forest were cleared for cocoa and coffee plantations, and intact forest remains mostly at higher elevations. Before independence of São Tomé, in 1975, plantations were frequently sprayed with pesticides, causing apparently drastic decrease in oriole numbers. Since then, many plantations have reverted to secondary growth, but recent land privatization and reintensification of agriculture may have led to increase in number of small farms, pesticide use and clearance of trees, while road developments along E & W coasts are facilitating access to previously remote areas. Protection of primary forest as a *zona ecológica* and a national park has been proposed, while a new law providing for the listing of protected areas and the protection of threatened species awaits final ratification. Improved knowledge of the species' numbers and habitat requirements may result in its population estimate being revised upwards and its threatened status being reviewed.

Bibliography. Anon. (2007g), Atkinson *et al.* (1991), Bannerman (1915a, 1939), Borrow & Deme (2001), Butchart & Stattersfield (2004), Christy & Clarke (1998), Collar, Crosby & Stattersfield (1994), Fry *et al.* (2000), Hall & Moreau (1970), Jones & Tye (2006), Meinertzhagen (1923), de Naurais (1984), Peet & Atkinson (1994), Sargeant (1994), Snow (1950), Stattersfield & Capper (2000), Stattersfield *et al.* (1998).

21. Western Black-headed Oriole

Oriolus brachyrhynchus

French: Lorient à tête noire **German:** Blauflügelpfirl **Spanish:** Oropéndola Cabecinegra
Other common names: Greenish-backed/West African Black-headed Oriole

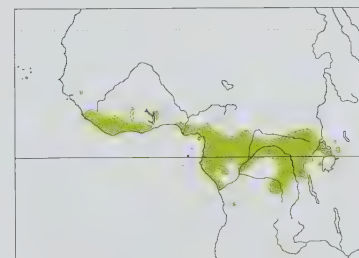
Taxonomy. *Oriolus brachyrhynchus* Swainson, 1837, Sierra Leone.

Closely related to and perhaps forming a superspecies with *O. monacha*; the two belong to the "African black-headed group", which also includes *O. chlorocephalus*, *O. crassirostris*, *O. percivali*, *O. larvatus* and *O. nigripennis*. Two subspecies recognized.

Subspecies and Distribution.

O. b. brachyrhynchus Swainson, 1837 – rainforests in E Guinea-Bissau, SW Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo and SW Benin.

O. b. laetior Sharpe, 1897 – rainforests in S Nigeria and Cameroon E to Central African Republic, extreme SW Sudan, W, C & S Uganda (and patchily in E), extreme W Kenya and extreme NW Tanzania, S to Gabon, N Angola and SW, SC & E DR Congo.



Descriptive notes. 21 cm; 42–57 g. Male nominate race has head and neck to upper breast glossy black, hindneck and uppermost mantle yellowish, rest of upperparts uniform bright yellowish olive-green; primaries and outer secondaries blackish with narrow whitish edges and tips, inner secondaries olive on outer web, edged and tipped grey (forming extensive pale grey wingpanel), tertials and upperwing-coverts yellowish-olive, outer greater coverts grey, primary coverts black with white tips (forming conspicuous white patch on closed wing); tail feathers black with olive bases and yellow tips, with progressively less olive at base and more yellow at tip from inner feathers to outer ones, underside of tail yellow and dull black; black of upper breast merges into dusky yellow on lower breast, bright yellow on belly and flanks; iris dark carmine-red; bill red-brown or pinkish-brown; legs blue-grey or dark grey. Female differs from male only on having iris chestnut-brown (not red). Immature is like adult, but head

dark olive (yellower on lores and around eye), grading into yellower olive of mantle; chin and throat olive-green, streaked yellow, breast and flanks mottled olive-yellow, belly clear yellow; upper mandible purplish, lower mandible pinkish-yellow at base and dark at tip, iris brown, legs grey-blue, grey-green or light blue. Race *laetior* differs from nominate in having distinct hindcollar brighter yellow, and lower breast bright yellow (not dusky yellow) and strongly demarcated from black of upper breast. **Voice.** Song repertoire of nominate race extensive (more than 50 variations recorded), e.g. a rich, mellow, fluty “waw-hah” (second note higher) and a shorter “waw-chop”, also “waw-kwee-hoo”, “hee-ku-waw”, “hip-oo-hooah” (last note upslurred) and rapid “tututu-weeah”; similar to song of *O. nigripennis* but rather deeper, notes more clearly separated, and changing in frequency more slowly. Scolding call a nasal “jewi-jaaa”. Race *laetior* has very varied repertoire, including mellow fluty whistle, “hoyo” or “oriole”, a similar “hohohoyee” (4 notes), “hohohoick” (3 notes) or “hohoyee” (3 notes), and other variations of this, as well as 4 or 5 rapidly repeated guttural “churk” notes, and a penetrating rasping and twanging double cry, “pisk-peisk”, with first note short, second drawn out.

Habitat. Primary forest and mature secondary forest, forest edge, treefall gaps, clearings with shrubs and tall trees, gallery forest, savanna woodlands, mature plantations and dense bushes; to 1800 m.

Food and Feeding. Invertebrates, especially caterpillars, also e.g. beetles (Coleoptera), spiders (Araneae), bugs (Hemiptera), large orthopterans; also large hard seeds and soft fruits, e.g. *Allophylus*, *Croton*, *Ficus*, *Macaranga*, *Tetrachidium didymostemon*. Forages alone, in pairs or in family groups, from middle storey to canopy, sometimes lower in treefall gaps and along logging roads. Often joins mixed-species flocks. Searches for insects in epiphytes and foliage, also on small branches; sometimes flycatches insects, e.g. winged ants (Formicidae), and observed even to feed on hornet (Vespidae) nest.

Breeding. Displays in Dec and Mar, developed gonads Aug–Dec and Mar, copulation seen in Oct, nest-building in Mar, May–Jun and Nov, and nesting in Apr–May in Liberia; pair displaying in Nov and collecting nest material in Apr in Ivory Coast; birds with enlarged gonads in Apr in Ghana; juvenile in Mar in Nigeria and adult feeding juvenile in May in Cameroon; singing and territorial pursuits most intense in Sept–Feb, birds in breeding condition Jun–Aug and Dec, adult feeding young Nov and occupied nest in Dec in Gabon; birds with developed gonads in Jan–Jul and Oct–Nov, breeding in Mar, young just out of nest in Dec, and immatures seen in Jan and Nov in DR Congo; in breeding condition Apr in Uganda and egg-laying Aug in Kenya. Deep open cup-nests woven mostly from dry vegetable matter, with *Usnea* lichen and mosses worked into outside of nest, sometimes bound with small amounts of spider web, suspended hammock-like in thin, horizontal forked branch, usually in well-foliaged tree canopy. Clutch 2 eggs; incubation by female, fed on nest by male. No other information.

Movements. Sedentary.

Status and Conservation. Not globally threatened. Fairly common to common and widespread in its range of c. 2,300,000 km². Estimated densities 0.08–0.15 pairs/ha in high forest in Ghana, 0.10–0.12 pairs/ha in primary forest and 0.06–0.08 pairs/ha in old secondary forest in Gabon (M’Passa), and 0.08–0.15 pairs/ha in high forest in Liberia. Occurs in various protected areas, e.g. Bia National Park, in Ghana, Odzala and Nouabalé-Ndoki National Parks, in PR Congo, and Bwindi-Impenetrable Forest National Park, Mount Elgon National Park and Malabigambo and Mount Moroto Forest Reserves, in Uganda.

Bibliography. Bannerman (1939), Borrow & Demey (2001), Chapin (1954), Dean (2000), Dowsett-Lemaire (1996), Fry *et al.* (2000), Gatter (1997), Grimes (1987), Gyldestolpe (1924), Hall & Moreau (1970), Happel (1986), Hillman & Hillman (1986), Mackworth-Præd & Grant (1960, 1973), Mann (1985), Marchant (1951), Marshall (1959), Nikolaus (1987), Rand (1959), Rodewald *et al.* (1994), Sinclair & Ryan (2003).

22. Ethiopian Black-headed Oriole
Oriolus monacha

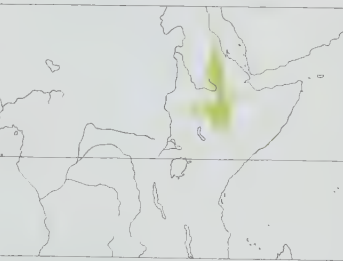
French: Lorient moine **German:** Mönchspirol **Spanish:** Oropéndola Monje
Other common names: Dark-headed/(Black-headed) Forest Oriole, Abyssinian Oriole

Taxonomy. *Turdus monacha* J. F. Gmelin, 1789, “Abyssinia” = Eritrea. Closely related to and perhaps forming a superspecies with *O. brachyrhynchus*; the two belong to the “African black-headed group”, which also includes *O. chlorocephalus*, *O. crassirostris*, *O. percivali*, *O. larvatus* and *O. nigripennis*. The name *permistus* is considered to be a younger synonym of *menelikii*. Races intergrade in C Ethiopia. Two subspecies recognized.

Subspecies and Distribution.

O. m. monacha (J. F. Gmelin, 1789) – Eritrea and N Ethiopia.

O. m. menelikii Blundell & Lovat, 1899 – S Ethiopia.



Descriptive notes. 23–24 cm; 63–74 g. Nominative race has head, neck and upper breast glossy black, hindneck and upper mantle bright yellow, rest of mantle and back olive-yellow, rump and uppertail-coverts bright yellow; primaries blackish, edged white or grey, secondaries blackish with broad grey outer edges (forming grey panel on closed wing), secondary coverts and tertials light grey, primary coverts black with white tips (forming conspicuous white patch); tail feathers black with yellowish-olive bases and yellow tips, amount of yellow increasing from inner rectrices towards outers; lower breast to vent and undertail-coverts bright yellow; iris dark brown; bill dull red to pinkish-brown; legs blue-grey, dark grey or olive-grey. Sexes alike, but female can have red iris. Immature is like adult, but head brownish-black, streaked and mottled with yellow; iris dark brown, bill black, legs grey. Race *menelikii* differs from nominate in having less yellow and more black on tail and is rather longer-winged and shorter-tailed (easily confused in field with race *rolletii* of *O. larvatus* in S Ethiopia). **Voice.** Song “wocheelywo”, “cheelowah”, “kocheelo”, “wokachilly” or in combination “wocholee, wocheelywo” or “wocheelywo-wollawochee”; higher-pitched, less rich and less fluty than songs of other African orioles. Scolding call a short “graaa-graaa”.

Habitat. Damp highland forests, mostly between 950 m and 2000 m, e.g. gallery woodland, evergreen forests of olive (*Olea*) and *Podocarpus*, highland juniper (*Juniperus*), *Croretum* and other wet or mesic woodlands on escarpments with figs (*Ficus*) and tamarinds (*Tamarindus indica*). Avoids pure acacia (*Acacia*) woodland.

Food and Feeding. Berries, fruits, e.g. figs; also invertebrates, e.g. mantids, caterpillars. Forages alone or in pairs; gathers in flocks at certain times of year, e.g. Jun. Searches branches and foliage; also flycatches insects, such as winged termites (Isoptera).

Breeding. Nest-building in Aug in Eritrea, and young out of nest being fed with berries in Jun in Ethiopia. Nest built by female, made out of grasses, mosses and bark strips, in horizontal forked branch 2–15 m above ground. Clutch 2 eggs, white to creamy, with red-brown and lighter purplish-grey spots and blotches concentrated at obtuse end. No other information.

Movements. Sedentary.

Status and Conservation. Not globally threatened. Locally common to abundant in its range of c. 480,000 km². Perhaps commonest in N half of range.

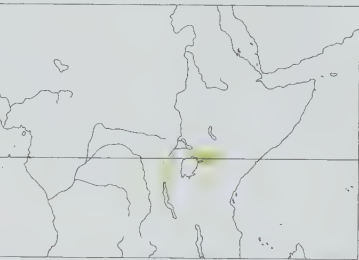
Bibliography. Friedmann (1937), Fry *et al.* (2000), Grant & Mackworth-Præd (1942), Hall & Moreau (1970), Mackworth-Præd & Grant (1960), Meinertzhagen (1923), Neumann (1905), Ogilvie-Grant (1904), Reichenow (1903), Rüppell (1836), Sinclair & Ryan (2003).

23. Mountain Oriole
Oriolus percivali

French: Lorient de Percival **German:** Bergpirol **Spanish:** Oropéndola Montana
Other common names: Montane/Black-tailed/Percival’s Oriole

Taxonomy. *Oriolus percivali* Ogilvie-Grant, 1903, Kikuyu Highlands, Kenya. Closely related to and sometimes treated as conspecific with *O. larvatus*, with which it may hybridize in C Kenya, but the two differ in ecology and vocalizations; both belong to the “African black-headed group”, which includes also *O. chlorocephalus*, *O. crassirostris*, *O. brachyrhynchus*, *O. monacha* and *O. nigripennis*. Monotypic.

Distribution. Montane forests of E DR Congo, Uganda, Kenya, NW Rwanda, Burundi and W Tanzania.



Descriptive notes. 19.5–21.5 cm; 60–71 g. Head to neck and upper breast are glossy black, mantle bright yellow, scapulars and back olive-green, rump olivaceous yellow; primaries blackish, narrowly edged and tipped grey-white, secondaries black with white edges and tips, tertials and greater coverts black, broadly edged and tipped yellow, median and lesser coverts yellow, primary coverts black, tipped white (conspicuous white patch on wing); central tail feathers black, remainder with yellow tips (larger on outer feathers); side of upper breast and rest of underparts intense bright yellow; iris deep red; bill brown-red or brownish-pink; legs grey or blue-grey. Sexes alike. Immature is like adult, but top and side of head streaky olivaceous black-brown, mantle olive (yellow at side) with darker streaks, chin and throat dark olive, streaked with black, merging into dull yellow breast streaked with olive; iris dark brown, bill blackish, legs light blue-grey. **Voice.** Short, fluid phrase, similar to that of *O. larvatus* but higher-pitched than that of *O. brachyrhynchus*; includes rather clipped “tyee-woh”, downslurred “ti-tyao-hoh” and longer upslurred “chit-chiluwee”. Duetting common, male giving loud “weeka-ku-weeu”, female replying with higher “weekla-wee-er”.

Habitat. Montane forest and submontane woods, well-timbered hillsides, primary and secondary evergreen forests, gallery and remnant forests, and adjacent wooded farmland, parks and gardens; between 1530 m and 3000 m.

Food and Feeding. Fruits, e.g. *Ureia* species; also invertebrates, e.g. caterpillars and hard-bodied insects. Forages alone and in pairs, also in small groups of up to six individuals (especially at fruiting trees); often joins mixed-species flocks. From middle storey to canopy, often in liana tangles; sometimes snatches food items and flycatches insects in understorey.

Breeding. Birds with enlarged gonads in May–Jun and Sept, month-old young in Aug and juveniles in Apr and Sept–Nov in DR Congo; adult feeding fledgling away from nest in Oct in Uganda. No other information.

Movements. Sedentary; perhaps some local movement.

Status and Conservation. Not globally threatened. Fairly common to common and widespread in its range of c. 83,000 km². Present in various protected areas, and classed as of least conservation concern. Occurs in montane forests in Kenya and Uganda, also common in Itombwe Mts (DR Congo) and Nyungwe Forest Reserve (Rwanda); also found in montane forests of NW Burundi, and in Mahali Mountain National Park, in W Tanzania.

Bibliography. Carswell *et al.* (2005), Chapin (1944, 1954), Fry *et al.* (2000), Hall & Moreau (1970), Jackson & Selater (1938), Mackworth-Præd & Grant (1960), McCarthy (2006), Meinertzhagen (1923), Prigogine (1978a), Short & Horne (2006), Sinclair & Ryan (2003), van Someren (1944), Zimmerman *et al.* (1996).

24. Eastern Black-headed Oriole
Oriolus larvatus

French: Lorient masqué **German:** Maskenpirol **Spanish:** Oropéndola Enmascarada
Other common names: (East) African Black-headed Oriole

Taxonomy. *Oriolus larvatus* M. H. C. Lichtenstein, 1823, “Terr. Caffror” = Cape Province, South Africa.

Closely related to and sometimes treated as conspecific with *O. percivali*, with which it may hybridize in C Kenya, but the two differ in ecology and vocalizations; both belong to the “African black-headed group”, which also includes *O. chlorocephalus*, *O. crassirostris*, *O. brachyrhynchus*, *O. monacha* and *O. nigripennis*. Race *additus* formerly known by name *tibicen*, but that name invalid, as preoccupied. Nominative race and *angolensis* appear to intergrade clineally in Zimbabwe. Proposed race *kikuyensis* (from Nairobi, in Kenya) is synonymized with *rolletii*. Five subspecies recognized.

Subspecies and Distribution.

O. l. rolletii Salvadori, 1864 – S Sudan, W & S Ethiopia, E DR Congo (to c. 2° S), Uganda, W & C Kenya, L Victoria Basin.

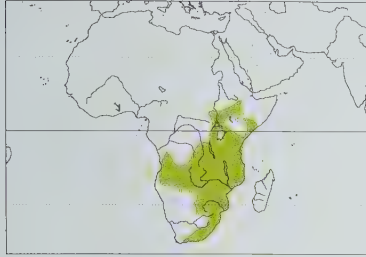
O. l. reichenowii Zedlitz, 1916 – coastal forests of Somalia to E Tanzania (S to c. 9° S).

O. l. angolensis Neumann, 1905 – Angola and N Namibia E to W Tanzania and N Mozambique.

O. l. additus Lawson, 1969 – coastal S Tanzania S to coastal S Mozambique.

O. l. larvatus M. H. C. Lichtenstein, 1823 – S Zimbabwe, inland S Mozambique, Swaziland and E South Africa (S to W Western Cape).

Descriptive notes. 20–21.5 cm; 59–72 g. Nominative race has head and neck to upper breast glossy black, mantle bright yellow, scapulars and back yellowish olive-green, rump yellow; remiges black, primaries edged and tipped grey-white, secondaries edged yellowish-grey, tertials tipped



yellow and edged olive, lesser and median coverts yellowish-olive, greater coverts broadly fringed yellowish-olive, primary coverts black, tipped white (forming conspicuous white patch on wing); central tail feathers greenish-olive to blackish, remainder black with bright yellow terminal patches, amount of yellow increasing towards outer feathers; lower breast and rest of underparts intense bright yellow; iris red; bill coral-red or brownish-red; legs slate-grey. Sexes alike. Immature is like adult, but top and side of head blackish-olive, mantle olive (yellow at side) with darker streaks, chin and throat black, streaked with yellow,

breast yellow, streaked with black; iris brown, bill blackish, legs light blue-grey. *Race angolensis* has upperparts greener than nominate, and rather smaller bill and tail; *additus* is like previous, but with shorter wing and longer bill; *rolleti* is smaller than nominate and with brighter yellow upperparts (easily confused in field with *O. monacha* in S Ethiopia); *reichenowi* is smallest, and differs from all others in having yellow areas more golden. VOICE. Song comprises wide vocabulary of liquid whistles, e.g. “ku-weeo”, “tyup, pu-wa-hoo”, “wree-ko-wuju” and “tyip-po-wheeyo”; also duets, first bird giving “pi-weeyo” or “jp-wyew-hoo”, answered by lower (sometimes glottal) “jip-bobblebob-wah” whistles. Alarm call a high, nasal downslurred “wrrreecaa”; utters loud whistling note, which turns into short grating note when alarmed. An excellent mimic, imitating many species, e.g. hawks (Accipitridae) and Olive Woodpecker (*Dendropicus griseocephalus*).

Habitat. Moist mature woodlands and forests, fairly closed-canopy deciduous woodlands in mesic savanna regions, preferably evergreen or only slightly deciduous, and especially well-timbered acacia (*Acacia*) savannas and broadleaf woodlands, e.g. miombo (*Brachystegia*), usually in vicinity of rivers, dams and other surface waters, such as gallery and coastal forests, thick coastal bush; also juniper (*Juniperus*) and thorn-scrub in Ethiopia. Also forest edge, mangroves, exotic plantations (e.g. blue gums, wattles, poplars, pines or eucalypts, even in grassland areas), mature parks, farmyards and gardens. Sea-level to 2300 m.

Food and Feeding. Small fruits and berries, e.g. of aloes (*Aloe*), *Trema*, figs (*Ficus*), loquats (*Eriobotrya japonica*), grapes (*Vitis*), mulberries (*Morus*); also nectar and pollen of aloes and *Erythrina* species, as well as hard, dry seeds. In addition, invertebrates, including grasshoppers and locusts (Orthoptera), beetles (Coleoptera), mantids, dragonflies (Odonata), honeybees (*Apis*), and both hairless and hairy caterpillars. Nestling diet mostly caterpillars of increasing size as young grow, also adult insects and dried calcium-rich millipede (Diplopoda) rings. Forages alone or in pairs, mostly in canopy, but sometimes in small groups in flowering or fruiting trees; regularly (especially immatures) joins mixed-species flocks. Invertebrates mostly gleaned; some, e.g. winged termites (Isoptera), caught by aerial flycatching. Occasionally feeds low in fruiting shrubs or on ground for caterpillars, which are habitually beaten before being swallowed.

Breeding. Breeding in Mar–Jun and Nov in Kenya, Jan–May in Uganda, Sept–Dec in Tanzania, Oct–Nov in DR Congo, Sept–Dec in Angola, Aug–Jan in Zambia, Aug–Mar in Malawi, Apr–May and Sept–Feb in Zimbabwe, Sept–Dec in Botswana and Sept–Oct in Mozambique; in South Africa, Sept–Jan in N & NE and Nov–Jan in Eastern Cape. Possible courtship displays include male standing near female with tail held fanned, wings spread and head held low, while emitting subdued notes, and noisy aerial chases. Nest built mostly or entirely by female, in 3–10 days, while male sings or calls often from nearby; a shallow to deep, open cup-nest woven mostly from old-man’s beard lichen (*Usnea*) where this available, or from grasses, mosses, tendrils and strands of pliable inner bark, lined with fine rootlets, grasses and hair, exterior camouflaged with grasses, lichens, bark, wool, string, cloth and acacia flowerheads, and sometimes bound with small amounts of spider web, external diameter 8–10 cm, height 10 cm, internal diameter 6.5–8.5 cm, depth 3.8–5.5 cm, thickness 6–8 cm; suspended hammock-like in thin, horizontal forked branch, usually in well-foliaged tree canopy at 3–20 m, away from centre of tree. Clutch 1–5 eggs, usually 2–3, pinkish or beige-grey at first, later creamy buff or white with large greyish, purplish-grey, reddish-brown, olive-brown and blackish-brown spots and streaks and some light brown blotches, concentrated at obtuse end and sometimes with grey haloes, dimensions 26.1–32.7 × 16.7–22.3 mm; incubation by female, fed on nest by male, period 14–16 days; chicks brooded mainly or entirely by female, fed by both sexes; nestling period 14–20 days. Average breeding success 1.1 fledglings per nesting attempt in Zimbabwe.

Movements. Resident, with some local movements in response to food availability; perhaps some seasonal movements, as numbers peak during Jul–Sept in E Zambia, Zimbabwe and NE South Africa.

Status and Conservation. Not globally threatened. Fairly common to common in parts of its range of c. 6,000,000 km². Breeding densities vary, generally 0.04–0.22 individuals/ha; exceptional density of 0.9 individuals/ha found in riverine forests in Tsavo East National Park, in Kenya. Occurs in various protected areas, and regarded therefore as not at any immediate risk.

Bibliography. Archer (1992), Ash & Miskell (1998), Barry (1998), Baumann (2001), Brooke (1962, 1965, 1970a, 1986), Clancey (1996), Cyrus & Robson (1980), Dean (2000), Dowsett *et al.* (2008), Dowsett-Lemaire (1989b), Dowsett-Lemaire & Dowsett (2006), Dunning (1993), Ellenberger (1951), Fry *et al.* (2000), Ginn (1989), Ginn *et al.* (1989), Hall & Moreau (1970), Harrison *et al.* (1997), Hockey *et al.* (2005), Howells (1985), Jackson & Selator (1938), Lack (1985), Mackworth-Præd & Grant (1960, 1963, 1973), McCarthy (2006), Neumann (1905), Nikolaus (1987), Nixon (1992), Oatley (1969), Oatley & Skead (1972), Parker (2005), Patten (2002), Priest (1936), Reichenow (1903), Rudnai (1994), Schönwetter & Meise (1983), Short & Horne (2006), Sinclair & Ryan (2003), Skinner (1995), van Someren (1956), Tarboton (2001), Vernon (1973, 1988), Vincent (1936), Zimmerman *et al.* (1996).

25. Black-winged Oriole

Oriolus nigripennis

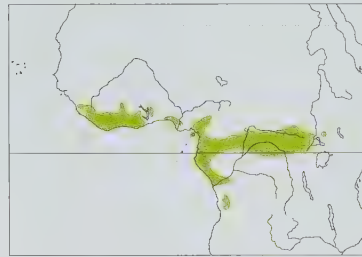
French: Lorient à ailes noires **German:** Schwarzflügelpirol **Spanish:** Oropéndola Alinegra

Taxonomy. *Oriolus nigripennis* J. Verreaux and É. Verreaux, 1855, Gabon River. Belongs to the “African black-headed group”, which also includes *O. chlorocephalus*, *O. crassirostris*, *O. brachyrhynchus*, *O. monacha*, *O. percivali* and *O. larvatus*. Proposed race *leucostictus* (described from Beni, in NE DR Congo) synonymized with nominate. Boundary between the two races uncertain, but probably R Niger, in Nigeria. Species often treated as monotypic. Two subspecies tentatively recognized.

Subspecies and Distribution.

O. n. alleni Amadon, 1953 – Sierra Leone and SE Guinea E to SW Nigeria.
O. n. nigripennis J. Verreaux & É. Verreaux, 1855 – SE Nigeria and S Cameroon E to S Sudan and NW Uganda, S to NW Angola; also Bioko I (Fernando Póo).

Descriptive notes. 19–21 cm; 50–60 g. Nominata race has head to neck and upper breast glossy black, hindneck and upper mantle bright golden-yellow, becoming yellowish olive-green on lower



and throat yellow with blackish streaks, breast dark-streaked olive-green; iris brown, bill brown or pinkish-brown. Race *alleni* is smaller than nominate, with upperparts yellowish-green or olive, not golden-yellow. VOICE. Vocabulary very varied, and similar to that of *O. brachyrhynchus* but higher-pitched, with rapid changes in pitch and intensity, some notes merging into others and leaving fewer gaps. Song phrases often turn into duets, an initial short “teeyup” answered by “co-wah” or a glottal “woo-t’i-wah”; also upslurred “ko-lip” (said to be distinct from calls of *O. brachyrhynchus*) and downslurred “tyi-who”, double “wah-wah” (like distant barking dog), “hoo-whee” or “hoo-weehoo”, often repeated, also “hee-haha”, a measured “ho, hee, her, kohor” and a deeper “hou-you-kyuwor”. Scolding call a nasal “tyipu-wrrraaya” with no change in pitch.

Habitat. Mature secondary forest, forest edge, gallery forest, coffee forest, mangroves, large trees in plantations and clearings; also around villages and in used or recently abandoned native cultivation which is overgrown with bush; found less often in primary forest. Sea-level to 2150 m.

Food and Feeding. Small fruits, e.g. figs (*Ficus*), *Musanga* and *Rauvolfia*; also invertebrates, e.g. beetles (Coleoptera), winged ants (Formicidae), butterflies (Lepidoptera), small orthopterans, but especially caterpillars. Forages alone, in pairs or in groups of up to four individuals; sometimes joins mixed-species flocks. Searches in dense foliage from middle storey up to canopy. Caterpillars gleaned from leaves and branches, sometimes from undersides of leaves during hovering flight.

Breeding. Fledgling in Jan in Guinea, birds with enlarged gonads in Sept in Liberia, and nest-building in Jan and full-grown young in Jun in Ivory Coast; nesting in Feb in Ghana and breeds in Mar–Jun in Nigeria; eggs in Feb and nestlings in Oct in Cameroon; breeding condition in Sept, nest-building in Oct, Dec and Feb, and juveniles in Dec in Gabon; enlarged gonads in Feb in Angola; breeding in Jul–Nov and immature in Dec in DR Congo, and breeding condition in Oct and Jan in S Sudan. Breeding partners chase away conspecifics and other bird species, e.g. *O. brachyrhynchus*. In possible courtship display, singing male adopts posture with tail spread and neck puffed out and held erect. One nest in Gabon was an open cup woven from grasses and fibres, with mosses and *Usnea* lichen worked into the exterior, suspended hammock-like in horizontal fork near end of branch 22 m up in a fig tree. No other information.

Movements. Sedentary.

Status and Conservation. Not globally threatened. Generally common and widespread in range of c. 1,900,000 km². Estimated density 0.04–0.1 individuals/ha at M’Passa, in Gabon. Occurs in various protected areas, e.g. Mont Nimba Strict Nature Reserve, in Ivory Coast, Korup National Park, in Cameroon, Dzanga Reserves, in Central African Republic, Odzala and Nouabalé-Ndoki National Parks, in PR Congo, and others.

Bibliography. Borrow & Demey (2001), Chapin (1954), Dean (2000), Dunning (1993), van den Elzen (1975), Fotso (1996), Fry *et al.* (2000), Greig-Smith (1977), Grimes (1987), Hall & Moreau (1970), Mackworth-Præd & Grant (1960, 1973), McCarthy (2006), Meinertzhagen (1923), Nikolaus (1987), Reichenow (1903), Sinclair & Ryan (2003), White (1962).

26. Black-hooded Oriole

Oriolus xanthornus

French: Lorient à capuchon noir **German:** Schwarzkopfpörl **Spanish:** Oropéndola Encapuchada
Other common names: (Asian/Oriental/Indian) Black-headed Oriole; Ceylon Black-headed Oriole (*ceylonensis*)

Taxonomy. *Coracias Xanthornus* Linnaeus, 1758, “America”; error = “Bengal”, north-east India. A member of the “Asian black-headed group”, which also includes *O. hosii*, *O. cruentus*, *O. trillii* and *O. mellianus*. Nomenclature of races in Indian Subcontinent uncertain because of uncertainty over precise location of type locality. Race *reubenii* formerly referred to by name *andamanensis*, but latter name invalid, as preoccupied; perhaps better merged with *ceylonensis*. Proposed race *thaiacous* (described from Koh-Lak, in SW Thailand) synonymized with nominate. Five subspecies currently recognized.

Subspecies and Distribution.

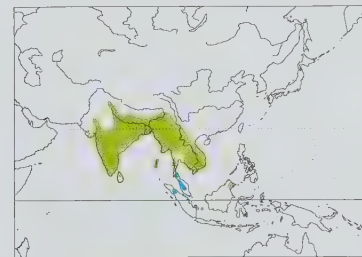
O. x. xanthornus (Linnaeus, 1758) – N India (Himalayan foothills) and S Nepal E to Myanmar and S China (S Yunnan), S to N & S Thailand, N Peninsular Malaysia (Langkawi I only) and Indochina (except N Vietnam).

O. x. maderaspatanus Franklin, 1831 – Ganges plain and peninsular India.

O. x. ceylonensis Bonaparte, 1850 – Sri Lanka.

O. x. reubenii Abdulali, 1977 – Andaman Is.

O. x. tanakae Nagamichi Kuroda, 1925 – NE Borneo (SE Sabah and adjoining Kalimantan) and adjacent islands.



of central tail feathers dark olive-green, throat dusky white with dark streaks. Race *maderaspatanus* is smaller than nominate, yellow on inner secondaries and tertiaries reduced to terminal spots; *ceylonensis* is smallest, and similarly has reduced yellow on inner secondaries and tertiaries; *reubenii*

mantle and back; rump and uppertail-coverts bright olivaceous yellow; flight-feathers black, primaries with narrow whitish edges, secondaries with broad olive-yellow edging, most of upwinging-coverts golden-yellow, primary coverts black; central tail feathers black, remainder with yellow tips increasing in extent towards outer feathers, outermost almost all yellow; side of upper breast and rest of underparts intense bright yellow; iris crimson or dark red; bill red-brown or pinkish-brown; legs grey or bluish-grey. Sexes alike. Immature has head olive-yellow, showing black as adult feathers emerge; upperparts olive-green, chin

and throat yellow with blackish streaks, breast dark-streaked olive-green; iris brown, bill brown or pinkish-brown. Race *alleni* is smaller than nominate, with upperparts yellowish-green or olive, not golden-yellow. VOICE. Vocabulary very varied, and similar to that of *O. brachyrhynchus* but higher-pitched, with rapid changes in pitch and intensity, some notes merging into others and leaving fewer gaps. Song phrases often turn into duets, an initial short “teeyup” answered by “co-wah” or a glottal “woo-t’i-wah”; also upslurred “ko-lip” (said to be distinct from calls of *O. brachyrhynchus*) and downslurred “tyi-who”, double “wah-wah” (like distant barking dog), “hoo-whee” or “hoo-weehoo”, often repeated, also “hee-haha”, a measured “ho, hee, her, kohor” and a deeper “hou-you-kyuwor”. Scolding call a nasal “tyipu-wrrraaya” with no change in pitch.

Habitat. Mature secondary forest, forest edge, gallery forest, coffee forest, mangroves, large trees in plantations and clearings; also around villages and in used or recently abandoned native cultivation which is overgrown with bush; found less often in primary forest. Sea-level to 2150 m.

Food and Feeding. Small fruits, e.g. figs (*Ficus*), *Musanga* and *Rauvolfia*; also invertebrates, e.g. beetles (Coleoptera), winged ants (Formicidae), butterflies (Lepidoptera), small orthopterans, but especially caterpillars. Forages alone, in pairs or in groups of up to four individuals; sometimes joins mixed-species flocks. Searches in dense foliage from middle storey up to canopy. Caterpillars gleaned from leaves and branches, sometimes from undersides of leaves during hovering flight.

Breeding. Fledgling in Jan in Guinea, birds with enlarged gonads in Sept in Liberia, and nest-building in Jan and full-grown young in Jun in Ivory Coast; nesting in Feb in Ghana and breeds in Mar–Jun in Nigeria; eggs in Feb and nestlings in Oct in Cameroon; breeding condition in Sept, nest-building in Oct, Dec and Feb, and juveniles in Dec in Gabon; enlarged gonads in Feb in Angola; breeding in Jul–Nov and immature in Dec in DR Congo, and breeding condition in Oct and Jan in S Sudan. Breeding partners chase away conspecifics and other bird species, e.g. *O. brachyrhynchus*. In possible courtship display, singing male adopts posture with tail spread and neck puffed out and held erect. One nest in Gabon was an open cup woven from grasses and fibres, with mosses and *Usnea* lichen worked into the exterior, suspended hammock-like in horizontal fork near end of branch 22 m up in a fig tree. No other information.

Movements. Sedentary.

Status and Conservation. Not globally threatened. Generally common and widespread in range of c. 1,900,000 km². Estimated density 0.04–0.1 individuals/ha at M’Passa, in Gabon. Occurs in various protected areas, e.g. Mont Nimba Strict Nature Reserve, in Ivory Coast, Korup National Park, in Cameroon, Dzanga Reserves, in Central African Republic, Odzala and Nouabalé-Ndoki National Parks, in PR Congo, and others.

Bibliography. Borrow & Demey (2001), Chapin (1954), Dean (2000), Dunning (1993), van den Elzen (1975), Fotso (1996), Fry *et al.* (2000), Greig-Smith (1977), Grimes (1987), Hall & Moreau (1970), Mackworth-Præd & Grant (1960, 1973), McCarthy (2006), Meinertzhagen (1923), Nikolaus (1987), Reichenow (1903), Sinclair & Ryan (2003), White (1962).

26. Black-hooded Oriole

Oriolus xanthornus

French: Lorient à capuchon noir **German:** Schwarzkopfpörl **Spanish:** Oropéndola Encapuchada
Other common names: (Asian/Oriental/Indian) Black-headed Oriole; Ceylon Black-headed Oriole (*ceylonensis*)

Taxonomy. *Coracias Xanthornus* Linnaeus, 1758, “America”; error = “Bengal”, north-east India. A member of the “Asian black-headed group”, which also includes *O. hosii*, *O. cruentus*, *O. trillii* and *O. mellianus*. Nomenclature of races in Indian Subcontinent uncertain because of uncertainty over precise location of type locality. Race *reubenii* formerly referred to by name *andamanensis*, but latter name invalid, as preoccupied; perhaps better merged with *ceylonensis*. Proposed race *thaiacous* (described from Koh-Lak, in SW Thailand) synonymized with nominate. Five subspecies currently recognized.

Subspecies and Distribution.

O. x. xanthornus (Linnaeus, 1758) – N India (Himalayan foothills) and S Nepal E to Myanmar and S China (S Yunnan), S to N & S Thailand, N Peninsular Malaysia (Langkawi I only) and Indochina (except N Vietnam).

O. x. maderaspatanus Franklin, 1831 – Ganges plain and peninsular India.

O. x. ceylonensis Bonaparte, 1850 – Sri Lanka.

O. x. reubenii Abdulali, 1977 – Andaman Is.

O. x. tanakae Nagamichi Kuroda, 1925 – NE Borneo (SE Sabah and adjoining Kalimantan) and adjacent islands.

Descriptive notes. 23–25 cm; 46–79 g. Male nominate race has head, neck and upper chest glossy black, rest of body and upwinging-coverts bright golden-yellow; rest of wing black, primaries narrowly edged whitish and tipped yellowish, primary coverts, secondaries and tertiaries black with yellow edging; tail feathers have basal half yellow, distal half black with golden-yellow tips, although three outer rectrices sometimes entirely golden-yellow; iris red; bill pink; legs grey. Female is as male, but duller above. Immature is like adult, but forehead with yellowish streaks (sometimes completely yellow), whitish eye-ring, outer half

is small, as previous, but deeper yellow; *tanakae* has four (rather than three) outer tail feathers entirely yellow. **Voice.** Song of liquid fluty whistles, very varied and differing among races, “tu-u-u-liu”, “hu-kwia-lu”, middle syllable stressed, “kwek-hu-kelu”, last syllable stressed and first audible only at close quarters; 4-note “yu-hu-a-yu”, answered by 3-note “tu-hu-ee” or a resonant and penetrating “ti-too”; male may give extended broken song for up to 15 minutes as a syncopated jumble of mellow fluty notes interspersed with harsh nasal phrases. Alarm a hoarse mewling “cheeah” and a harsh nasal “kwaak”.

Habitat. Dry dipterocarp forest and mixed deciduous moist woodlands, open semi-evergreen and evergreen forests, swamp-forest, mangroves, mature second growth, forest edge, scrub, plantations, orchards, mango (*Mangifera*) groves, avenue trees, parks, village groves, gardens, and other cultivated areas. Usually below 1200 m, but sometimes up to 1800 m in India, Sri Lanka, Bhutan and Nepal; to 1000 m in China, Thailand and Borneo.

Food and Feeding. Mainly berries and fruits, especially figs (*Ficus*), notably peepal (*Ficus religiosa*); also some nectar, e.g. of *Salmalia*, *Bombax* and *Erythrina*; also insects, e.g. hemipteran bugs, weevils (*Curculionidae*), ants (*Formicidae*), moths (*Lepidoptera*) and hairy caterpillars, and flying termites (*Isoptera*). Nestlings fed with gnats and other small insects, later with small caterpillars. Forages alone, in pairs or, after breeding season, in small flocks; sometimes joins mixed-species flocks. Feeds generally high in trees; sometimes descends to ground to take insects.

Breeding. Breeding throughout year, with local variations; two or more broods per season. Possible courtship displays include frequent aerial chases. Deep cup-nest built by both sexes, of leaves, grasses, thin strips of bark and other vegetable fibres, lined with very fine twigs or grasses, decorated on outside with lichens, woolly fibres, leaves, bark flakes and the like, internal diameter 7–8 cm, internal depth 5–1 cm, suspended hammock-like in thin, horizontal forked branch at various heights, usually high in outer edge of well-foliaged tree canopy, and often close to nest of Black Drongo (*Dicrurus macrocerus*). Clutch 2–4 eggs, usually 3, white to pinkish-white or creamy with a few pinkish-brown, reddish-brown or purplish-grey spots and streaks, darker and more concentrated at obtuse end and sometimes surrounded by reddish-pink to ink-purple haloes, dimensions 23.5–33.3 × 18–22 mm; both sexes incubate eggs and tend chicks, no information on duration of incubation and nestling periods; after young fledge, family-members stay together for brief period.

Movements. Generally resident, but some local movements reported in India and Nepal, e.g. upward migration in summer. Nominate race apparently only a non-breeding winter visitor Oct–Apr in N Peninsular Malaysia and Sumatra, and one vagrant recorded W Borneo (SW Sarawak).

Status and Conservation. Not globally threatened. Common in parts of its range, which covers c. 1,000,000–10,000,000 km². Occurs in various protected areas through most of range, and considered not at any immediate risk.

Bibliography. Ali & Ripley (1972a), Chen Fuguan *et al.* (1998), Dharmakumarsinhji (1954), Dickinson (2004), Dunning (1993, 2008), Eve & Guigues (1996), Fleming *et al.* (1984), Fletcher & Inglis (1936), Grewal (1993), Grimmett *et al.* (1998), Henry (1998), Hume & Oates (1889), Inskipp & Inskipp (1991), Jeyarajasingam & Pearson (1999), Kazmierczak (2000), King *et al.* (1975), Lekagul & Round (1991), Lowther (1949), MacKinnon & Phillips (1993, 2000), Majumdar (1980), van Marle & Voous (1988), Medway & Wells (1976), Meinertzhagen (1923), Rasmussen & Anderton (2005b), Ripley (1982), Robson (2000b), Schönwetter & Meise (1983), Sheldon *et al.* (2001), Smythies (1986), Smythies & Davison (1999), Stuart Baker (1926), Wells (2007), Whistler & Kinnear (1949).

27. Black Oriole

Oriolus hosii

French: Lorient noir

German: Mohrenpirol

Spanish: Oropéndola Negra

Taxonomy. *Oriolus hosii* Sharpe, 1892, Mount Dulit, Sarawak, Borneo.

Closely related to *O. cruentus*, *O. traillii* and *O. mellianus*; all of these, together with *O. xanthornus*, form the “Asian black-headed group”. Species name sometimes misspelled “*hosei*”. Monotypic.

Distribution. Montane forests of NW Borneo.



Descriptive notes. 21.5 cm. Male is entirely black with slight gloss, except for deep chestnut undertail-coverts; iris dull crimson; bill dull pink; legs grey to greyish-black. Female is like male, except that lower chest and belly are dark slate-grey, rather than black, and contrast (not sharply) with black head, upper breast and upperparts. Immature resembles female. **Voice.** Clear whistles with downward inflection.

Habitat. Montane forest and mossy transitional forest, from 900 m to 2000 m, but especially between 1100 and 1200 m on sandy N side of Dulit range.

Food and Feeding. Fruits, berries, also invertebrates, e.g. termites (*Isoptera*). Quietly forages alone, in pairs or in small groups, in canopy, rarely coming to ground.

Breeding. No information.

Movements. Presumed sedentary.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Bornean Mountains EBA. Confined to small montane range in Sarawak, with records from only six localities. Most montane forests in region remain relatively pristine, but some recent human encroachment into this species' range may have caused some population decline. It should nevertheless be secure in several protected areas, e.g. Gunung Mulu National Park, and several others that have been officially listed.

Bibliography. Anon. (2007g), Butchart & Stattersfield (2004), Collar *et al.* (2001), Hose (1893), MacKinnon & Phillips (1993), Meinertzhagen (1923), Smythies (1960), Smythies & Davison (1999), Stattersfield & Capper (2000), Stattersfield *et al.* (1998).

28. Black-and-crimson Oriole

Oriolus cruentus

French: Lorient ensanglanté

German: Rotbrustpirol

Spanish: Oropéndola Ensangrentada

Other common names: Crimson-breasted Oriole

Taxonomy. *Leptopteryx cruenta* Wagler, 1827, Java.

Closely related to *O. hosii*, *O. traillii* and *O. mellianus*; all, together with *O. xanthornus*, form the “Asian black-headed group”. Four subspecies recognized.

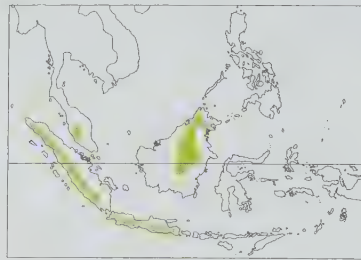
Subspecies and Distribution.

O. c. malayanus Robinson & Kloss, 1923 – Peninsular Malaysia.

O. c. consanguineus (R. G. W. Ramsay, 1881) – mainland Sumatra.

O. c. cruentus (Wagler, 1827) – Java.

O. c. vulneratus Sharpe, 1887 – N & C Borneo.



Descriptive notes. 21–24 cm. Male nominate race has plumage entirely black with bluish gloss, except for dark crimson patch (longer than it is broad) on breast and upper belly; wing dark brown, primary coverts tipped dark crimson (forming small wing patch); iris dark brown; bill light blue-grey with small dark tip; legs grey. Female is as male, but breast patch more orange-red than crimson. Immature is sooty black, with greyish tinge on lower breast and belly; immature male has a few scattered crimson breast feathers. Race *malayanus* is larger than nominate and has much larger square-shaped crimson breast patch extending

full width of breast, primary coverts entirely crimson (larger wing patch), also sexually dichromatic, female black with slight blue gloss above, sooty black-brown and with no trace of red below; *consanguineus* is like a smaller version of previous race, having large square crimson breast patch and almost entirely crimson primary coverts, also sexually dichromatic, female slightly glossy blue-black above and sooty grey with brownish-black mottling below; *vulneratus* is smaller than nominate and male has entirely red primary coverts, larger extent of crimson on breast (but less than in preceding two), sexes very similar but female has less extensive crimson on breast, and primary coverts only tipped and fringed red. **Voice.** A short melodious call and harder “kek kree, kree kek”; also a sharp, harsh, shrill, cat-like descending mew, “keeeuu”, and a rather similar “squee-eh”, repeated after several seconds.

Habitat. Broadleaf evergreen forest, moss forest and forest edge, especially in creeper-covered trees; in Sumatra, in montane primary forest and mature secondary forest and edges, but also in low bushes in moss forest up to mountain summits; in hill and montane forests in Java. At 900–1500 m (once at 600 m) in Peninsular Malaysia, 500–2400 m in Sumatra, 1200–1800 m in Java, and between 600 m and 2300 m in Borneo.

Food and Feeding. Berries and fruits, e.g. of Melastomataceae and figs (*Ficus*), also insects, e.g. beetle larvae (*Coleoptera*), termites (*Isoptera*), both hairy and hairless caterpillars. Even leaf buds, e.g. of rhododendrons (*Rhododendron*), taken. Forages alone or in pairs, rarely in small groups, from understory to canopy; often in vine tangles or low in bushes in moss forests on mountain summits, and sometimes even on ground. Often joins mixed-species flocks, when it flycatches insects in middle storey, canopy and above.

Breeding. Birds in breeding condition in Feb and Jul and evidence of breeding Mar and Jun–Aug in Peninsular Malaysia, nestlings in Jun in Sumatra, and fledglings in Mar in N Borneo (Sabah). Nest a deep cup woven from grasses, bryophytes and small twigs, suspended hammock-like beneath thin, horizontal forked branch high in outer edge of canopy foliage, two nests recorded at 8–10 m. No information on clutch size, eggs white with a few sparse purplish-black spots concentrated on obtuse end, 32.3 × 22.2 mm; one brood apparently of two nestlings, tended by both parents. No further information.

Movements. Presumed sedentary.

Status and Conservation. Not globally threatened. Uncommon to fairly common in parts of its range, estimated to cover c. 1,000,000–10,000,000 km². Occurs in various protected areas, e.g. Fraser's Hill Wildlife Reserve, in Peninsular Malaysia, Kinabalu Park, in Sabah (N Borneo), and several others. Is sometimes sold in cagebird trade.

Bibliography. Davison (1992), Glenister (1985), Jeyarajasingam & Pearson (1999), King *et al.* (1975), MacKinnon (1988), MacKinnon & Phillips (1993), van Marle & Voous (1988), Meinertzhagen (1923), Robson (2000b), Schönwetter & Meise (1983), Sheldon *et al.* (2001), Shepherd *et al.* (2004), Smythies (1960), Smythies & Davison (1999), Strange & Jeyarajasingam (1993), Wells (2007).

29. Maroon Oriole

Oriolus traillii

French: Lorient pourpré

German: Blutpirol

Spanish: Oropéndola Granate

Taxonomy. *Pastor Traillii* Vigors, 1832, no locality = Darjeeling, north India.

Closely related to *O. hosii*, *O. cruentus* and, especially, *O. mellianus*; all, together with *O. xanthornus*, form the “Asian black-headed group”. Four subspecies recognized.

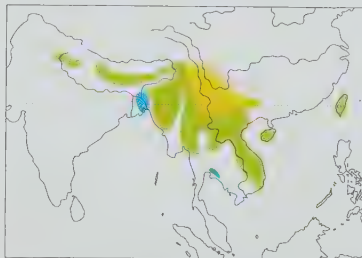
Subspecies and Distribution.

O. t. traillii (Vigors, 1832) – Himalayas, Myanmar, S China (Yunnan E to SE Guizhou and W Guangxi), N Thailand, N Laos and N Vietnam.

O. t. robinsoni Delacour, 1927 – S Laos and S Vietnam.

O. t. nigellicauda (Swinhoe, 1870) – Hainan I.

O. t. ardens (Swinhoe, 1862) – Taiwan.



Descriptive notes. 25.5–28 cm; 67–81 g. Male nominate race has head and neck to upper mantle and upper breast entirely glossy black, rest of body deep metallic maroon; upperwing glossy black, tail pale maroon; iris creamy white; bill pale blue-grey; legs pale blue. Female has head blackish-brown, merging above into dark brown mantle (sometimes with maroon wash), rump maroon-chestnut; wing dark brown with paler edging, central tail feathers maroon-brown, outer rectrices paler brownish-maroon on inner webs; throat, breast and belly whitish with traces of maroon wash, all heavily streaked with blackish, undertail-coverts

maroon; in some birds, chin to upper breast black; bare parts as male. Immature male is similar to female, but head and throat black, back darker than female, and chest to belly streaked maroon and black; iris brown. Male *robinsoni* is smaller and a lighter, more crimson maroon than nominate; *nigellicauda* differs from nominate in being bright crimson with little gloss, rather than metallic glossy maroon; *ardens* is like previous but larger, and with rather stouter bill. **Voice.** Harsh “keeah” or “ko-kay-wa”, usually followed by rich liquid fluty whistles, “pi-io-io”; also a nasal miaowing “nyaoooooow”.

Habitat. Dense moist deciduous, semi-evergreen or evergreen forests and forest edge, e.g. oak (*Quercus*) forests or subtropical pine (*Pinus*) forests; moves into more deciduous forests and adjacent plantations in winter. Up to 4000 m in China, but only to 2500 m in Nepal and Bhutan and 800 m in Thailand; lower in non-breeding season, e.g. 1200–2100 m in winter in Nepal.

Food and Feeding. Nectar, berries, fruits, especially figs (*Ficus*), and invertebrates, e.g. caterpillars. Forages secretively, alone, in pairs or in small flocks, from middle storey up to canopy; sometimes descends to understorey or ground. Often joins mixed-species flocks.

Breeding. Breeds Apr–Jun in India and Mar in Myanmar. Nest, built by both sexes, a deep cup woven from bark and other vegetable fibres, grass stems, tendrils, bamboo sheaths, leaves and green mosses, lined with fine grasses and rootlets, bound with cobwebs, external diameter 12.7 cm, height 7–8.9 cm, internal diameter 8.3–10.1 cm, depth 5.1–6.4 cm, suspended hammock-like from thin, horizontal forked branch usually high in outer edge of well-foliaged tree canopy. Clutch 2–3 eggs, white with creamy or pink tinge, with reddish-brown, dark purplish-brown or blackish spots and streaks concentrated at obtuse end and surrounded by brownish-red haloes, dimensions 26.3–30.7 × 18.1–21.7 mm; both sexes incubate eggs and tend chicks, no information on duration of incubation and nestling periods.

Movements. Some altitudinal movement. In cold weather and during winter, individuals move from summer elevations to lower altitudes (below 1800 m), so that some passage or wintering birds regularly found in lowlands of Bangladesh, N Laos, Tonkin, N Annam or Thailand.

Status and Conservation. Not globally threatened. Fairly common to common in most parts of its range of c. 1,000,000–10,000,000 km². Occurs in various protected areas in breeding range, e.g. Diding Nature Reserve (Guangxi).

Bibliography. Ali & Ripley (1972a), Chen Fuguan *et al.* (1998), Cheng Tsohsin (1987), Dunning (1993), Échécopar & Hile (1983), Eve & Guigüe (1996), Fleming *et al.* (1984), Grimmett *et al.* (1998), Hume & Oates (1889), Inskipp & Inskipp (1991), Inskipp *et al.* (1999), Jerdon (1863), Kazmierczak (2000), Lee Kwok Shing *et al.* (2006), Lekagul & Round (1991), MacKinnon & Philipps (2000), Meinertzhagen (1923), Meyer de Schauensee (1984), Rand & Fleming (1957), Rasmussen & Anderton (2005b), Ripley (1982), Robson (2000b), Round & Nadee (2001), Schönwetter & Meise (1983), Smythies (1986), Stuart Baker (1926), Yan Chongwei & Xu Weishu (1996).

30. Silver Oriole
Oriolus mellianus

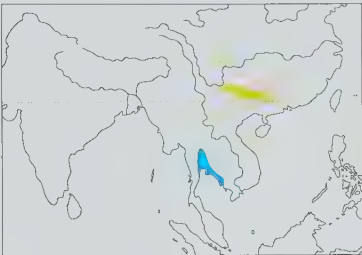
French: Loriot argenté **German:** Seidenpirol **Spanish:** Oropéndola Plateada
Other common names: Stresemann's/Mell's (Maroon) Oriole

Taxonomy. *Oriolus traillii melliianus* Stresemann, 1922, Drachenkopf, Guangdong Province, south-east China.

Closely related to *O. hosii*, *O. cruentus* and, especially, *O. traillii*; all, together with *O. xanthornus*, form the "Asian black-headed group". Monotypic.

Distribution. Breeds in SC China (SC Sichuan, NE Yunnan, Guizhou, N Guangxi, N Guangdong); non-breeding SE Thailand and W Cambodia.

Descriptive notes. 28 cm. Male has head, neck and throat glossy jet-black, rest of body silvery white, with some deep maroon spots (usually hidden), undertail-coverts whitish to pink; wing all black, tail feathers maroon with silvery edging; iris pale yellow; bill bluish-grey; legs pale bluish-grey. Female has head and neck black, contrasting sharply with dark grey mantle with darker streaks, rump slightly browner; wing all dark blackish-brown, tail maroon; chin and throat white with heavy black streaking and spotting, breast white with dark grey streaks, undertail-coverts pink;



Food and Feeding. Diet presumably insects and fruit; seen to take nectar from *Erythrina* tree in non-breeding season (Thailand). Forages alone or in pairs in canopy; sometimes joins mixed-species flocks.

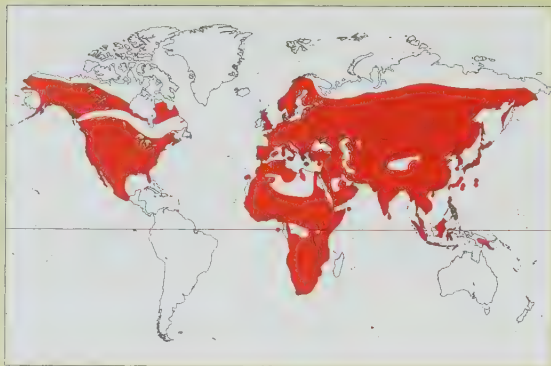
Breeding. Breeds Apr–Aug. Pre-breeding activities, such as dawn song, display, pair-bonding flights and territorial chases, observed from late Apr until early May in Nanling National Nature Reserve (Guangdong), and a female on nest as well as a nest under construction 20 m up in moderately mature *Sorbus folgneri* tree in May. No other information.

Movements. Migratory. Arrives at Chinese breeding sites in Apr and leaves in Oct at latest; arrival at non-breeding sites in Thailand and Cambodia in Oct, departure in Apr.

Status and Conservation. **VULNERABLE.** Restricted-range species: present in Chinese Sub-tropical Forests EBA. Has relatively small breeding range (c. 28,000 km²) and presumably small, declining and fragmenting population of fewer than 10,000 individuals following widespread habitat loss, degradation and fragmentation in both breeding and wintering ranges. Was considered to be fairly to very common in 1930s, but recent extensive habitat loss implies that species has undergone a rapid population decline. Currently known from only 22 breeding localities (15 post-1980) in SC Sichuan, Yunnan, Guizhou, N Guangxi and N Guangdong, in SE China, and from twelve wintering localities (seven post-1980) in Thailand and SW Cambodia. Still locally common in Sichuan, where a flock of 40 individuals recorded in 1988 and estimated density of 1.5 birds/km²; up to nine birds recently recorded at several localities in Guangxi and Guangdong. Main threat is ongoing forest loss, degradation and fragmentation in both breeding and wintering ranges through timber extraction (both legal and illegal), construction of hydro-electric power stations, conversion to agriculture and uncontrolled fires, even in some protected areas. Most of remaining primary forests in S Sichuan are scheduled for logging in the next 20 years, but a recent logging ban in upper Yangtze basin appears to have led to a complete halt to deforestation. The species is legally protected in Thailand. It has been recorded from at least eight protected areas in China, e.g. Nanling National Nature Reserve (Guangdong) and Mao'er Shan Nature Reserve (Guangxi), and six in Thailand, but some protected areas are now completely isolated forest patches and face further degradation through human encroachment coupled with inadequate management.

Bibliography. Anon. (2007g), Buchart & Stattersfield (2004), Chen Fuguan *et al.* (1998), Collar, Andreev *et al.* (2001), Collar, Crosby & Stattersfield (1994), Crosby (1991), Dickinson (2004), Eve & Guigüe (1996), Kilburn (2004), King *et al.* (1975), Lee Kwok Shing *et al.* (2006), Lekagul & Round (1991), MacKinnon & Philipps (2000), Meyer de Schauensee (1984), Pilgrim & Pierce (2006), Riley (1938), Stattersfield & Capper (2000), Stattersfield *et al.* (1998), Stresemann (1931b).

Class AVES
Order PASSERIFORMES
Suborder OSCINES
Family LANIIDAE (SHRIKES)



- Small to rather large, slender-bodied, short-necked passerines with rounded wings, longish tail, bill with tomial tooth, prominent rectal bristles; plumage generally sombre.
- 14–50 cm.



- North America, Europe, Asia and Africa.
- Grassland, open country, bushy areas, fallow fields, one species in forest.
- 3 genera, 31 species, 99 taxa.
- 1 species threatened; none extinct since 1600.

Systematics

The family Laniidae is a comparatively small group of ten-primaried passerines. It is widespread in Africa, Asia, Europe and North America, but absent from South America and Australia, as well as from Antarctica.

The origins of the shrikes are subject to debate. It has been suggested that during the Miocene, about 24 million years ago, the continent that is now Africa had a relict Eurasian avifauna and that shrikes were part of the radiation. An African origin has been proposed on the basis of plumage characteristics, and is supported by the hypothesis that Palearctic migration had its origins in Africa. Recent evidence, however, indicates that the shrikes may have originated in the Australasian region during the Tertiary period. The earliest shrike-like fossil, *Lanius miocaenus*, is from the Lower Miocene of Europe. The first attempts at a logical classification of birds, carried out by F. Willughby, by C. Linnaeus, and by J. Latham in the seventeenth and eighteenth centuries, included reasonably good descriptions of the European laniids.

A similarity of sperm shape to that of the corvids provides an important clue to the ancestry of the shrikes. This is further substantiated by the results of genetic and behavioural studies, which support the idea of a common corvid ancestor.

Some classifications have included the bush-shrikes (Malaconotidae) or the helmet-shrikes (Prionopidae), or both, as subfamilies within the Laniidae, the “true” shrikes then being treated as the third subfamily of the latter. Although such treatment has found favour with a number of recent taxonomists, both the bush-shrikes and the helmet-shrikes exhibit significant differences from laniids in morphology and behaviour, and it seems better to treat these three groups as representing three distinct families.

Apart from the 27 shrike species in the genus *Lanius*, the family as presently constituted contains the very long-tailed Yellow-billed Shrike (*Corvinella corvina*) and Magpie Shrike (*Corvinella melanoleuca*), both of which look different and have in the past caused taxonomic confusion. On the basis of their cranial morphology and jaw and hind-limb anatomy, and on the results of DNA–DNA hybridization studies, they are close to both the *Lanius* shrikes and the white-crowned shrikes of the genus *Eurocephalus*. They differ, however, in the fact that they produce vocal duets, as well as in several aspects of behaviour, including co-operative breeding and gregariousness, with groups of a dozen individuals occurring; moreover, they do not impale prey in the

manner of *Lanius* shrikes. Likewise, the two African white-crowned species, the Southern White-crowned Shrike (*Eurocephalus anguitimens*) and the Northern White-crowned Shrike (*Eurocephalus ruppelli*), are distinctive. They were once combined as one species, but all recent authorities now agree that they represent two separate species on the grounds primarily of plumage differences between them, coupled with their discrete distributional ranges. It has been suggested that they form a superspecies. According to research based on DNA–DNA hybridization, the *Eurocephalus* shrikes are close to the shrikes of the genus *Lanius*. Of all genera currently considered to comprise the family Laniidae, *Eurocephalus* is the least “shrike-like”. Its anatomical and behavioural characteristics suggest that its two members are the most primitive of the shrikes.

Although recent authors place *Eurocephalus* in the family Laniidae, others have pointed out that these two white-crowned shrikes build neat, compact, well-camouflaged nests like those of the prionopid helmet-shrikes, and unlike the nests of *Lanius* shrikes in Africa. In addition, and again in contrast to *Lanius*, they have scutellation extending down the sides of the tarsus, as well as the front of it. They are generally sedentary, occurring primarily in pairs or in small family groups, instead of in flocks. Like *Lanius* shrikes, they capture their prey mainly from the ground.

True shrikes are well represented in sub-Saharan Africa. The genus *Corvinella* is confined to that region, but the most widespread sub-Saharan species is the Common Fiscal (*Lanius collaris*), which, with seven subspecies, can be seen almost everywhere in suitable habitats in the region. The rarest species is the rather similar Newton's Fiscal (*Lanius newtoni*), restricted to the island of São Tomé, in the Gulf of Guinea. Two *Lanius* species breed both in North Africa and in Eurasia, namely the Southern Grey Shrike (*Lanius meridionalis*) and the Woodchat Shrike (*Lanius senator*), and the latter also migrates from Eurasia to Africa, as do populations of four other *Lanius* species. Other shrikes of this genus are common in Asia, and the subspecies *stresemanni* of the Long-tailed Shrike (*Lanius schach*) breeds in New Guinea. Only two species have reached North America. The Holarctic Great Grey Shrike (*Lanius excubitor*) has some breeding populations beyond the Arctic Circle and breeds in Alaska and northern Canada, as well as in northern, middle and south-east Europe and north, central and east Asia, and the very similar Loggerhead Shrike (*Lanius ludovicianus*) is found only in North America and Mexico.

The uniformity of the *Lanius* species has led to much debate and little consensus over their relationships within the genus. An example of such confusion is that of the “brown” shrikes, which have at different times been lumped into a single species or split into at least three separate species, the Brown Shrike (*Lanius cristatus*), the Red-backed Shrike (*Lanius collurio*) and the Isabelline Shrike (*Lanius isabellinus*). To confuse matters further, hybridization between these species is recorded in a number of zones where their distributions overlap, and this continues to contribute to the problems of defining species limits. Initial taxonomic classification was based exclusively on the analysis of plumage characteristics, but subsequent attempts relied more on behavioural characters and, sometimes, on systems of communication.

These three largely allopatric Eurasian shrikes form a super-species of undoubtedly related taxa. They also share a long common “capricious” taxonomic history, as K. H. Voous put it in 1979, when speaking of the Isabelline Shrike. The complicated taxonomy of this group is demonstrated by the fact that various authorities have treated these taxa as representing one, two, three and even four different species. Several points arise. First, the Brown Shrike is phenotypically well distinguished from the Red-backed Shrike and appears to be a valid species; the breeding ranges of the two overlap in a wide area, and these shrikes may occur in the same habitats and sometimes in neighbouring territories, but only two hybrid specimens are known. A long zone of sympatry exists also between the Brown and Isabelline Shrikes, but the two species generally prefer different types of habitat; only one possible hybrid has been described. Second, the Red-backed and Isabelline Shrikes can be regarded as distinct biological species, although this is a more controversial situation, as the degree of reproductive isolation between these two is still relatively low; mixed pairs and hybrids occur regularly in the small zones of range overlap. Third, the recent suggestion that the western subspecies *phoenicuroides* and the nominate race of the Isabelline Shrike should be treated as constituting a separate species, the so-called “Turkestan Shrike”, merits serious consideration. The conclusions reached by Russian ornithologists are based on vast field experience, and cover morphological considerations, as well as observations concerning behaviour and voice. The current thinking, based on various forms of evidence, is that, within this superspecies, the Red-backed and Isabelline

Shrikes are more closely related to each other, while the Brown Shrike is a slightly more distant relative. Their systematic status is further complicated by the fact that all three are polytypic, the Red-backed Shrike with three subspecies and the Brown and Isabelline Shrikes each with four.

A good example of this confusion is provided by the taxonomy of the Isabelline Shrike. Although in the past frequently lumped with the Brown and the Red-backed, in recent times the Isabelline has normally been treated as a separate species, two of its subspecies breeding in Central Asia and migrating south-west to non-breeding quarters in Arabia and north-east Africa, and the other two breeding in north China and being shorter-distance migrants, wintering in Pakistan and north-west India, west to Iran and Iraq. Now, the type specimen of the species was collected on the non-breeding grounds in western Arabia, and described in 1833, but in 2000 D. J. Pearson suggested that the nomenclature of the species might have become transposed. Subsequent examination of the type specimen at the Berlin Museum has confirmed that the plumage of this bird was actually that of the form hitherto known as “*speculigerus*”, freshly moulted and like those individuals of the species that overwinter in the Nile Valley of Sudan. Consequently, following the Principle of Priority in zoological nomenclature, the taxon previously known as *L. isabellinus speculigerus* must now be treated as the nominate form, *L. isabellinus isabellinus*, while the form previously treated as the nominate takes the next oldest available name, *arenarius*; the name *speculigerus* becomes merely a synonym of *isabellinus*. The nominate race of the Isabelline Shrike is rather warm-toned both above and below, adults having a complete mask and blackish wings. The subspecies *phoenicuroides*, breeding from southern Kazakhstan south to Iran and Afghanistan, is darker above, with a rufous crown, and whiter below, and usually has a bolder white supercilium and white at the base of the primaries; the adult male has a complete black mask, and the adult female has paler lores and, below, strong dark brown chevrons on a whitish background. Males in south Kazakhstan lack rufous on the crown, and this population has been described as *karelini*, but these individuals are otherwise no different from others of the subspecies *phoenicuroides* and do not warrant recognition as a separate race. Compared with first-winter individuals of the nominate race, those of *phoenicuroides* tend to be darker above

Shrikes are compact, well proportioned birds with elongated tails and sturdy legs. One of their signature traits is a robust, hook-tipped bill, an adaptation to a predatory lifestyle. This feature, in combination with a patient demeanour and an upright stance, often gives them the air of miniature raptors. The largest genus in the family is *Lanius*, which contains 27 species in the current taxonomic treatment. Some of these are rather uniform brown or fawn coloured, including the male **Isabelline Shrike**.

This is one of several shrikes for which species limits are disputed, and which may be split in future into two or more species.

[*Lanius isabellinus*,
Oman.

Photo: Markus Varesvuo]



and whiter with stronger and darker chevrons below, and are closer in appearance to juvenile Red-backed Shrikes than are young of the nominate race. The form which breeds in the Tarim Basin of north-west China, previously known as *L. i. isabellinus* but now renamed *L. i. arenarius*, is pale and "washed out", having pale lores and a pale rufous tail not darkening at the tip, the white primary patch tiny or lacking altogether, and a short primary projection with often five tips visible beyond the tertials; the adult male has mid-brown wings paler than those of the two aforementioned subspecies, a pale orangey tail, and pale buff underparts very faintly barred. First-winter *arenarius* is even paler than the adult, pale buffy brown above and washed buff below, with a pale rufous tail not darker towards the tip; it probably never has white at the base of the primaries. The fourth subspecies, *tsaidamensis*, breeds in the Qaidam Depression, in north-central China; it is very similar to the nominate race and may be better merged with it.

Another group of apparently closely related species contains the Long-tailed, the Grey-backed (*Lanius tephronotus*) and the Mountain Shrikes (*Lanius validirostris*), although the taxonomy of these is still not clear. Early researchers recognized just two species, the Long-tailed Shrike, with twelve subspecies, and the Mountain Shrike, confined to the Philippines, with four. Only later was the validity of a third species recognized. Recent observations confirm that the Grey-backed Shrike, a high-elevation form sometimes known as the "Tibetan Shrike", overlaps widely in range with the Long-tailed Shrike without interbreeding with it. Its subspecies *lahulensis*, confined to northern India, is, however, a puzzling bird, appearing morphologically intermediate between the nominate race of the Grey-backed Shrike and the subspecies *erythronotus* of the Long-tailed Shrike. It may represent a stabilized hybrid population. The Mountain Shrike is phenotypically close to the Grey-backed Shrike but smaller, and with a thicker bill. As its English name suggests, it, too, is a mountain species. These last two shrikes, because of their similarities, are sometimes treated as a single species, and their relationship merits further consideration.

In the Afrotropics, the Common Fiscal is widespread in suitable habitats, whereas the Uhehe Fiscal (*Lanius marwiti*) is confined to highlands from north-east to south-central Tanzania, and the very rare Newton's Fiscal occurs only on São Tomé, in the Gulf of Guinea. The taxonomic status of the latter two is controversial. Both have sometimes been regarded as races of the Common Fiscal, as they were, for instance, by C. M. N. White in 1962. A. L. Rand, in 1960, gave species status only to *newtoni*, and this view is reinforced by recent observations, which confirm the existence of rather marked plumage differences, as well as ecological differences, between the Common Fiscal and Newton's Fiscal. The form *marwiti*, elevated to species level by such authorities as B. P. Hall and R. E. Moreau, shows less obvious differences from the Common Fiscal. Indeed, R. J. Dowsett and F. Dowsett-Lemaire had no doubt that it was just a race of the latter, and pointed out that the white eyebrow, so striking a feature of *marwiti*, occasionally appears also in the Common Fiscal population living on the Nyika Plateau, in Malawi. Nevertheless, the Uhehe Fiscal is commonly treated as a full species, distinct from the Common Fiscal, mainly on ecological grounds. Further proposals concerning the already complicated taxonomy of the Common Fiscal include the suggestion that the northern populations, those north of approximately 5° S, may represent a different species from those south of this latitude; this hypothesis, still to be firmly tested, is based on differences in the degree of sexual plumage dimorphism and, above all, on differences in visual and vocal displays.

The most recent taxonomic split within the Laniidae involved the Great Grey Shrike. French researchers presented compelling evidence that the Mediterranean parapatric population did not associate with the "northern" Great Grey Shrike. Their data illustrated that southern populations, given the name of Southern Grey Shrike, differ morphologically and in habitat preferences, and no hybridization between the two forms is known.

The Great Grey Shrike, the Southern Grey Shrike and the exclusively North American Loggerhead Shrike are undoubtedly closely related species. The little-studied Chinese Grey Shrike

(*Lanius sphenocercus*), although more distantly related, could also be attached to this group, the members of which form a superspecies. The first two of these species have frequently been treated as conspecific, but they exhibit a number of features which differentiate them. The Great Grey Shrike tends to be slightly the larger of the two, and has more rounded wings, a less graduated tail with broader rectrices, and slightly shorter legs, and the nominate race, at least, exhibits, comparatively more distinct sexual dimorphism, males having more white in the plumage. Some races, particularly the nominate and, even more so, *homeyeri*, often possess an extended wingbar, whereby the white at the base of the primaries continues onto both webs of the secondaries. Juveniles have barred underparts, and barring can still be present on adults of some subspecies, including the nominate; indeed, it is quite regular on adults of the dark races *funereus* and *mollis*. The Great Grey Shrike is predominantly a taiga species, but one which has adapted also to semi-open grassy agricultural land dotted with copses and hedges; it lives in rather large territories covering 30–100 ha or more, feeds mainly on insects and small vertebrates, particularly voles (Microtinae), and in central Europe nests at an average height of about 8 m. The Southern Grey Shrike has the white wing patch generally confined to the base of the primaries; although some subspecies, *elegans* and *lahtora* for instance, have some white on the secondaries, this is only on the inner webs. Adults of this species never have barred underparts, but faint vermiculations may sometimes be present on juveniles of the nominate race and of *koenigi*. The Southern Grey Shrike is mainly an Afro-Asian species living in warm areas such as scrubland, steppes and deserts; its territory size is generally small, 5–15 ha, and the diet consists primarily of insects but with some small vertebrates, above all lizards. The nest-site may reflect an ecological difference from the Great Grey Shrike, as the nest is generally placed at a height of only 1–2 m in a bush or small tree. The breeding ranges of these two species almost come into contact in southern France; they may even have overlapped at some time in the Aquitaine region, but the data are thus far inconclusive. More interestingly, a proven zone of sympatry exists near the eastern end of the respective breeding ranges, in Mongolia. There, the subspecies *mollis* of the Great Grey Shrike occupies open mountain forest from the base of the slopes to the alpine zone, whereas the subspecies *pallidirostris* of the South-



Like several congeners, the **Long-tailed Fiscal** is essentially piebald, with a dark upperside and bare parts, and a gleaming white underside. In addition to the obviously raptorial bill and feet, all shrikes have several more inconspicuous traits that equip them for hunting. Their eyes protrude slightly and are angled forwards, a little more like a hawk than a typical passerine. This facilitates binocular vision and is presumably an adaptation for hunting. Likewise, they share with birds of prey a large distal digital pad on the toes, and the trick of incapacitating vertebrate prey by dislocating the caudal vertebrae.

[*Lanius cabanisi*,
Amboseli, Kenya.
Photo: Günter Ziesler]

Most shrikes lack bright colours, but they remain attractive because their plumage is crisply patterned, often with bold blocks of white, grey and black. These simple shades typify a clade of larger species centred on the **Great Grey Shrike**.

White flashes on wings and tail come as standard. They are usually formed by white patches on the bases of primaries and the fringes or tips of the outer rectrices, and they are particularly conspicuous in flight, as shown here. It is possible that they function as visual signals for communicating identity or individual quality to conspecifics, but this remains to be confirmed.

[*Lanius excubitor excubitor*,
Liminka, Finland.

Photo: Markus Varesvuo]



ern Grey Shrike, often known as the “Steppe Grey Shrike”, is confined to the caragana steppe. This spatial and ecological segregation is not, however, very strict, and pairs of *mollis* can sometimes be found in typical *pallidirostris* habitat, although no mixed pairs have so far been found. As with the nominate races of the two species in south-west France, *mollis* and *pallidirostris* exhibit sharp differences in their general appearance.

Recent molecular-genetic studies involving base sequencing of the cytochrome *b* gene indicate that the Great Grey Shrike and the Southern Grey Shrike are, indeed, separate species. The divergence between them is almost as great as that between the Great Grey Shrike and the Loggerhead Shrike. Interestingly, the Southern Grey Shrike seems to be closer to the latter species than it is to the Great Grey Shrike, although this possibility requires further research. Perhaps surprisingly, biometric differences between the Great Grey and Southern Grey Shrikes are poorly described. Spanish researchers have attempted to ascertain sex and age-related variations in external measurements for the nominate race of the Southern Grey Shrike in northern Spain, where they ringed and measured a total of 174 Southern Grey Shrikes and used molecular techniques to determine the sex of each one. They found significant differences in size between the sexes and also between age-classes; adult males were the largest and yearling females the smallest. In terms of biometry, at least, the Southern Grey Shrike is more similar to the Loggerhead Shrike than it is to the Great Grey Shrike. An attempt was made to differentiate Spanish Southern Grey Shrike populations by using tandem repeats in mitochondrial DNA (mtDNA). Four populations, three from the Navarra region, in north Spain, and one from Cáceres, farther south, were sampled and an analysis carried out, the results of which suggested the existence of a genetic flow between populations.

One of the most studied laniid species in recent genetic investigations is the Loggerhead Shrike. There is a mass of literature on the delimitations of the different subspecies, the geographical breeding boundaries and the wintering grounds. To date, however, most of the subspecies described, and their distributions, remain vague, the taxa being hard to identify in the field. In a molecular-genetic study of Loggerhead Shrikes in central and eastern North America, M. Vallianatos and colleagues used a total of 206 samples from 27 populations covering the ranges of three recognized subspecies, namely the nominate race, *migrans* and *excubitorides*, and included sites within a putative zone of intergradation between two subspecies; *migrans* samples were derived both from extant populations and from museum specimens spanning approximately 130 years. For all samples com-

bined, 267 base pairs of mitochondrial control-region sequence were obtained and a total of 23 distinct haplotypes (sets of polymorphic alleles on the same chromosome) identified. The results of analyses suggested that statistically significant differences existed between eastern and western populations of *migrans*, and that there was a higher genetic diversity in the intergrade zone. The authors, whose research was prompted by conservation considerations, identified four “management units” for these eastern and central populations of Loggerhead Shrikes. In a continuation of this study, the researchers used data on mitochondrial DNA sequences in order to explore historical, ecological and geographical factors that might have played a role in the genetic differentiation of these four units, and examined the evidence for intergradation between the subspecies *migrans* and *excubitorides*. No geographically discrete, monophyletic clades were evident, but the distribution of haplotypes indicated some phylogeographical structure that might perhaps reflect an intermediate stage of differentiation between parapatry and reciprocal monophyly. The *migrans*-*excubitorides* contact zone is supported by the mixing of haplotypes unique to each of the hybridizing populations and intermediate frequencies of common haplotypes. The researchers considered that these patterns were a result of the impact of both glacial refugial dynamics and anthropogenic habitat changes in eastern North America.

Scientists who studied the Loggerhead Shrike’s endangered subspecies *mearnsi*, which is confined to the island of San Clemente, in the Channel Islands, off southern California, found that this taxon probably has a small effective population size and that there is insignificant gene flow from the adjacent mainland. The team further used polymorphic nuclear microsatellite loci to characterize genetic variation in contemporary and historic populations of the San Clemente Loggerhead Shrike, and also compared the population with two contemporary populations of the still abundant subspecies *gambeli* living 120 km away on the adjacent mainland. The current population of *mearnsi* has 60% of the genetic variation of the mainland shrike populations and is strongly differentiated from them. Comparison of live individuals with 19 specimens collected in 1915 reveals that most of the variation within the island population was lost before the recent 90% decline in its numbers, and the 20% decrease in variation during the twentieth century is probably attributable to genetic drift. Additional analyses, involving mitochondrial DNA control-region sequences from 80-year-old specimens, show that *mearnsi* may have recently experienced limited introgression from another island subspecies, *anthonyi*, found in the northern Channel Islands of California. Today, gene flow between *mearnsi* and



The **Common Fiscal** is one of several polytypic shrikes with distinctive races. In South Africa, for example, much of the country is occupied by the nominate race with a largely black head, while arid portions of the north and west are occupied by the race *subcoronatus*, which is distinguished by a conspicuous white supercilium. Despite this obvious visual difference, these forms are otherwise very similar and hybridize regularly where they come into contact.

[Left: *Lanius collaris collaris*, Midmar Nature Reserve, KwaZulu-Natal, South Africa. Photo: HPH Photography/Photo Access]

Right: *Lanius collaris subcoronatus*, Kruger National Park, South Africa. Photo: Terry Carew/Photo Access]

mainland *gambeli* is very low, even though a few individuals of the latter visit the island annually. The researchers concluded that the island subspecies population has evolved sufficient genetic independence to justify ongoing conservation efforts designed to counter demographic collapse and genetic erosion; the study, based on DNA amplified from feathers, also demonstrated that it is now possible to monitor the progress of genetic erosion non-invasively. Another study, however, came to a different conclusion. Nine morphological characters of 167 post-juvenile museum specimens were examined in order to ascertain whether Loggerhead Shrikes on San Clemente are diagnosable as *mearnsi*. Four recent specimens from the island were compared with historical specimens, for which exercise a bivariate scatter plot and a discriminant function were used. The few recent specimens were not diagnosable as *mearnsi*, but appeared, instead, to be intergrades between that race and the northern Channel Island subspecies *anthonyi*, being perhaps closer to pure *anthonyi*. The evidence suggests that the shrikes currently on San Clemente are the product of the genetic "swamping" of *mearnsi* by *anthonyi* and that the former is probably no longer a diagnosable taxon. The researchers concluded, however, that the entire Channel Islands population of the Loggerhead Shrike should be protected, as the species has declined drastically throughout the islands.

The San Clemente Loggerhead Shrike Rescue Team also investigated mtDNA sequence variation in five populations, representing four subspecies, including *mearnsi*. Variability was extremely low, and defined four haplotypes. Strong structure was apparent among all three southern Californian subspecies, one haplotype predominating in each respective subspecies. Although potential levels of gene flow between *mearnsi* and neighbouring populations would seem to be low, mtDNA data support field observations that some shrikes visit the island during the winter but do not stay to breed, suggesting that these birds come from the mainland. The similarity in haplotypes between populations from Saskatchewan, in Canada, and those in southern California suggests that a postglacial northward range expansion of the species took place. The results indicated the evolutionary distinctiveness of *mearnsi* and, in contrast to the aforementioned study, justify the continuing efforts for its conservation. This was further substantiated when the team studied the Loggerhead Shrike breeding populations on seven of the eight Californian Channel

Islands. One of the two subspecies, *anthonyi*, is considered to breed on six of the islands, while *mearnsi* is endemic on San Clemente Island. Previous studies had indicated that the San Clemente Loggerhead Shrike is well differentiated genetically from both *anthonyi* and mainland populations, despite the fact that individuals from outside the population are regular visitors to the island. Those studies, however, did not include a comparison between San Clemente shrikes and the breeding population on Santa Catalina, the island closest to San Clemente. The team used mitochondrial control-region sequences and nuclear microsatellites to investigate the population structure of Loggerhead Shrikes in the Channel Islands. They further confirmed the genetic distinctiveness of the San Clemente Loggerhead Shrike, and identified the presence and inferred the source of the non-breeding visitors. The results indicated that Loggerhead Shrikes in the Channel Islands area of south California comprise three distinct genetic clusters, one inhabiting San Clemente Island, another on Santa Catalina Island, and the third breeding in the northern Channel Islands and on the nearby mainland. These findings do not support the suggestion that, for conservation purposes, all Channel Island Loggerhead Shrikes should be managed as a single entity.

Finally, it has been suggested that the most plausible indication of a double invasion of the New World by a Palearctic avian stock is provided by the shrikes. The two North American laniid species are almost certainly derived from two incursions of the same stock, the details of which are believed to have been as follows. An initial immigration took place prior to the Pleistocene glaciations by birds belonging to the widespread Old World species now referred to as the Great Grey Shrike. With the advent of glaciations, this species moved south. As indicated by the extensive Old World range of the Great Grey Shrike, this is a highly adaptable bird, and therefore, with the retreat of the ice, populations in America were able to remain as far south as southern Mexico, while northern populations reoccupied an area extending to central Canada. At some later time, the Great Grey Shrike again crossed the Bering Strait and quickly spread through the boreal region of North America. This second wave of immigrants is currently regarded as having evolved into two subspecies of the Great Grey Shrike, closely related to the Old World races through the Siberian population. The descendants of the

first invasion, however, exhibit certain well-marked differences from the ancestor, differences which have evolved in geographical isolation in these earlier and more southerly populations, and are now regarded as a separate species, the Loggerhead Shrike. Members of the latter species resemble some of the ecologically parallel populations of the Old World species, and during the breeding season in North America they do not overlap in range with the Great Grey Shrike, which is generally known on that continent as the "Northern Shrike".

Morphological Aspects

Probably the best-known characteristic of the laniids, the one most closely associated with this family, is the bill. This is short, strong and sharp, and hooked at the tip, and has a tomial "tooth" in the upper mandible and a corresponding notch in the lower mandible. This tomial tooth is very similar to that possessed by the falcons (Falconidae) and was one of the reasons why shrikes were associated taxonomically with raptors in early classifications. They are similar to raptors also in many other morphological and behavioural aspects. Examples are the slightly protruding position of the eyes, which facilitates binocular vision, the large distal digital pads on the toes, and the technique of killing vertebrate prey by dislocating the caudal vertebrae; further similarities include their hunting methods, which include perching, hovering and flushing, the mantling of captured prey, the repeated use of favourite perching sites, and the regurgitation of pellets. Shrikes differ from raptors in that they capture and kill their prey with the beak, rather than with the feet, and they store food items in a cache, and not in the crop. In addition, they impale each prey item or secure it in a suitable crack or crevice before dismembering it, whereas falcons use the feet in order to hold down the food and then tear it apart.

The Laniidae range in size from 14 cm to 50 cm and weigh from 14.5 g to 100 g on the breeding grounds. Besides the distinctive bill, described above, they have a stout tarsus which is regularly scutellated on the outer posterior surface. The basal joints of the middle and outer toes are united, and the claws are strongly curved and rather sharp. Typically, the plumage combines white, grey, black, and brown or reddish-brown. One of the most brightly coloured *Lanius* shrikes is the east Himalayan subspecies *tricolor* of the Long-tailed Shrike, which sports a black cap and mainly deep rufous upperparts. With one exception, all members of the family have a dark mask that stretches from the

bill and forehead, across the eye, and backwards to the cheek or nape region. The exception is the Magpie Shrike, which is almost wholly black.

Shrikes of the genus *Lanius* are small to relatively large birds. The smallest is the Central African Emin's Shrike (*Lanius gubernator*), and the largest and heaviest is the high-elevation race *giganteus* of the Chinese Grey Shrike. Males and females are often quite similar, sexual dimorphism being very obvious in only a few species and particularly in the Red-backed Shrike. All juveniles are typically brown or brownish-grey and heavily vermiculated.

Loggerhead Shrikes exhibit little sexual dimorphism, although females may be slightly smaller than males and have browner primaries than the latter. It has been suggested that females also have a significantly higher ratio of wing chord to tail length, and that this could be used as part of an equation to differentiate the sexes with 77.4% accuracy. A Canadian study of intraspecific variation and sexual dimorphism among Loggerhead Shrikes, however, concluded that significant variation in this ratio within populations makes its employment in correctly identifying subspecies of Loggerhead Shrike untenable.

The two *Corvinella* species are large and noticeably long-tailed. The Yellow-billed Shrike has a length of 30–32 cm, of which 16–18.5 cm is accounted for by the tail; with its brown, vermiculated plumage, it resembles a giant juvenile *Lanius* shrike. The Magpie Shrike measures 34.5–50 cm, 22.5–35 cm of which is the tail, and is almost completely black, with white scapulars and wing patches.

The two white-crowned shrikes in the genus *Eurocephalus* are large, stocky laniids with a proportionately shorter tail than that of other members of the family. They have a length of 19–24 cm and a weight in the range 42–70 g, the Southern White-crowned Shrike being slightly the larger of the two. Adults of both are distinguished by the white crown and nape, contrasting with the black facial mask. They have brownish upperparts and a pale throat and underparts, the Northern White-crowned being further distinguished by its white rump, which is striking in flight.

The black mask possessed by shrikes is thought to have a function of absorbing light in the head region, especially around the eye, thus preventing its reflection into the eyes, which, if it occurred, could reduce the sharpness of the image. Shrikes often face into the sun when foraging. It has been suggested that this confers the advantage that the prey is more noticeable because its shadow is cast towards the perched shrike, providing a larger

Another group of species in the genus *Lanius* is characterized by patches of rich rufous colour, as found in the **Tiger Shrike**.

Sexual dichromatism in this group is quite dramatic, with the male being sharply patterned and richly coloured, while the female is a relatively muted, barred version of the male. The black mask is striking in the male, set against a pearly white throat and a dove-grey crown and nape. In the female, however, the same head pattern is smudged and ill defined.

[*Lanius tigrinus*.]

Left: Dongzai Xinyang,
Henan, China.
Photo: Xue Juzheng.

Right: Chengdu Botanical
Garden, Sichuan, China.
Photo: Dong Lei]





In many shrike species, for example the **Grey-backed Shrike**, adults of both sexes are very similar but juvenile plumage is usually distinctive. In this case, both adults have the classic black mask, wings and tail, along with grey upperparts, whitish underparts, and a delicate peach wash on the flanks. The juvenile (right) is much duller and browner, with an indistinct head pattern, faint barring on the underside and a horn-coloured lower mandible, all features that are typical of juvenile shrikes.

[*Lanius tephronotus tephronotus*.]

Left: Khao Yai National Park, Thailand. Photo: Kanit Khanikul.

Right: Tiebu Nature Reserve, Sichuan, China. Photo: Dong Lei]

image for detection; it is advantageous also because the attacking shrike approaches with the sun in front of it, so that its shadow does not give away its approach and prompt the prey to escape. It has been suggested further that the pale belly of the shrike makes it less visible against the background of the sky.

Aberrantly pale, leucistic, shrikes, as well as dark, melanistic, individuals, are occasionally reported. Such cases have been documented for the Common Fiscal, the Red-backed, Brown, Woodchat, Great Grey, Long-tailed and Loggerhead Shrikes, and the Yellow-billed and Magpie Shrikes. Plumage coloration appears to be influenced by humidity. This was described for Loggerhead Shrikes in North America and for Southern Grey Shrikes in north Africa; from pale coloration in the deserts, the plumage becomes increasingly darker with increasing humidity, the darkest subspecies inhabiting rainy regions or areas of greater cloudiness.

Males of many bird species display colourful plumage, but there are just as many species, and entire avian genera, that are achromatic, meaning that they have predominantly white, grey and black plumage. Achromatic plumage is a typical feature of many shrikes. In a recent study, scientists examined the black tail spots on the two outermost pairs of tail feathers, T6 and T5, of Lesser Grey Shrikes (*Lanius minor*) and assessed the importance of these as a sex discriminant and as an indicator of individual quality. The results suggest that the black pattern, especially on T5, is important in determining sex, but only in combination with other plumage or morphological features; the presence of black spots on T5 was an indicator also of male age. In terms of breeding performance, however, there was no evidence that the presence of these black spots, and their size and precise pattern, were indicators of individual quality of either sex.

Geographical variation among four Common Fiscal subpopulations along an altitudinal gradient in South Africa was one of several themes studied by S. Soobramoney and colleagues. The researchers found significant variation in 13 morphological features and 38 skeletal characters. Common Fiscals were largest in cooler, more arid areas and smallest in warmer, more humid localities, as would be expected from Bergmann's Rule. Variations in morphology and anatomy exhibited a significant correlation with eleven climatic trends. For example, cardiopulmonary organ mass and blood haematocrit value increased with altitude, reflecting adaptation to low ambient temperatures and decreased oxygen pressure associated with high altitudes. Similarly, Common Fiscals from more mesic habitats at low altitude were found to have a higher basal metabolic rate, evaporative water loss and body temperature

compared with those from semi-arid areas at higher altitude. Clear differences in circadian rhythm of these three parameters were apparent, too, and the fiscals exhibited seasonal acclimatization in thermoregulation, increasing their basal metabolic rate and oxygen consumption in cold conditions, and reducing their body temperature in the winter months.

An interesting question was addressed in Germany, that of whether Red-backed Shrikes are becoming smaller. From 1964 to 1998, a total of 2811 shrikes from a stable population in Baden-Württemberg was trapped. The wing length and body mass were recorded, and two secondary feathers (the 8th and 9th), a greater secondary covert and an outer rectrix were plucked. During this period the mean wing length decreased, the reduction beginning around 1991 in the case of females and in 1995 for males and fledglings. The length of the eighth secondary decreased slightly from 1964 to 1998, while that of S9 increased. There was no change in body mass during this period. The degree of heritability was high until the end of the 1980s, but decreased after that. As morphological characteristics with a high degree of heritability are not closely associated with fitness, there was no significant connection between the measurements and breeding success, or between the measurements and the rate of return to the breeding grounds from non-breeding quarters.

Sedentary shrikes undergo a single complete post-breeding moult annually. Of the migratory species, some partially suspend the moult while on migration and others have two complete annual moults. Most juvenile laniids are known to retain some of their greater primary coverts on the upperwing until the second autumn moult. The presence of these buff-tipped feathers is considered a reliable criterion for the ageing of first-year individuals, both in the hand and in the field.

In a study of moult among Palearctic migrants in Ghana, it was found that first-year Woodchat Shrikes began by replacing primaries P3 or P4 and then moulted their primaries descendantly. The earliest individual in active moult was one trapped on 19th November. By mid-December, all juveniles were replacing their outermost primaries, but none had shed the inner primaries or the secondaries. This corroborated previous studies, which had concluded that first-year shrikes moult only the outer five or six primaries during their first winter. One adult female showed suspended moult on 14th December, when secondaries S4 and S5 had not yet been renewed. The retrapping of moulting individuals indicated that primary scores increased slowly. The Woodchat Shrike, with a comparatively slow moult, did not complete

it any later than the rapidly moulting species because not all of the remiges were replaced. It is suggested that slow moult is to be expected in the winter quarters whenever birds are faced with prolonged and predictable wet seasons, as in southern and central Africa.

The Loggerhead Shrike breeds throughout much of North America, the northernmost populations being migratory. Little is known about the moult of this species and how it may vary geographically, but it appears that different populations follow different moult strategies. G. E. Pérez and K. A. Hobson investigated the moult sequence of 27 breeding Loggerhead Shrikes by using stable-hydrogen-isotope analysis of flight-feathers. As feather isotope varies with the latitude at which the feather is, it is a relatively simple matter to identify those feathers grown at localities south of the shrike's breeding area. For each individual, eleven feathers were sampled in order to determine the locations between the breeding grounds and the wintering grounds where moult took place. Feather samples were taken in central Saskatchewan and in the southern region of the Saskatchewan–Manitoba border, in south Canada. It was found that the shrikes began the moult of the flight-feathers on the breeding grounds, where outer primaries P1 and P3 were replaced, but then largely suspended the moult until they arrived in their wintering areas. According to the isotopic evidence, the first primary appears to provide information on the individual shrike's breeding latitudes, whereas the innermost tertial gives information on its wintering or southernmost moulting latitudes.

In a study of Red-backed Shrikes in south-west Germany, 33% of individuals during the breeding season had a deficient tail. Individuals with several defective rectrices were more frequent in occurrence than would be expected. The central tail feathers were lost more frequently than were the others and were regrown more slowly, and in the period from May to July the shrikes had more feathers missing than they had growing ones. Some of the lost rectrices were replaced late, often during the postnuptial moult of the body feathers. There were no indications of a regular moult of the tail feathers, either by breeding birds or by unmated ones.

The flight-feather moult of Red-backed Shrikes in the non-breeding range was studied by examining data from 302 museum skins, as well as eleven live individuals trapped in sub-Saharan Africa. The majority seem to start the flight-feather moult soon after arrival in their southern African non-breeding quarters. About 75% of individuals had started before mid-December, during the main arrival time of the species. The period between the day when 50% of the population had reached the first stage of recorded moult and the day when they reached the last stage amounted to about 82 days, and nine days later 75% had reached this last stage. For the individual shrike, therefore, moult can be estimated to cover about 80–90 days, with the main moulting period between mid-November and mid-March, thus spanning about four months. There was no apparent difference in timing between males and females.

Avian morphological traits are known to vary with age. For Red-backed Shrikes, a significant difference in wing-chord length between adults and yearlings was found in females but not in males. For Bull-headed Shrikes (*Lanius bucephalus*), no statistically significant differences were detected in the bill dimensions, the total head length and the tarsus length between the two age-classes within each sex. This suggests that, in both sexes, the skeletal parts were fully grown within the first year of life. Furthermore, although adult females had longer wings and a longer tail than those of yearling females, significant differences were not found in males, and the differences between the means were smaller. The similarity between the age-classes of males can be attributed to the moult pattern, because adults undergo a complete post-breeding moult, and some other individuals in post-juvenile moult change all of their feathers except for some primary coverts. The explanation for this has generally focused on the need for wing manoeuvrability as a response to selection pressure such as predation or foraging efficiency; or, alternatively, that the young are constrained by poor nutrition. In a study in Japan, however, it was suggested that the similarity between males of different ages, and the disparity between different-aged females, could be attributed

to sexual selection and to natural selection, respectively. When a male Bull-headed Shrike courts a female, he raises his head and tail upright and moves them from side to side, and during pursuit of a female he exaggerates the white patches on his wings. Selection would therefore dictate that yearling males grow wings and a tail as long as those of adult males in order to attract a mate. This was corroborated by the fact that, on the island of Chichijima, mated adult male Bull-headed Shrikes had a significantly longer tail and wing-chord length than did unmated males.

Because the heart is the body's power source, its relative size indicates its capacity for driving the blood around the body. Studies of Loggerhead Shrikes revealed that this species' heart weight decreases in the colder months of the year; in winter it accounted for 1.26% of the body mass, compared with 1.47% in the summer. Moreover, the average, 1.35%, is greater than that for other bird species of similar size, suggesting that, in comparison with them, the shrikes have a more strenuous way of life.

Habitat

Most species of shrike occupy edge habitats and open areas that consist of mosaics of short grass, bushes, trees and prominent perching sites. Some occur in sparsely vegetated xeric habitats, while others inhabit woodland and forest, usually along edges or in clearings. The distribution of the family stretches from north of the Arctic Circle southwards to the tropics and to the tip of southern Africa.

Laniids are typical birds of semi-open habitats. They require perches offering a good view down of the ground, where most of their prey is taken. Most species have benefited from deforestation and have adapted well to low-intensity farming. A few shrikes, however, are forest-dwellers. The rarest, Newton's Fiscal, is restricted to primary lowland and middle-altitude forest on the island of São Tomé; it has never been recorded in secondary forest or in cultivated areas.

Many shrikes show seasonal differences in habitat preferences. For example, some prefer forest edges, and ecotones between forest and open grassland or agricultural land, as breeding habitat, but during the non-breeding period they have a strong preference for meadows and arable areas.

Loggerhead Shrikes have been particularly well studied with regard to their habitat preferences. They use prairies, pasture,

In another odd echo of a situation found in raptors, a few species of shrike are polymorphic, with rare blackish morphs being particularly regular in some regions. The name fuscatus, for example, was given to dusky birds from south-east China and Hainan, but these turn out to be simply a melanistic form of the Long-tailed Shrike. The evolutionary basis for these (usually male) polymorphisms is unknown.

[*Lanius schach schach*, Kinmen, Taiwan.
Photo: Penshing Liao]





The genus *Corvinella* contains two anomalous shrikes from sub-Saharan Africa. One of these, the **Yellow-billed Shrike**, differs from *Lanius* shrikes in its longer tail, grizzled brown plumage, and bright yellow bill. It is also considerably more gregarious, breeding co-operatively in groups of up to 25 individuals, and singing duets. In addition, it does not impale prey in the manner of most shrikes. Although this species has been the subject of taxonomic debate over the years, it does appear to be a true shrike, not too far removed from *Lanius* on the basis of cranial morphology and genetics.

[*Corvinella corvina*
corvina,
Kotu, Western Division,
Gambia.
Photo: Dick Forsman]

sagebrush (*Artemisia*) desert, and fencerows or shelter-belts of agricultural fields, as well as old orchards, riparian areas, open woodland, farmsteads, suburban areas, abandoned railroads, cemeteries, golf courses, and reclaimed strip mines. Scattered shrubs or trees, particularly thick or thorny species, provide nesting sites and hunting perches, and thorny vegetation serves also for impaling prey. In south-west Idaho, impaling stations were located 7–65 m from the nest, contained one or two sharp points, and were well protected within the shrub. Fences, utility wires, and strong-stemmed grasses can also be used as perches. In the upper Midwest, an abundance of open habitat, foraging areas, and elevated perch sites were considered the most important factors in habitat suitability. Grasslands and structurally similar crops, such as alfalfa (*Medicago sativa*) and oat fields, are preferred over row crops, such as corn or soybeans. Of 48 nests in Minnesota, 45% were found in grassland, 37% were adjacent to agricultural fields, and 18% were in pastureland; compared with unoccupied sites, nest-sites had a greater amount of grassland and pasture and longer hedgerows. To the south, in south-western Iowa, nesting areas had more tree cover and bare ground and fewer shrubs than did unoccupied sites, probably reflecting the species' preference for large nesting trees. Again in Iowa, Loggerhead Shrikes nested in roadside areas with smooth brome (*Bromus inermis*) and small, scattered trees and shrubs, whereas most territories in Missouri and Illinois were in pasture.

In Canada, Loggerhead Shrikes breed in pastures with isolated trees and shrubs, thickets or hedgerows, and in thorny bushes alongside railroads. In Ontario and Quebec, they nested in isolated trees more than in hedgerows; hawthorn (*Crataegus*) and red cedar (*Juniperus virginiana*) were the two trees most commonly utilized. In south-east Manitoba, willow (*Salix*) bushes, growing singly or in clumps, and deciduous trees in shelter-belts were the preferred nesting sites; these sites contained more pasture and fewer trees than did randomly selected sites, and also had longer fencerows than found at the latter. Nest trees in pasture had a wider canopy and a larger diameter, and they were surrounded by fewer trees with a height in excess of 2 m; nest trees in cropland were surrounded by fewer shrubs less than 2 m tall. In south-east Alberta, an average of 6.6 breeding pairs was found in seven 41.5 km² blocks containing more than 100 clusters of trees or shrubs, whereas the average in twelve blocks containing fewer

than 50 such clusters was only 2.3 pairs. Compared with random sites, areas within 400 m of localities where shrikes were observed contained a greater diversity of habitats and more frequently encompassed roadside areas, farmyards and shelter-belts; no differences were detected, however, in the proportion of annually cultivated fields, pasture, or hayland in areas around shrike locations. In another Alberta study, breeding habitat of Loggerhead Shrikes had more silver buffaloberry shrubs (*Shepherdia argentea*), a greater percentage of grass more than 20 cm tall,



The **Magpie Shrike** is included in *Corvinella*, although it was once considered sufficiently distinctive to warrant separation in its own genus, *Urolestes*. It is the largest and perhaps the most spectacular member of the shrike family, with an extremely elongated tail, some 22–35 cm long. The plumage is almost entirely black, with striking white patches on the scapulars and primaries, both of which are dramatically conspicuous in flight. It is a widespread specialist of the park-like savanna, semi-dry Acacia scrubland and mopane woodland of East Africa, extending southward from Kenya to South Africa.

[*Corvinella melanoleuca*
aequatorialis,
Tarangire, Tanzania.
Photo: Ketil Knudsen]

The genus *Eurocephalus* was previously treated as a single species, but this has now been split into the Southern White-crowned Shrike (*E. anguitimens*) and the Northern White-crowned Shrike. On the evidence of genetic analyses, both these forms appear to be closely related to classic Lanius shrikes, but they differ from them in a variety of morphological and behavioural traits. For instance, they spend more time on the ground, and they live permanently in closely consorting pairs, or in small groups. They are unique in having a glaring white crown and rump, and differ in the distribution of tarsal scutellation. Overall, they are probably the least "shrikelike" of the shrikes.

[*Eurocephalus ruppelli*,
Kenya.

Photo: Arthur Morris/
Birds as Art]



and a taller mean height of grass and forbs than did heavily grazed habitat unoccupied by the species.

Throughout the Great Basin shrub-steppe and the Great Plains grasslands of North America, the abundance of Loggerhead Shrikes was positively correlated with the percentages of shrub cover and of bare ground, and with the average height of emergent forbs or shrubs; it was negatively correlated with percentage of grass cover. In Oregon and Nevada shrub-steppe, Loggerhead Shrikes were increasingly more numerous with increasing rockiness, dead vegetation and shrub diversity, and with greater cover of spiny hopsage (*Greyia spinosa*), budsage (*Artemisia spinescens*) and shortspine horsebrush (*Tetradymia spinosa*). In Washington, the species' territories were located in areas characterized by relatively large, thick shrubs interspersed with native bunchgrasses or sand-dune openings with about 40% bare ground. Vegetation types supporting Loggerhead Shrike territories included big sagebrush (*Artemisia tridentata*) in lowland and upland areas, mixed shrub and antelope bitterbrush (*Purshia tridentata*); areas used by these shrikes also had a strong horizontal and vertical structural diversity. Community types not dominated by shrubs, such as grasslands and riparian areas, were shunned. In Idaho shrub-steppe, the shrikes nested in big sagebrush, antelope bitterbrush and greasewood (*Sarcobatus vermiculatus*), but in neighbouring north-central Montana, near the Missouri River, they preferred limber pine (*Pinus flexilis*) and Rocky Mountain juniper (*Juniperus scopulorum*) to big sagebrush. In Washington, the shrub species present more commonly around nest-sites than at unoccupied sites were live big sagebrush, antelope bitterbrush and spiny hopsage, and the less common species were rabbitbrush (*Chrysothamnus nauseosus*) and dead antelope bitterbrush; nesting sites exhibited taller shrubs and a greater shrub canopy, and less annual grass cover, than found at unoccupied sites. Loggerhead Shrikes here preferred to nest in big sagebrush and antelope bitterbrush, and avoided spiny hopsage, rabbitbrush and green rabbitbrush (*Chrysothamnus viscidiflorus*). The shrubs utilized for roosting were large, dense living ones, whereas tall dead shrubs providing good visibility were used as perches.

Canadian researchers employed satellite imagery as a means of assessing breeding-habitat availability for the Loggerhead Shrike in Quebec. They found that, of 1700 plots located in the historical breeding range, 310 fitted the required criteria, sup-

porting a total of 3988 pastures, and they visited more than 500 of these pastures in order to validate their current status. The researchers found that the Outaouais region would be the most suitable for nesting Loggerhead Shrikes in southern Quebec; here, suitable habitat remained because more than two-thirds of the visited sites were still pastureland, hawthorns were well distributed in the region, and pastureland fragmentation was less than elsewhere. The conclusion was that the availability of breeding habitat does not limit the establishment of a breeding population of Loggerhead Shrikes in Quebec, because it is estimated that thousands of hectares of suitable habitat survive in that province.

Modern agriculture contributed to the decline of many bird species in western Europe during the second half of the twentieth century, shrikes in particular having suffered through habitat degradation or loss (see Status and Conservation). The Lesser Grey Shrike is among the most threatened breeding bird species in the region. In France, 50–60 pairs still breed at two sites in the Mediterranean area, where they nest in tall trees, either isolated or in avenues, and, more importantly, appear to depend on vineyards associated with grassy fallows. In one of the two sites, west of Montpellier, a study of the local land use revealed the predominance of vineyards, followed by fallows, and with only minor elements of small orchards and gardens. What seems essential is that vineyards and fallows occur in a mosaic arrangement of small plots. The shrikes capture their prey in both habitats, but mostly in fallows.

The importance of habitat composition and territory size for reproductive success among Lesser Grey Shrikes in Slovakia was investigated. Territory size varied significantly, but did not determine breeding success. Territories contained a high diversity of habitats, meadows being the most important type, but all territories also contained considerable expanses of bare ground. In fact, bare ground was the preferred habitat type at the beginning of the breeding period, whereas, during chick-feeding, mowed meadows were clearly preferred. Access to insect food seems to be the key factor in explaining these preferences. The tree species used for nesting varied considerably between 1996 and 1999, and variation in the development of foliage cover seemed to be the cause of this. Although Lesser Grey Shrikes exhibited a clear preference for some habitat types, the researchers were unable to identify any influence of habitat variables on territory selection and breeding success. It could be that the



study area in general provides optimal conditions for all breeding pairs, and the small differences in territory quality may be negligible.

P. Koskimies found that transmission-line areas in Finland provided a favourable nesting environment for Red-backed Shrikes. The study indicated that the nesting frequency of this species in such areas, in which a significant portion of the total population nested, was considerably higher than it was in other Finnish habitats. The trees and bushes in transmission-line areas

have become vital compensatory habitats following the loss of natural meadows. In a study of Red-backed Shrikes in southern Austria, an objective census technique was devised, enabling relative measures of abundance and habitat cover to be obtained. The shrike's abundance was found to have a positive correlation with grassland grazed by livestock, with fence lines and with scattered trees and shrubs, and a negative one with arable land and ungrazed grassland. Shrikes were most strongly associated with a mixture of grazed grassland and scrub, but their abundance in this habitat increased only when scrub was limited to 10–15% cover.

In Switzerland, ornithologists investigated habitat availability and farming intensity and studied their effects on breeding-bird densities and on habitat use during foraging. It was found that the Red-backed Shrike was influenced most by farming intensity. Shrikes were more widespread and more abundant in areas farmed at low intensity than in more intensively farmed areas, where they utilized areas close to pastureland, dry grassland and hedges, woodlots, orchards and vineyards. The density and height of vegetation were important, meadows being suitable for ground hunting when they were newly cut, while tall grassland was better for catching aerial prey. Foraging sites were much closer to the nest in low-intensity farmland than in intensively farmed areas.

The details reported above are similar to findings for Loggerhead Shrikes in Florida, where the effects of suboptimal substrate on this species' hunting capabilities were observed. Hunting attempts and hunting success before the grassland was mown were not significantly different from those after mowing, although there were significant differences in the number of prey caught in aerial chases and during hovering and in the number captured by perch-hunting. None of the shrikes adjusted the boundaries of its territory following the modifications, but all were apparently able to overcome the effects of tall vegetation by altering their hunting behaviour.

Low grassland appears to be the optimal habitat for Loggerhead Shrikes, as it permits energetically efficient hunting. In addition, it was found that the density of hunting perches affected the nutritional condition of non-breeding territorial Loggerhead Shrikes. Areas of a Florida cattle ranch that lacked shrike territories had only few fences and sparsely scattered trees, and could not therefore be exploited by the shrikes. It was shown that all

*One of the most persistent and distinctive traits of shrikes is their habit of sitting conspicuously on prominent perches, quite often the highest one available. This behaviour, like the hooked bill, is related to their ecological role as sit-and-wait predators. It also makes shrikes popular with birdwatchers because they are fairly easy to find and to observe for prolonged periods. After patiently scanning for prey, this **Common Fiscal** is taking a break from foraging for a bout of preening. Shrikes preen, like all other birds, to minimize their parasite load and to maintain the immaculate quality of their plumage.*

[*Lanius collaris collaris*,
Hermanus, South Africa.
Photo: Jaime Rojo]



*In the temperate zone, most shrikes are solitary birds. Even paired individuals usually forage separately, a habit that presumably helps to reduce competition for scarce food resources. In the tropics, however, some shrikes are highly social. The **Northern White-crowned Shrike**, for example, generally lives in small groups which defend shared territories and often forage together. A tropical insectivore presumably encounters more prey, and more predators, than a temperate insectivore. On the one hand, the abundance of prey may allow several individuals to hunt in close proximity, thus reducing the costs of living in a group. On the other hand, the greater risk of predation might also increase the benefits of sociality.*

[*Eurocephalus ruppelli*
ruppelli,
Samburu, Kenya.
Photo: Arthur Morris/
Birds as Art]

territories comprised a logical mosaic and had the same amount of utilizable area; that large territories contained more "dead" space; that the ratio of benefits to cost in terms of energetics varied with territory size; and that a shrike's nutritional condition, as determined by feather growth rates (ptilochronology) varied inversely with territory size. Similarly, shrikes inhabiting pastures were in better nutritional condition than those with territories in citrus groves, where application of pesticides had an adverse effect on the prey base. The condition and the breeding success of Loggerhead Shrikes living on cattle pastures were likewise adversely affected when a common fertilizer, sodium ammonium nitrate, was sprayed on the pasture; seven eggs, two nestlings and eight fledglings disappeared, or died from causes attributed to the spraying, in addition to which one male and seven females disappeared and one territory was abandoned. Shrikes are considered good indicators of habitat quality, and these observations suggest that further studies are required in order to examine the effects of supposedly "environmentally friendly" fertilizers.

Common Fiscals are resident in South Africa, where their territories, varying in size from 0.3 ha to 6.3 ha, are located in both natural and human-modified habitats. The availability of hunting perches had an important effect on habitat selection by this species, which was found to avoid open land used for monoculture crops, as well as heavily wooded regions. Common Fiscals were able to colonize areas having no natural perches by making use of overhead cables, fence lines and artificial perches. The Common Fiscal is unusual among shrikes in that it appears not to be following the current global trend of decline recorded for many other laniids (see Status and Conservation). A population in South Africa inhabiting natural habitat, in the form of savanna, and human-modified habitat, represented by eucalypt (*Eucalyptus*) groves and monoculture grasslands, was studied in order to determine whether foraging behaviour could be contributing to their population stability. The three habitats differed significantly in the perch structures and perch heights that they provided, and the fiscals adjusted both their search height and their foraging method accordingly, performing more aerial hunting from tall eucalypt perches and fewer from lower fence lines in grassland. Territories were smallest in eucalypt groves, where the fiscals spent less time in flying between perches. Hunting

success and prey size did not differ from one habitat to another, but capture frequency was greatest in human-modified habitats. Common Fiscals are uncommon in many protected natural areas in South Africa, but their flexibility in foraging methods has allowed them to exploit new habitats, and they have increased their range and numbers in modified habitats.

Again in South Africa, a comparative study of the numbers of Red-backed Shrikes in different habitats on the wintering grounds showed that the highest densities, of 10–15 individuals per 10 ha, were recorded in semi-arid parts of the former Transvaal Province. Highest numbers were in arid savanna of medium cover and height. A comparison with the densities in the best breeding areas in Europe reveals a similar number of full-grown individuals to that present in the arid savannas in southern Africa. Understanding the winter distributions of migrant birds is important, because productivity and recruitment are influenced by conditions at several places and at different periods in the life cycle of individuals (see Movements).

Habitat selection by migratory populations of two sympatric shrike species, the Bull-headed and Brown Shrikes, was examined in northern Japan between 1992 and 1997. While Bull-headed Shrikes did not show any particular preferences, Brown Shrikes bred mainly in natural grassland with shrubs. Since available habitat for Brown Shrikes has decreased rapidly in and near the study area, this species' strong tendency to return to the same breeding sites each year may be the result of a scarcity of habitat. Bull-headed Shrikes, on the other hand, may have a higher tendency to disperse because they are habitat generalists. With its more narrow requirements, the Brown Shrike appears to have suffered significantly from habitat loss, while the Bull-headed Shrike has not been adversely affected.

The way in which habitat use and perch selection by Great Grey Shrikes were influenced by prey type and the presence of a snow layer was investigated in south-west Finland. It was found that the habitat chosen depended on snow cover, reflecting a preference for poorly vegetated arable fields when hunting invertebrates and for vegetation-rich habitats when available prey were mainly vertebrates. As is consistent with theories on optimal perch height, the shrikes, when hunting mainly vertebrates, chose higher perches and also increased the time spent on each perch, probably because vertebrate prey are less frequent than invertebrate

Most shrikes sing alone to attract mates, but the gregarious species will often defend their shared permanent territories by singing together. The **Grey-backed Fiscal**, for example, lives in groups of up to 20 individuals, each of which forages alone unless drawn to a locally abundant resource, such as ant swarms or termite hatchings. When the territory is threatened by an intruder, however, several individuals may gather on a prominent perch to display communally. This spectacle includes a co-ordinated chorus, the purpose of which is presumably to deter rivals by signalling territory ownership and group quality.

[*Lanius excubitorius*,
Lake Naivasha, Kenya.
Photo: Hanne & Jens
Eriksen]



prey. A selection of lower perches when hunting invertebrates was evident in mild winter periods, but not in the autumn. Snow cover increased the average distance to mammalian prey captured, but the average frequency of mammal capture remained unchanged. The shrikes preferred to hunt invertebrates when these were available, rather than to adopt a hunting strategy that would optimize the encounter rate with vertebrates. The rate at which they hunted ground-living prey decreased, however, as the snow depth increased, whereas energetically costly types of hunting behaviour remained unchanged.

In Navarra, in northern Spain, it was found that the geographical distribution of the Red-backed Shrike is linked with a combination of both the vegetation available for nesting and the climate. This allows the shrikes to be used as bio-indicators of the climate and vegetation in given areas.

General Habits

Most migratory species of laniid hold all-inclusive territories on the breeding grounds, and guard smaller feeding territories when on migration or in the wintering quarters. They make use of exposed sites for perching, when they usually adopt an upright stance, except when watching prey below them, or crouching if a larger predator is in the vicinity. When moving to another perch, they typically drop down and fly close to the ground with bursts of rapid wingbeats, swooping upwards at a steep angle to alight on the next perch. It appears that the upright stance serves to advertise their presence, and the exposed perch facilitates the sit-and-wait foraging technique. They scan the area surrounding their prominent perch and swoop down to capture prey, which they detect, probably, by its movement. Foliage-gleaning and aerial capture are not frequently undertaken, even though they may be the only means of gathering food in some situations, as when the undergrowth is especially tall during the rainy season and the sedentary individual will not abandon its territory. In such cases, shrikes will resort to hawking insects or other birds, snatching them in mid-air, and to hovering, both of which are energetically the most expensive modes of flight and hence the least preferred.



Members of the two African genera *Eurocephalus* and *Corvinella* are gregarious, and often occur in groups. Both genera are thought to be co-operative breeders. Two other African shrikes are likewise gregarious: the Long-tailed Fiscal (*Lanius cabanisi*); and the Grey-backed Fiscal (*Lanius excubitorius*). The latter, and possibly also the former, breed co-operatively, with one breeding pair that benefits from the presence of a varying number of helpers (see Breeding). All the other species are found singly or in solitary pairs, although they sometimes form loose colonies, particularly in the case of the Lesser Grey Shrike, and concentrations can be encountered also during migration.

Shrikes are also highly territorial, the territories of the small Red-backed Shrike extending over an average of 1.5 ha and those of the much larger Great Grey Shrike covering up to 100 ha or more. Establishment of territories is a complicated process, especially when two sympatric species return at different times from the wintering grounds. An example of such a situation is found in Japan, where the Bull-headed Shrikes return early in the breeding season and begin to set up territories. On the arrival of Brown Shrikes, however, competition for breeding territories becomes intense, and the territories held in the previous year have to be re-established in the face of the pressure exerted by interspecific and intraspecific competition. It appears that this situation leads to the depression of populations of both species in a given area, because the number of territories that can be accommodated is limited and depends on the carrying capacity of the habitat.

Territoriality is a feature also of transient and winter resident Brown Shrikes in Taiwan. Large numbers of these crowd into the available habitat during the passage period, and the cost of maintaining territories changes markedly, depending on the number of shrikes present. Almost a quarter of the autumn passage migrants arrive before the wintering shrikes, while almost three-quarters of wintering Brown Shrikes arrive in Taiwan during the period of the species' autumn passage through the island. Studies revealed that the frequency of intraspecific aggression was correlated with the number of individual shrikes seen along a transect line. Among ringed individuals that returned during passage time, 80% returned directly to their previous territories, but some waited for the departure of passage migrants before establishing territories. Departure from and arrival at the study area were frequent during the winter months, but no individuals moved territories within the study area. On average, 25% of ringed overwintering shrikes returned to the study site in subsequent years, whereas no passage migrants were recorded as doing so.

Perch sites are important in territorial behaviour, and influence the life-history traits of shrikes. At the Kenting National Park, in southern Taiwan, the foraging behaviour, perch choice and use, and interspecific and intraspecific interactions of migratory Brown Shrikes were observed. It was found that the shrikes had an overwhelming preference for perching on protruding branches on a side of the tree canopy, which made it easier for them to detect prey on the ground and to keep an eye open for raptors. They also rested a lot between hunting bouts while on migration, when their hunting rate was very different from that during the breeding season. Of a total of 89 aggressive interactions with other individuals, 62 involved conspecifics and 27 were with members of other species. Of the 62 intraspecific interactions, three were with groups of up to five migrating Brown Shrikes that landed in the study plot before heading out to sea, presumably towards the Philippines. It appears that Brown Shrikes in Taiwan maintain feeding territories while on migration.

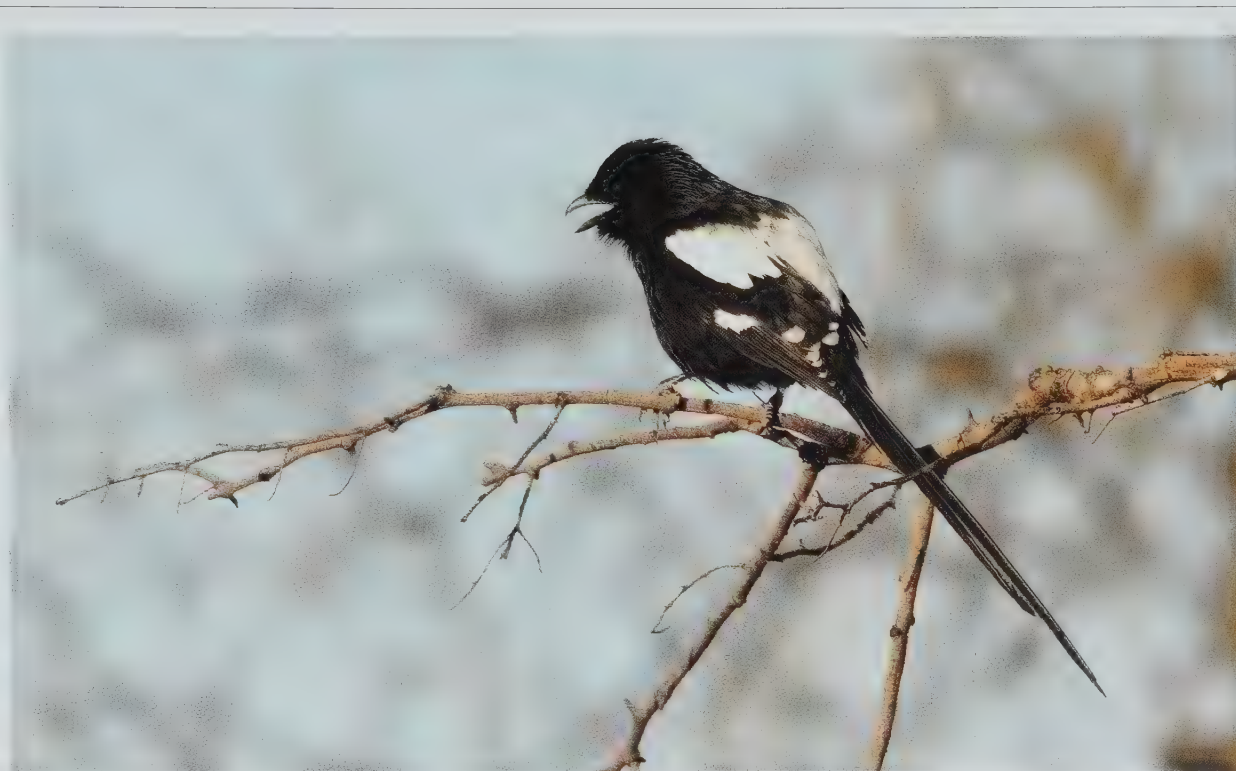
Shrikes require two types of perch. Being diurnal hunters, they need daytime foraging perches, which they utilize also both for dismembering prey and for perching conspicuously in order to advertise the territory to intruding conspecifics. In addition, they require nocturnal perches for the purpose of roosting. Both types of perch are used repeatedly by individual shrikes. From the few data available on the selection of night roosts, it seems that these are generally situated above ground level in tall, dense, live shrubs, screened by overhanging limbs, and often marked by large areas of faecal deposits, or "whitewash", and have regurgitated pellets strewn around them. The adults have been observed to reach the roost about one hour after sunset and to leave about 40 minutes before sunrise. When the young are still in the

Most shrikes produce a variety of tuneless, grating calls, a common variant being "schach". Indeed, the word "shrike" is thought to be derived from these harsh notes, which are given singly or repeated in series. Though it often gives these calls, the **Long-tailed Shrike** is similar to most other members of the family in that it only sings infrequently and unobtrusively. The song, though rarely heard, is unexpectedly elaborate. It lasts up to 15 minutes, and incorporates sweet warbles, whistles, and even some mimicry.

[*Lanius schach schach*, Xiamen, Fujian, China. Photo: Xue Juzheng]

The most vociferous shrikes are the two species of *Corvinella*. In common with most social birds, they call loudly, frequently, and with a wide repertoire of notes. Not only do they produce a variety of whistles, chatters, twitters and chirps, but they often vocalize in concert, either by duetting or chorusing. They also habitually call in flight. When an individual discovers an intruder on the territory, it produces a series of sonorous whistles, or in the case of the **Magpie Shrike**, a distinctive warbling noise. This seems to function as a rallying cry, as other group members soon arrive to strike up a complex chorus of whistles and scolding notes.

[*Corvinella melanoleuca melanoleuca*, east of Modimolle, Limpopo, South Africa. Photo: Warwick Tarboton/VIREO]



nest, the parental roosts tend to be in the nest tree. In Washington, the mean height of shrubs utilized by Loggerhead Shrikes for roosting was about 2.1 m, which was greater than the mean height for all the bushes in the surrounding area.

Shrikes search for prey from high vantage points, from which they swoop directly into hunting attacks. It is important, therefore, that they have perches of varying heights, as this allows the hunting of a wider size range of prey; as perch height increases, the average size of prey caught increases, perhaps because shrikes may not see the smaller prey items from high perches. Perch density in agricultural areas is inversely related to territory size and positively related to nutritional condition; a greater number of perches means that the chances of finding prey also are greater, the result being that a smaller territory is needed in order to sustain the bird, especially during the breeding season. Such perches can include both natural ones, such as shrubs, trees and stumps, and artificial ones, such as fence lines, utility lines and utility poles, and they are more exposed than are night-time roosts.

In coastal Texas, in the southern USA, perches are regarded as a necessary component of the foraging habitats of Loggerhead Shrikes, and the density of elevated perches has a direct influence on territory quality. In natural grasslands, those grasslands maintained through such processes as fire and low-intensity grazing, the shrikes utilized the abundant non-woody perch structures, such as sunflowers (*Helianthus*), partridge pea (*Chamaecrista*) and sesbania (*Sesbania*), more than they did other substrates. In agricultural and other non-natural systems, including crop fields, intensive grazing, hayfields, lawns and roadsides, they used primarily fence posts, utility lines and woody vegetation located in strips near the edge of fields. Shrikes may restrict their use of foraging substrate to that within 10 m of elevated perches, so that, in areas with a low density of perches, large areas of potentially good foraging are unexploited. This demonstrates the value of natural grasslands, which generally have non-woody perches evenly distributed throughout and which possess high vegetation diversity, thus allowing the shrikes to exploit a large proportion of the vegetation for foraging. In contrast, perches in agricultural habitats tend to be concentrated at edges. In Utah, shrikes were reported as hunting and storing food in large greasewood shrubs (*Sarcobatus vermiculatus*), and in Florida they used perches that were less than 5.5 m above the ground. In studies in South Carolina, Loggerhead Shrikes were reported as perching mostly on utility lines during the summer months, but using trees and shrubs more in the winter; it has been suggested, how-

ever, that this apparent difference is due to the fact that shrikes perched in trees were easier to see in the winter, when the branches are bare of foliage.

Mean estimates of the territory size of Loggerhead Shrikes in various parts of North America range from approximately 4.6 ha to more than 30 ha. Another criterion often used when determining area requirements is the distance between adjacent nests, some reports of which include 800 m in Nevada, 400 m in Colorado, 160 m in Alabama, 37 m in Indiana and 80–200 m in Alberta.

The black mask around the eye is a feature of many *Lanius* species, including the **Long-tailed Shrike**. It is thought to be a foraging adaptation, based on the fact that pale plumage would reflect and scatter more sunlight around the eye, perhaps reducing the acuity of vision. In theory, the black mask absorbs more light, making it easier to search for prey. Although difficult to test, this fits with the observation that foraging shrikes often perch facing the sun. Perhaps they are more likely to spot an insect if they can also see its shadow, or there may be less likelihood of the bird's shadow flushing the insect just before capture. Whatever the reason, shrikes regularly look into the glare of the sun when foraging.

[*Lanius schach*, Keoladeo Ghana National Park, Bharatpur, India. Photo: Jesús Rodríguez-Osorio]





Shrikes catch most of their prey on the ground by diving down from a high perch. Less regularly they also sally out to snatch winged invertebrates, or occasionally small birds, in mid-air. They are capable of hovering briefly to search for food but they mainly use elevated vantage points. The **Northern White-crowned Shrike**, for example, often scans for prey from bushtops, boulders and telephone wires. Like several other shrike species, it is sometimes observed perching on large mammals, in this case a domestic goat.

[*Eurocephalus ruppelli* ruppelli,
Lake Baringo, Kenya.
Photo: Theodoulos Poullis]

Both of these measures demonstrate a good degree of variation, with no apparent geographical trend, suggesting that range limits in themselves are not a predictor of territory size. Rather, territory size seems to be roughly correlated with fine-scale habitat quality, high-quality habitat resulting in smaller territories and, therefore, a greater density of nests.

Perches, in particular, seem to be an important determinant of territory size. As has been seen, the potential foraging area is likely to extend less than 10 m from a suitable perch, and territories that are sparsely vegetated are, therefore, usually larger. For example, Loggerhead Shrikes in dunes have territories 2–3 times larger than those of shrikes in moderately wooded sites, and the provision of additional perches in formerly unused foraging habitat resulted in a reduction in territory size and an increased density of nesting pairs. Moreover, it seems that shrikes may use the dispersion of trees as an indicator of habitat quality when selecting territories.

Southern Grey Shrikes have a distribution that includes the most extreme deserts. The thermoregulatory characteristics of these shrikes, determining how they manage heat balance in a wide range of thermal conditions, particularly those experienced in the hot Negev Desert of Israel, is of interest. The Negev shrikes were found to have physiological characteristics similar to those of most other passerine species of corresponding size, but with two notable exceptions. First, the rate of increase of evaporative water loss with increasing ambient temperature above the upper critical temperature was 40% higher than predicted for a bird of the same body mass and similar to that recorded for other desert-dwelling birds. Secondly, the shrikes' body temperature increased with increasing ambient temperature within the thermoneutral zone; this controlled hyperthermia leads to a saving of water. Resistance to heat loss was low compared with that of other small endotherms. During the summer, the standard operative temperature lies within the thermoneutral zone throughout the shrikes' morning and afternoon foraging periods; in the winter, it was below the lower critical temperature throughout the day. There was no significant relationship between the activity of these shrikes and the standard operative temperature in winter.

In ambient air temperatures of up to 40°C, the Loggerhead Shrike does not drink water. It has a basal metabolic rate that is lower than predicted for a passerine of its size, but is more similar to that of other raptorial species. In addition, it has an ex-

tended thermoneutral zone, ranging from approximately 24°C to more than 36°C. Indeed, K. G. Cunningham concluded that, as the species is a sit-and-wait predator, it may benefit from having a reduced basal metabolic rate. Its most metabolically expensive behaviour is flight, which it uses rarely. This shrike spends approximately 80% of its day perched, although it will spend more time in flight in areas of suboptimal foraging habitat.

Voice

The vocalizations of the family were well summarized by T. Harris and K. Franklin in their 2000 monograph. For many *Lanius* species, the song is relatively rarely uttered and is not far-carrying, although territorial calls are important. Shrikes use predominantly harsh calls, a feature from which the English vernacular name "shrike" is derived. The two *Corvinella* shrikes and some of the *Lanius* species combine harsh calls with whistles, the members of the latter genus having a warbling song, usually with mimicry. The Great Grey Shrike has been observed to lure vulnerable prey species by mimicking their calls.

The songs of most laniids consist of short trills and clear notes, varying in combination, tone and volume, the same song usually being repeated every few seconds. The vocalizations of males shift towards territorial defence once pair-bonds have been formed. The mate-attracting spring song incorporates higher, clear notes and fewer harsh screeches than the territorial song. Both males and females will give territorial warnings consisting of 4–10 harsh screeches.

Members of the genera *Eurocephalus* and *Corvinella* are gregarious, and often occur in groups. The basic song structure of the two *Eurocephalus* species is complex, their utterances being loud, with harsh squeaks, squawks and nasal bleating interspersed with stuttering, chattering and twittering calls, usually given in chorus. Duetting is well developed, and it, too, is often performed in chorus. These two species do not have any obvious territorial vocal advertisement, but the territorial call is started by the dominant individual in a group, which utters a bleating call, to which other group-members respond by chorusing with various stuttering, chattering and bleating calls combined with harsh sounds. Low growling noises are given in threat. The alarm calls of the white-crowned shrikes involve loud nasal calls given by

one individual, the others in the group immediately responding with repeated equally noisy calls. Little is known about the courtship calls of this genus, but the pair-bond is apparently maintained by means of duetting. The food-carrying adults emit bleating calls when approaching the nestlings, and the latter make persistent loud wheezy calls, although juveniles of the Northern White-crowned Shrike utter sharp, piercing "skeet" calls. At the roost, these species utter much calling before they finally settle, and purring growls and soft chortling sounds can be heard as individuals jostle for position and the flock-members huddle together on a branch.

Both of the *Corvinella* species are noisy birds, uttering a variety of loud sonorous whistles, harsh rasps, buzzing noises, and chattering, twittering and chirping sounds. They often duet, sometimes in chorus, and they often call in flight. They advertise the territory mainly by the use of visual signals, but these are accompanied by whistled calls. When a member of the group discovers one or more intruders infringing on the group's territory, it utters loud sonorous whistles or, in the case of the Magpie Shrike, a warbling call; these whistles and calls attract the rest of the group-members, which then join in with a complex chorus of various whistles and harsh calls. The intruding group uses similar calls, such as repeated whistles and harsh chattering, scolding, rattling, which develop into a loud communal chatter. In addition, the Yellow-billed Shrike utters a harsh grating and scolding alarm call, the corresponding vocalization of the Magpie Shrike being a short harsh phrase or a rasping note. The alarm calls usually bring the group-members together in order to repel the intruders.

The song of the Loggerhead Shrike includes a sharp, two-syllabled phrase, transliterated as "krrr-dí", "jée-uk" or similar, which is repeated at short intervals. Its calls are variable, and can contain elements similar to song phrases and interspersed with scolding notes, examples being "jaaaaa" and "teen raad raad raad". The calls of unpaired males are different from those of paired males, the mate-attracting song having higher, clearer notes and fewer harsh screeching elements. Most shrikes will ruffle the head and body feathers and emit buzzing or clicking calls when predators are detected. For the Loggerhead Shrike several predator warnings have been identified. The male gives a sharp two-note whistle with increasing cadence when the predator is at a good distance but approaching; this sharp whistle changes to a buzzing call, and the shrike creeps into cover or adopts a crouching posture, when the predator is almost overhead. In addition, a rapid clicking of the mandibles, producing a staccato clacking sound, is given when defending the nest-site, when a predator is close to fledglings, and during attacks on invading conspecifics. Alternatively, males use rasping buzzy "aak, aak, aak" calls, mostly against aerial predators. When mammalian and reptilian predators are close, they utter "jaa" calls accompanied by wing and tail movements.

Food and Feeding

Although there are seasonal variations, insects generally form the bulk of the diet of shrikes, and some species may be exclusively insectivorous. However, those species that breed in the higher latitudes rely exclusively on mammals and birds during the cold and snowy weather of the winter months. True shrikes will feed on relatively large prey, including small vertebrates such as reptiles, rodents and birds. Some invertebrates possess chemical defence mechanisms against predators, but the shrikes have evolved a method of overcoming this potential problem. They impale the prey on a thorn or similar sharp projection and consume it only after the chemical toxins have degraded, the cue to which appears to be the change in colour of the prey owing to detoxification and degradation over time. The removal of the sting of venomous invertebrate prey, such as wasps and bees and other Hymenoptera, appears to be innate and has been recorded for at least four species. The white-crowned shrikes in the genus *Eurocephalus* are known to eat millipedes (Diplopoda).

In the Northern Hemisphere, at least, the peak foraging times of laniids seem to be in the morning, but, as winter approaches,

daylight becomes shorter, and the temperature colder, an increasing amount of time in the afternoon is devoted to hunting, probably because prey activity at that time decreases. Typically, shrikes make 8–12 capture attempts per hour, but the number is highly variable. Capture success, too, varies widely, depending on habitat, prey availability, time of year, and the individual shrike's experience and skill; in a sample of various studies, it has been found that 28–85% of attempts result in a capture. Generally, shrikes increase their attack rate and capture rate during the breeding season.

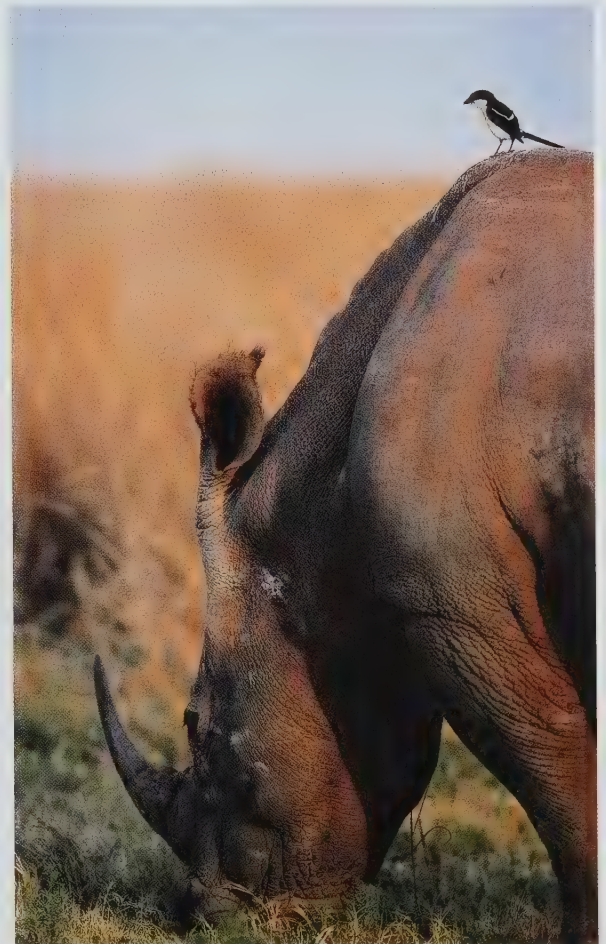
During periods of great energetic demands, as at the height of the breeding season or at times of food shortage in winter, shrikes display their dietary flexibility. If necessary, they will even resort to frugivory. For example, Southern Grey Shrikes were observed to consume dates in Algeria, Lesser Grey Shrikes include cherries (*Prunus*) and figs (*Ficus*) in the diet, Woodchat Shrikes eat mulberries (*Morus*) in Crete, and Red-backed Shrikes consume rose hips (*Rosa*) in Scandinavia. A pair of Southern Grey Shrikes in an urban environment in Tunisia was observed to scavenge at hotel tables and to feed its young with food remains which included peanuts and bread. Shrikes have adapted to human encroachment in the landscape by hunting at birdfeeders.

Although shrikes generally capture prey that are smaller than the shrike itself, they are known also to capture and kill animals that are 3–5 times as large as their own body size or mass. One of the most striking examples involves the Southern Grey Shrike. In India, a saw-scaled viper (*Echis carinatus*) 25 cm long was found in a larder maintained by this shrike, and in Israel a fat sand rat (*Psammomys obesus*) and an intruding conspecific were impaled. In the USA, a Loggerhead Shrike in Florida was observed repeatedly to attack a large yellow chicken snake (*Elaphe quadrivittata*). Common Fiscals in South Africa sometimes catch and eat bats, and a wintering Great Grey Shrike in the UK captured a Northern House Martin (*Delichon urbicum*) in flight. Shrikes will also actively hunt in aquatic habitats by plunge-diving after their prey. A Common Fiscal in southern

For some shrikes, particularly those of open African savannas, the only suitable perches may be provided by megafauna. This **Common Fiscal** is making use of a handy white rhino (*Ceratotherium simum*). Large mammals such as this may increase the foraging efficiency of shrikes for more than one reason. Not only do they afford a good vantage point from which to search for prey, but they also disturb terrestrial invertebrates and attract large numbers of flying insects within range.

[*Lanius collaris*,
South Africa.

Photo: Roland Seitre]





Shrikes are not terrestrial but they do capture terrestrial prey. The **Bay-backed Shrike** is typical in that it spends much time scanning 2–2.5 m above the ground on a high perch from which it dives down onto unsuspecting animals, usually within a radius of 10 m. It usually returns immediately to the same perch, or to a similar vantage point nearby, but it sometimes remains standing on the ground for several seconds. Most terrestrial prey species are insects, including many beetles (Coleoptera) and grasshoppers (Orthoptera).

[*Lanius vittatus vittatus*, Jaipur, Rajasthan, India. Photo: Gaurav Bhatnagar]

Africa was seen to hunt tadpoles of the African clawed frog (*Xenopus laevis*), and Loggerhead Shrikes in Florida hunted blue crayfish (*Procambarus alleni*). In India a Southern Grey Shrike specialized in slugs (Gastropoda), and in Germany a Great Grey Shrike was observed to catch, impale and consume white-lipped snails (*Cepaea hortensis*) and Roman snails (*Helix pomatia*) during the winter. Shrikes are also opportunistic, and they will feed on carrion and scavenge at prey remains left by raptors or at roadkills. During the breeding season they may cannibalize their own dead nestlings, irrespective of the cause of death.

Slovak and Polish researchers were able to demonstrate a link between a species' phenotypic characters and its diet. In a study of the Great Grey Shrike, they found that the composition of the diet was non-random; smaller individual shrikes foraged mainly on beetles, while individuals with longer wings and tail preyed on flying and plant-dwelling insects.

Laniids choose foraging habitats that are especially abundant in large insects and small reptiles and rodents. Studies of the Red-backed Shrike's diet in relation to prey abundance in Spain revealed a negative selection for Orthoptera, whereas beetles (Coleoptera) and Hymenoptera were positively selected. This is in contrast to south-west Finland, where the shrike was found to prey on Orthoptera and carabid beetles in an abundance-related manner.

A seven-year study of the diet of the last two French breeding colonies of Lesser Grey Shrikes showed that, in accordance with information from other breeding colonies across the species' distribution, the main prey during the nestling and fledgling stages were beetles, grasshoppers and locusts (Acrididae). It was discovered that the diet of pairs in loose colonies was different from that of pairs breeding solitarily. At colonies, the beetles *Amphimallon pygialis* and *Anisoplia tempestiva* and the white-faced bush-cricket (*Decticus albifrons*) accounted for 60% of the diet, whereas these species represented only 10% of the food of solitary pairs. This may be attributed mainly to the fact that colonies were located within hunting distances of meadows, and solitary nests were not. The latter were mostly in vineyards, cereal fields and vegetable plots.

Studies of the diet composition of Great Grey Shrikes in the period October–March during nine winters in southern Finland showed that the main prey was *Microtus* voles, which formed 35.4% of vertebrates taken, followed by the harvest mouse

(*Micromys minutus*), at 27.5%, the common shrew (*Sorex araneus*), at 14.8%, and the house mouse (*Mus musculus*) and a variety of birds, each of which accounted for 7% of vertebrates consumed by this laniid. Invertebrates constituted only about 0.1–1.7% of the total prey biomass. The shrikes hunted birds in an opportunistic manner; no preference for larger species within the suitable size range was evident, but tits (Paridae) dominated, accounting for 61.2% of all birds eaten. This was not due to a greater availability or to prey selection but, rather, was a result of the greater vulnerability of tits. The hunting of voles decreased in mid-winter and during periods with snow, whereas the proportion of birds and, especially, mice in the diet showed a corresponding increase at these times.

The shortness of the winter daylight period in Finland limits the possibilities for hunting. Calculations estimated the mean daily amount of captured prey as 36.3–59.8 g, and the mean daily food consumption as 44.1–62.6 g, both parameters being lowest in mid-winter. Increased capture efficiency, rather than increased hunting effort, enabled the shrikes to catch a fairly constant number of prey items each day, irrespective of time available for hunting. With a decrease in the amount of daylight, the shrikes showed signs of increased hunting activity in the morning and evening twilight. They responded to shortened daylight time by reducing the interval between meals, so that the percentage of the daylight time used for feeding increased as the photoperiod shortened. In this way, the shrikes adjusted their foraging and feeding behaviour in order to achieve a stable prey-capture rate and food consumption without increasing the energy costs.

Farther south, a study of the breeding-season and winter diets of the Southern Grey Shrike in south-west Europe revealed that this species fed mostly on cold-blooded prey such as beetles. Vertebrates were seldom taken except during the fledging period, when the adults caught small passerine birds. Marked seasonal differences were found. Hymenoptera were consumed largely in the autumn, arachnids in the autumn and winter, Orthoptera in summer and autumn, and Lepidoptera larvae in winter and spring and by fledglings. Nevertheless, beetles were ingested in large proportions throughout the year; carabids were the main prey in winter and beetles of the family Melolonthidae were especially important for adults during the nestling period, as were cetoniid species for the fledglings. Small mammals and small birds were exploited less by the nominate race in France

and Spain than by the subspecies *theresae* and *elegans* in Israel, whereas the opposite might be expected from a north-south climatic gradient.

Geographical variation in feeding has been reported both between species and among subspecies. Important differences can be observed in the main prey consumed by the Great Grey Shrike and the closely related Southern Grey Shrike according to latitude. One is the presence in the diet of mammals, which are the most important prey of the Great Grey Shrike in northern geographical zones and the frequency of which decreases with latitude. In the Canary Islands, one of the most southerly latitudes examined, mammals were not frequently captured by the local race *koenigi* of the Southern Grey Shrike, probably because the two small mammals available for the shrike on Tenerife are essentially nocturnal. It was found that the highest rate of predation on mammals occurred in spring. In mainland Spain and France, on the other hand, the nominate race of the Southern Grey Shrike preys on mammals most frequently in autumn and winter. The presence of reptiles in the diet, however, increases towards the southernmost latitudes. The importance of reptiles in the shrike's diet in the Canaries could be influenced by the high availability of lizards, one of the main ecological characteristics of these islands.

Throughout its range, the Loggerhead Shrike's principal food during warmer months seems to be arthropods, especially grasshoppers where these are abundant, but small vertebrates, such as amphibians, reptiles and small mammals, are regularly taken, as are other passerines. Vertebrates are of greatest importance in the colder months, when arthropod abundance declines, and they can sometimes account for 50–76% of the shrike's diet. Reptiles and amphibians, often combined under the term "herptiles", are taken mostly in the spring, when the herptile populations are high, following hatching events, and the juvenile shrikes are learning to forage. Birds are taken usually in the winter and spring, which are energetically intense periods for wildlife. These birds are usually of the same size as or smaller than the shrike itself, but larger prey recorded as being taken include, for example, the American Robin (*Turdus migratorius*) and the American Mourning Dove (*Zenaidura macroura*). Mammals, too, are captured primarily in winter, although with less frequency than birds, probably because they are less accessible beneath a snow layer during

temperate winters. In various studies, the dietary components of Loggerhead shrikes were, by number of prey items, 68% insects, 4% spiders (Araneae) and 28% vertebrates, although the latter, because of their larger size, may comprise a greater portion of the biomass consumed.

A list of specific prey items of the Loggerhead Shrike reported in the general literature incorporates a wide range of species. Mammals listed include the meadow vole (*Microtus pennsylvanicus*), sagebrush vole (*Lemmys curtatus*), white-footed mouse (*Peromyscus leucopus*), pocket mice (*Chaetodipus*), kangaroo rats (*Dipodomys*), shrews (Soricidae) and the thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*), with one record of a full-grown cotton rat (*Sigmodon*); birds include the Chimney Swift (*Chaetura pelagica*), New World warblers (Parulidae), sparrows and buntings (Emberizidae), finches (Fringillidae), a single record of a Northern Cardinal (*Cardinalis cardinalis*), American Mourning Dove and Horned Lark (*Eremophila alpestris*); in addition, the American green tree-frog (*Hyla cinerea*) and its relative the spring peeper (*Pseudacris crucifer*) are recorded as prey, and invertebrates listed include grasshoppers, crickets (Gryllidae), beetles, butterflies, moths, bees and spiders. On one South Carolina island, analysis of Loggerhead Shrike pellets indicated that earwigs (Dermaptera) formed 17.1% of the species' diet, ants (Formicidae) 13.9%, crickets 13.1%, grasshoppers 8.7%, and side-blotched lizards (*Uta*) 6.7%. In New Mexico, a shrike was seen to be carrying, presumably having killed, a desert massasauga rattlesnake (*Sistrurus catenatus*) about 40 cm long and weighing some 35 g, although this is probably an abnormal case.

In general, it seems that shrikes select smaller, easier-to-catch prey when these are available, and that they attack larger prey opportunistically and in times of food scarcity. Shrikes occasionally take carrion and scavenge meat scraps left by raptors, which may represent a "last-resort" food source during the winter months when live prey are scarce. Some individual variability in prey choice is apparent, some individuals having a preference for specific types of prey.

Pellets, which are regularly regurgitated by all laniids, collect at the base of the favourite perches or impaling sites within a shrike's territory. They contain the indigestible parts of the prey, and include bones and fur of mammals, bones and feathers of

True shrikes are capable of capturing surprisingly large prey, including some rodents. However, the tendency to hunt vertebrates varies widely. Tropical species are often largely insectivorous, but those of higher latitudes may rely exclusively on birds and mammals during cold weather. In the snowy Finnish winter, for example, the **Great Grey Shrike** survives by consuming large numbers of *Microtus* voles, harvest mice (*Micromys minutus*), and common shrews (*Sorex araneus*). Unlike raptors, all shrikes capture and kill vertebrate prey with the beak, rather than with the feet. When conditions are particularly tough, they are also known to scavenge carrion or meat scraps left at raptor kills.

[*Lanius excubitor excubitor*,
Liminka, Finland.
Photo: Markus Varesvuo]





birds, bones and skin of reptiles, and the chitinous remains of invertebrates. Pellets are formed 40–50 minutes after the shrike has consumed a full meal. Study of these pellets is a widely employed technique for identifying the diet of shrikes; the results, however, must be treated with caution, because they tend to underestimate those prey having soft body parts and, of course, those that are completely digested.

A study of Red-backed Shrike predation on small mammals at León, in north-west Spain, was based on pellet analysis and the identification of prey caught, and compared the chosen diet with prey availability. The shrikes preferred mammals associated with forest edge and open areas with scrub, avoiding those of wooded areas. They caught both young and adults of smaller species, but only young of larger ones. The local habitat use and diet of Red-backed Shrikes were studied also in south-west Finland. From an analysis of a total of 688 pellets, carabid beetles constituted 29.1% of the prey and bees, especially bumblebees (*Bombus*), 18.3%; the rest was made up mainly of representatives of other beetle families, with 21.6%, other Hymenoptera, with 12.6%, and Orthoptera, 8.3%. In the diet, beetles decreased whereas Apidae and Orthoptera increased as the season progressed, reflecting changes in the abundance and the vegetation-dependent availability of these insects. Breeding shrikes were found in natural unmowed meadows and in areas created by forestry, and there was little difference between the two habitats in terms of the shrike's territory size, the starting date of incubation, breeding success, and the abundance of the main prey and its percentage of the diet. In the post-breeding season, however, shrikes showed a particular preference for meadows, this in part related to a high abundance of Orthoptera in this habitat, which was corroborated by diet analyses. In addition, factors minimizing the risk of predation, such as the open aspect of meadows, may have contributed to the observed habitat selection.

In another study of the dietary preferences of the Red-backed Shrike, this time in Poland, and based on analysis of prey remains in pellets, at impaling sites and in nests, the diet consisted almost totally of insects. The proportions of the different taxa, especially for hymenopterans and orthopterans, varied according to the method of food analysis. There were significant differences in species composition when this was evaluated separately

for each of the sites within a shrike's territory. Red-backed Shrikes evidently preferred beetles and hymenopterans, and avoided flies (Diptera) and arachnids, the degree of preference again depending on the method of analysis used.

A comparison was made between a nesting Great Grey Shrike, representing a small predator, and a nesting Common Kestrel (*Falco tinnunculus*), a larger predator, hunting in the same clearing. Both predators carried most large prey, in the form of mammals, to the nest and consumed all small prey, insects, at the capture site. The smaller predator, the shrike, carried most lizards, representing medium-sized prey, to the nest, whereas the larger kestrel consumed most lizards at the capture site, although the distance from the capture sites to the nest was the same for each predator. If this pattern applies in general, it is likely that traditional nest-based food analyses overestimate the proportion of lizards in the diet of the Great Grey Shrike and underestimate it in that of the Common Kestrel.

The ability of predators to kill prey depends on the ease with which the latter can be captured and handled, and the matter of prey vulnerability therefore becomes one of paramount importance. There is a direct relationship between the difficulty of capture of a prey species and the proportion of substandard individuals of that species in a shrike's diet. This was found to be the case especially when shrikes fed on birds, as opposed to when they fed on rodents. In ordinary conditions, shrikes tend to ignore healthy individuals because of the energetically expensive challenge of capture, but predatory behaviour appears to be stimulated by circumstances that render such prey vulnerable to attack. For example, the Loggerhead Shrike has been observed to grab a Savannah Sparrow (*Passerculus sandwichensis*) seconds after it was shot and hit the ground, and to catch and impale a Grasshopper Sparrow (*Ammodramus savannarum*) after it was hit by a truck; this laniid has been seen to seize birds when they were feigning injury, or attending nests, or in exposed situations in open areas.

The effects of Southern Grey Shrikes on the seed dispersal of the solanaceous plant *Lycium intricatum* were studied on Alegranza, a small xerophytic island in the Canaries. Totals of 146 shrike pellets and 123 Atlantic lizard (*Gallotia atlantica*) droppings were analysed, and the pellets were found to contain 611 *Lycium* seeds and the lizard droppings 224. *Lycium* fruit remains, including seeds, were present in 50% of the pellets and 31.7% of the droppings. Intriguingly, there was a significant coincidence of *Lycium* seeds with the presence of lizard remains in shrike pellets, and it seems clear that seeds in the shrike pellets originate from fruit consumed by lizards that have subsequently been preyed on the shrikes, and not directly from fruit eaten by the shrikes themselves. Seeds from shrike pellets had significantly higher germination rates than did those from uneaten fruits and from lizard droppings, and it seems probable that differences in retention time and treatment in the gut between the two species are main factors influencing the germination process. It has been estimated that a seed takes on average 2.42 days to pass through the gut of the Atlantic lizard, whereas a seed is retained inside a shrike gizzard for a much shorter time, only 45–55 minutes. This appears to be an example of the very poorly known phenomenon of indirect seed dispersal, which seems to play a comparatively important role on small islands where the interaction between animals and plants is very intense.

Still in the Canary Islands, the diet and prey selection of the Southern Grey Shrike were studied in the xeric coastal area of Tenerife. The main aim of this study was to compare the diet on Tenerife with those of continental populations of the Southern Grey Shrike and those of the Great Grey Shrike. A total of 5112 prey items from 440 pellets was analysed, and the majority of the prey, 85.4%, was found to consist of beetles, mainly of the families Curculionidae and Tenebrionidae, the rest consisting of other arthropods and vertebrates. In terms of biomass, the bulk was made up mainly of vertebrates, especially lizards, which accounted for 64%. Although slight seasonal variations were apparent, beetles and lizards featured prominently in the diet in all seasons. A positive selection for some beetles and some non-formicid Hymenoptera, and also for the desert locust (*Schistocerca gregaria*), was detected. The importance of lizards in the diet of

Intensive studies of the Loggerhead Shrike have revealed that roughly 70% of its diet consists of insects. In addition, it consumes a range of other arthropods, such as spiders (Araneae) and crayfish (Decapoda). The rest of the diet is made up of vertebrates, including frogs, rodents, birds and reptiles. Amongst some of the unexpected prey items are the thirteen-lined ground squirrel (Spermophilus tridecemlineatus), the Chimney Swift (Chaetura pelagica) and the American green tree-frog (Hyla cinerea). This bird has captured a horned lizard (Phrynosoma).

[*Lanius ludovicianus*, Texas Forshage Ranch, Edinburg, Texas, USA. Photo: Bill Gozansky/VIREO]

this insular shrike population could be related to three ecological factors: the high abundance of lizards on such islands, the greater effectiveness of predation, and the lower energy investment required to capture them. The data accord with the hypothesis that the Southern Grey Shrike relies on cold-blooded prey in hot weather, such as the south of France, whereas the Great Grey Shrike relies mainly on warm-blooded prey in cold conditions, as found in Scandinavia.

Selective predation by Southern Grey Shrikes on small mammals was studied in north-western Spain. The shrikes favoured semi-open habitats and, as a consequence, exhibited a preference for the species of small mammal associated with forest edge, farmland, scrubland and other open areas with scattered shrubs and trees. They avoided small-mammal species related to other habitats. The shrikes did not discriminate among the sizes and ages of small species of shrew, mouse and vole, but they did prefer smaller and younger individuals of medium-sized species.

Shrikes are "sit-and-wait" predators, spending a great deal of time on perches of various kinds. They catch their prey mainly on the ground, but in fair weather, when aerial insects are often numerous, they catch many winged invertebrates by hawking them in the air. They also hover at times. Co-operative hunting by shrikes appears to be rare, and there is only one published report to date: in eastern Oregon, USA, a pair of Loggerhead Shrikes were seen combining to kill a garter snake (*Thamnophis*) and carrying it to their nest.

The hunting behaviour of Woodchat Shrikes in northern Switzerland was studied by direct observation of five pairs. The shrikes fed only on arthropods, preferring larger ones, although in poor weather they were dependent on smaller ones. During warm and dry weather the insect activity increased, and more insects were seen in tall vegetation than in short growth. The shrikes hunted both on the ground, which accounted for 64% of attacks, and in the air, where 36% of capture attempts were made. Ground-hunting was practised mainly in areas with short vegetation, on average 7 cm high, and in terms of energetics was of greater benefit than was aerial flycatching owing to the larger average prey size and the shorter hunting distance involved. The proportion of time which the adults spent in flight was longest during the nestling stage of breeding. The total hunting activity of the adult shrikes was slightly increased during the incubation and nestling stages, but reduced in

the period before incubation and after the fledging of the young. It appeared that the Woodchat Shrikes in this study spent less time in flight when hunting over short vegetation than when hunting over taller growth.

Soobramoney and colleagues analysed the variations in foraging behaviour of four subpopulations of colour-ringed Common Fiscals along an altitudinal gradient in South Africa, revealing some interesting results. There were clear differences between the four subpopulations in the height of perches used, the attack distance and the length of prey, as well as in the rates of attack, capture and success. During winter, the fiscals obtained more food by increasing their attack and capture rates and by taking larger prey items. Foraging success varied according to the size of prey attacked, and, with the exception of one subpopulation, was higher in winter than in summer. Common Fiscals exhibited considerable variability in feeding strategies and foraging parameters, and showed that they are highly opportunistic. Invertebrate prey was important, accounting for more than 90% of items, while vertebrates made up less than 10%. The authors of this study reasoned that, even if shrikes seek to maximize their chances of locating larger, higher-energy prey, the low capture rates of these, combined with the short duration of hunting attempts when capturing smaller prey, mean that small prey can be taken with little cost while waiting for "better" food items to appear.

Mackinnon's Shrike (*Lanius mackinnoni*) in Central Africa has been observed to follow carnivorous ant swarms when on forest edges, and to prey on insects attempting to escape from the ants. In western Poland, the Great Grey Shrike preyed on adult amphibians, including poisonous toads. These shrikes practised a novel form of behaviour, skinning the toads before consuming them. This action is logical, because, like the parotid glands behind the toad's eyes, toad skin is poisonous, containing irritant bufotoxins. Although amphibians were present in a large number of the shrike territories being studied, in only a few of these did the researchers record cases of predation on amphibians, including toxic species. Only a few adult shrikes from the population studied were able to feed on toxic amphibians, indicating that individual experience may perhaps play a crucial role.

Although having stronger legs than those of other passerines, and despite being similar to diurnal raptors in their predatory behaviour, the Laniidae do not possess the strong talons of the raptors, utilized by the latter when dismembering prey. It has been

Many species of *Lanius* appear to subsist on a diet made up largely of orthopterans. This is presumably a function of the abundance of grasshoppers and their relatives in the grassy or shrubby habitats favoured by shrikes. The other main quarry are beetles (Coleoptera). In migratory species, such as the **Isabelline Shrike**, there is much seasonal variation in diet. In terms of species composition, there is little overlap in insect fauna between the Asiatic breeding grounds, the East African wintering grounds, and migration stopovers in the deserts of the Middle East.

[*Lanius isabellinus*, Sun Farms, Sohar, Oman. Photo: Hanne & Jens Eriksen]



suggested that they have overcome this limitation by evolving the behaviour of impaling prey or wedging food items in branch forks, which permits them to increase the size of exploitable food items. The unpredictable and transitory nature of food surplus seems to have been a crucial factor in the initiating of impaling behaviour. Moreover, the composition of caches of impaled food was found in several studies to be a function of the distribution and accessibility of the prey. Nevertheless, shrikes are able to grasp prey with the foot, and to eat smaller items or dismembered pieces of larger prey in the manner of a parrot (Psittacidae), by raising the foot to the bill.

In the context of the Laniidae, "impaling" is defined as the skewering of prey on a sharp projection, such as a thorn, twig or barbed wire. "Wedging" is the placing of the item in the fork of a branch, barbed wire or similar substrate, allowing the shrike to manipulate and feed on the food. Almost all *Lanius* shrikes impale their prey, but the regularity of this behaviour varies among species and even within species. It is a regular practice of the larger shrikes, which need to "anchor" vertebrate victims in order to dismember and eat them. The evolutionary development of this unique behaviour, however, is unstudied, although its ontogeny in young shrikes is well known. Other avian groups display similar types of behaviour. For example, some Australian butcherbirds (Cracticidae) and African Southern Boubou Shrikes (*Laniarius ferrugineus*) are known to wedge prey in forks, apparently to save handling time, but these species never impale prey on thorns. In contrast, the Laniidae impale vertebrate prey on sharp objects, decapitate them and, in most cases, consume the brain before other body parts. Both wedging and impaling are considered to facilitate the dismembering of prey items at lower energetic cost to the predator.

Most studies of impaling have focused on one or more of four species, namely the Loggerhead, Red-backed, Woodchat and Great Grey Shrikes. Field observations confirm that the ability to impale prey develops in the young of these species in the first four to five weeks after fledging; although impaling may be innate in young shrikes, it has been found that it could be mastered only through practice and experience. This idea is consistent with the findings that, among avian predators, capture rate, capture efficiency, prey size and handling time improved with the age of the individual, indicating that there is a learning component in avian predatory behaviour. The type of implements available during a young shrike's learning period will determine its impaling tendencies for the rest of its life; shrikes raised in the vicinity of thorns favour impaling on thorns, while those which are accustomed to the presence of branch forks and the like in their surroundings prefer to wedge their prey.



After capturing a prey animal, the shrike transports this to a perch. Smaller prey items, those equivalent to 9–58% of the shrike's own body weight, are carried in the bill, while larger prey, those 61–131% of its body weight, are carried in the feet. Once at the perch, the shrike snaps the neck of its victim, using the tomial notch of its bill or a sharp blow to the back of the prey's head.

During the breeding season, many impaled prey items are stored to form a cache, or "larder", which serves to attract mates and to allow females to feed during incubation without leaving the nest vicinity. In a study of the temporal and spatial patterns of impaling exhibited by a migratory population of Loggerhead Shrikes, it was found that in 88% of 24 breeding territories the pair impaled prey. Insects and reptiles were the most common victims, comprising 56% of such animals. The number of impaled prey was highest during the nestling stage, and shrikes also impaled items at sites closer to the nest during this stage than during either the incubation or the fledging stages. There was a positive correlation between the abundance of impaled prey and the number of young fledged from the nests. The results suggested that potential or realized demand was a major factor affecting impaling patterns, and that supplemental food for delivery to incubating females and to nestlings was a significant function of impaling during the breeding season.

A similar study was undertaken in western Poland, this time involving a resident population of Great Grey Shrikes. Several seasonal shifts in the pattern of impaling behaviour were apparent, these being expressed as changes in the prey species found at larders, the level of food consumption and the concealment of impaling sites, as well as in the spatial distribution of larders. During the pre-breeding period, males impaled more prey before mating than they did afterwards, the majority of larders were located on borders of territories and in exposed sites, and a large proportion of the impaled food was left uneaten. All of this suggests that during the mating period impaling behaviour has a signalling function. During the breeding stages, on the other hand, the distance from larders to nests decreased, more prey were stored in well-concealed sites, and a larger proportion of the stored food was consumed; in this period, therefore, impaling was primarily a means of storing food.

Another study focused on the temporal and spatial patterns of food-caching by two sympatric species in north-west Spain, the Southern Grey Shrike and the Red-backed Shrike. It was found that Southern Grey Shrikes stored food mainly during the non-breeding season and Red-backed Shrikes during the breeding period, the incidence of caching being dependent on prey availability and the shrikes' energy requirements. For example, the food-caching rate of Red-backed Shrikes increased as the number of nestlings increased. Southern Grey Shrikes used 62% of their stored prey, most of it within nine days. Red-backed Shrikes, however, usually utilized their caches within 24 hours, mainly at dawn and dusk, and used 88% of their stores. The preferred sites for larders were hawthorn and blackthorn (*Prunus*) bushes with long, thin and cylindrical thorns, whereas rose and bramble (*Rubus fruticosus*), which have short, broad, laterally flattened thorns, were avoided by both species. Red-backed Shrikes scattered their larders; the distance between the nest and the stored food depended on the availability within the shrike's territory of suitable thorny shrubs, but there was a tendency to impale food close to the nest.

In this Spanish study, the shrikes selected the upper and inner parts of the shrubs for caching, presumably in an attempt to conceal the food from potential kleptoparasites. In addition, there was an apparent link between prey colour and the colour of the bush on which it was stored, suggesting that cryptic coloration was a factor in the choice of cache site. Nevertheless, at least 6% of the prey stored by the Red-backed Shrikes was lost, mainly to wasps. It is of interest that kleptoparasitism has been recorded in several other studies. Prey animals impaled in conspicuous sites are especially susceptible to being stolen by neighbouring shrikes, or by transient or dispersing individuals moving through the area. Moreover, predators such as Little Owls (*Athene noctua*) and kestrels from neighbouring territories sometimes steal the shrike's caches in order to supplement their own diet, some even doing so on a regular basis.

Millipedes (Diplopoda) are rather noxious creatures, and they appear to be avoided by most birds.

The only shrikes reported to eat them are the African species in the genus Eurocephalus, although the related Yellow-billed Shrike can be added to the list, as this photograph attests. This individual may have unearthed its prey while feeding on the ground, as the species has occasionally been observed hopping about, turning over leaf litter and pulling worms from soft earth in a very unshrike-like manner.

[*Corvinella corvina togoensis*,
Jos Plateau, NC Nigeria.
Photo: A. P. Leventis]

Shrikes habitually manipulate their prey to prepare it for consumption. In the case of venomous invertebrates, such as wasps, bees and other Hymenoptera, this involves removing the sting from the abdomen. The technique of sting-removal appears to be innate, and has been reported from several members of the family. Even non-venomous insects tend to be beaten against a hard surface, or shaken rapidly with the bill, as demonstrated by this juvenile **Common Fiscal**. These manipulation techniques help to remove wings, legs, carapaces and other indigestible body parts.

[*Lanius collaris humeralis*,
Aberdare National Park,
Kenya.
Photo: Arthur Morris/VIREO]



Caches made prior to pair-bonding and before the onset of the breeding season may indicate to females the quality of individual males, and the latter's potential to supply sufficient food for the female and young. During the prenuptial period, male shrikes have been observed to impale inedible objects such as rags, snailshells and eggshells, faecal sacs and even bread crusts, ostensibly to boost the visual impact of the cache. It has been suggested that male quality might be assessed not only by the visual impression of the cache, but also by the species composition of the larder, even though such caches are subject to kleptoparasitism. In addition, fitness has been found to be positively correlated to initial cache size. Males with larger caches not only had greater breeding success but also were more frequently polygynous. The fact that shrikes often persist in maintaining conspicuous larders even when their young have hatched and that they impale inedible objects while under constant threat from kleptoparasites, which may even endanger their young, has prompted several authors to suggest that such "exhibitionism" might assist in reducing the energetic costs of territorial defence during the most strenuous part of the birds' annual cycle. In fact, it is thought that impaling may play a role in the advertising of territory ownership and in defining territorial boundaries. Other suggestions are that food-hoarding, the creation of a larder for later use, is the major function of impaling. It was also proposed that the impaling by shrikes of old nest material for subsequent reuse could result in inedible objects remaining impaled after the new nest has been constructed. K. M. Burton suggested that this behaviour could have been the progenitor of the impaling of large prey items for dismemberment. Others have theorized that impaling might serve to divide tasks between the parents, such that the males hunt and impale prey while the females feed themselves and their young from the larders.

Impaling appears to be an innate behavioural characteristic that is refined by learning and practice. Fledgling shrikes play with inedible objects while still being fed by their parents, and they indulge in "dragging" behaviour that later develops into what has been termed "dabbing", which involves holding the prey with the tip of the bill and thrusting it towards nearby objects. Once the young are able to catch their own prey, they develop individual variations in their prey-handling techniques. Young shrikes use the act of impaling solely as a means of facilitating the dis-

membering of prey. They also return to use sites where they had successfully impaled items previously, usually at places where they had engaged in dabbing, and it appears that this fidelity to impaling sites has carried over into their adult life.

An interesting utilization of impaling for a purpose other than that for which it evolved, a phenomenon known as exaptation, was found for Loggerhead Shrikes in the USA. Aposematically coloured lubber grasshoppers (*Romalea guttata*), which possess chemical defences, were impaled by these shrikes, left until the deterrent chemicals had decomposed, and only later consumed. Sexual selection by females appears to have been a force behind the various other exaptations of impaling reported to date. One may hypothesize that in the past, when females arrived at the breeding grounds, they evaluated the male and his territory quality by observing the locations of his cache sites and their contents; in response to the females' behaviour, the males probably resorted not only to killing more prey than they needed and impaling the surplus in their caches, but also to adding small prey items that could otherwise be consumed with relatively little handling cost. In order to enhance the visual impression of the cache, males also impaled objects that were inedible but often colourful, and it was probably at this stage that aposematically coloured, chemically defended insects were impaled, initially as visual cues but later, after detoxification, becoming edible. The culmination of this process is that those males having the biggest food larders mate with the earliest-arriving females, enabling them to make more than the average number of nesting attempts and to produce a large number of young, or, in extreme cases, to breed simultaneously with two females.

During the courtship-feeding stage (see Breeding), the food offered to the female by the male is invariably fresh. Later, when the female is incubating or brooding the nestlings, the male can supplement the prey brought to the nest with items from his larder, replenishing the cache when time allows. Male Southern Grey Shrikes do not feed the chicks until the latter are at least five days old, the nest being the exclusive domain of the female, which does all the brood-feeding. Incubating or brooding females have been observed to fly to and eat directly from the cache. The amount of prey in these larders drops significantly during the fledging and post-fledging periods, when the young consume all the food and the parents impale only in order to dismember the larger prey



items, the pieces being then transported to the young. In most cases when an impaled vertebrate was decapitated, the male consumed the brain and the head, and the body was delivered to the female and the young.

A study of the Lesser Grey Shrike in Slovakia revealed that in natural conditions this species seldom stored food or impaled prey. Only when the shrikes were experimentally provided with a temporary, spatially clumped food surplus did they hoard food, and repeated exposure to such surpluses significantly increased the impaling rate. It was suggested that the low caching rates of the shrikes might be due partially to lack of experience. Males, rather than store food, preferred to feed any surplus to the female. The researchers concluded that the Lesser Grey Shrike is likely to cache prey only when its immediate food needs are satisfied as a result of a temporary abundance of suitable prey, a situation which probably occurs seldom in nature. This variable, combined with a probable dearth of suitable impaling sites, may result in there being few stimuli for shrikes to cache food, thereby limiting the learning process in this species. This, in turn, could explain why the Lesser Grey Shrike has a comparatively poorly developed propensity for impaling and hoarding food.

So far as is known, neither the two *Corvinella* species nor the two *Eurocephalus* white-crowned shrikes impale their prey. Unlike the *Lanius* shrikes, the members of these two Afrotropical genera appear not to store food.

Breeding

Monogamy is the predominant breeding system of most of the Laniidae. Nevertheless, under certain environmental pressures, such as biased sex ratios wherein females outnumber males, or when a marked difference in quality among males is observed during the pre-breeding season by females (see Morphological Aspects), several species may sometimes practise polygyny. Po-

lygyny has been recorded for Southern Grey Shrikes in Israel, for Great Grey Shrikes in Austria and Poland, for Red-backed Shrikes in Poland and Sweden, and for Loggerhead Shrikes in North America. Polygynous pairs of Southern Grey Shrikes in Israel had the choice of two different breeding strategies. Males with large food caches used a different strategy from that adopted by conspecifics with small caches. Pairs with large caches used a parallel strategy: the females laid a second clutch soon after the first had hatched, and males cared for the first brood. Those pairs with small caches employed a serial strategy: both parents cared for the young until the latter fledged, the male doing all of the provisioning, and the females laid the next clutch after the first brood had fledged. Pairs which adopted the parallel strategy were significantly more productive, having more breeding attempts, laying many more eggs and rearing many more young in the season than pairs which adopted the serial strategy.

Extra-pair copulations have been recorded for at least five members of the Laniidae. They can be costly for both sexes, especially if they are detected by a social partner. The threat of extra-pair fertilization of the partner could result in reduced parental investment or divorce. In order to reduce the costs of extra-pair copulations, natural selection may favour behaviour that reduces the likelihood of its being detected by a partner. Moreover, habitat structure may influence the efficiency of a male's mate-guarding behaviour and, therefore, the possibilities of occurrence of extra-pair copulations. In studies of the Great Grey Shrike, a socially monogamous passerine of semi-open habitats, it was found that individuals of both sexes selected more secluded sites for extra-pair copulations than for within-pair copulations. For females, the costs of participating in extra-pair copulations are an interesting topic. An obvious potential cost to females, one proposed in theory, is that of physical sanctions by the male partner, although retaliation and punishment by male partners have not been experimentally demonstrated. A team of European researchers, combining field observations and a field experiment, found that, with the Lesser Grey Shrike, there was a high rate of intrusion by extra males during the female's fertile period, and that extra-pair copulations occurred in the population; when females were "detained" during the fertile phase, males retaliated physically against their partners, thereby increasing the costs related to female extra-pair behaviour, but there were no obvious costs to males of "punishing" the mate. Interestingly, DNA-"fingerprinting" revealed that, in this Lesser Grey Shrike population, extra-pair paternity was rare or non-existent, although it could not be proven that this apparent monogamy at the genetic level was the result of male retaliation. The researchers suggested, however, that in future studies the males' strategies should be considered when attempting to explain interspecific variation in extra-pair paternity.

Further, the aggressiveness of male shrikes during the fertile period of their females may be a method of preventing extra-pair copulations. Hence, the level of aggression of Red-backed Shrikes was tested experimentally, by placing a stuffed male at a distance of, in most cases, 10–20 m from active nests. At each stage of the breeding process some males ignored the dummy or did not more than approach it, while others attacked it weakly or fiercely. With two exceptions, the breeding females took no notice of the stuffed male. The reactions during the nest-building and laying periods were, on average, stronger than those during incubation, diminishing further during the nestling stage.

In the USA, a genetic study of Loggerhead Shrikes in Oklahoma used six nuclear microsatellites in order to assess the extent of intraspecific brood parasitism and extra-pair paternity among 218 offspring from 44 broods. In this, the first genetic assessment of parentage in a wild population of Loggerhead Shrikes, it was apparent that no offspring were the result of intraspecific brood parasitism, but eight young from five families, representing 4% of all offspring, had been sired by extra-pair fertilization.

Overlap among the home ranges of breeding male Red-backed Shrikes in a valley in the Lombardy Alps, in Italy, was correlated with the results of DNA-fingerprinting for six family groups. One out of 19 young had paternity different from that assumed on the basis of behavioural observations. In addition, after the young

Once insects have been captured, and duly beaten and prepared for consumption, shrikes often eat their prey directly. As with most insectivores, they will often manoeuvre large prey in the bill to ensure that it is correctly orientated. This **Chinese Grey Shrike** has returned to its hunting perch to swallow a recently caught orthopteran in typical fashion: head first. This large species, a member of the *Lanius* excubitor group, occurs widely in East Asia from Mongolia and Russia across much of China to Korea.

[*Lanius sphenocercus sphenocercus*, Wild Duck Lake, Beijing, China.

Photo: Qiao Yi-lun]

shrikes had fledged, several recorded instances of the care of juveniles being shared by more than one pair of adults were observed. Occasionally, unmated individuals of this species help in the task of brood-rearing, at times to the virtual exclusion of the breeding pair. Although co-operative breeding has been described for a few tropical members of the Laniidae, this seems to be the only example documented outside Africa.

Co-operative breeding, involving a breeding pair and a variable number of helpers, is practised by both of the *Corvinella* shrikes and both *Eurocephalus* species, as well as by at least one African species of *Lanius*, the Grey-backed Fiscal. Two sympatric species of *Lanius* were studied near Lake Naivasha, in Kenya, in an effort to understand the ecological factors favouring the evolution and maintenance of co-operative breeding. The co-operatively breeding Grey-backed Fiscal occupied territories having significantly greater tree and shrub cover than those occupied by the Common Fiscal, which is not a co-operative breeder; in addition, areas with greater vegetation cover held significantly more insects in the dry months of the year than did relatively open sites. Possibly associated with these differences in habitat and resources was a significant difference between the two species in the rate at which they disappeared during the study, population turnover among Grey-backed Fiscals being about half that of Common Fiscals. Similarly, territorial stability, as measured by the percentage of territories continuously occupied during the 18-month study, was nearly twice as high for the Grey-backed Fiscal. Within the restricted acacia (*Acacia*) woodland Grey-backed Fiscals were dominant over Common Fiscals, and in four instances the latter were observed to be driven out of their own territories by the Grey-backed Fiscals. It was suggested that co-operative breeding by Grey-backed Fiscals is related to occupancy of a stable but spatially restricted habitat of high quality; this may lead to relatively higher survival rates among Grey-backed Fiscals and, as a consequence, the habitat becomes "saturated" by the species. In such circumstances, juveniles have only limited opportunities for dispersal, and one evolutionary solution is that of group-living.

In the same Kenyan study, the roles of social and ecological factors in the maintenance of group-living were examined. Grey-backed Fiscals occurred in groups of 2–9 or more individuals, with only one breeding pair per group, the "supernumeraries" acting as helpers. The amount of perennial shrub cover in the habitat varied, and in the dry months areas with high cover contained significantly more prey items than did low-cover areas. Group size was positively correlated with shrub cover on three

of the four occasions during the three-year study when it was tested, and the average group size over an 18-month period was likewise correlated with shrub cover. Both individual survival and the number of young produced increased with increasing cover. Moreover, group size was correlated with these two factors of survival and productivity. Pairs or small groups of Grey-backed Fiscals occasionally colonized areas with poor vegetation cover, but, typically, these disappeared without having bred successfully. In contrast, high-cover areas harboured a constant number of breeding pairs and a varying number of supernumeraries. The latter appeared to have a choice between dispersal and remaining on the natal territory, the second option offering the probability that they would ultimately attain breeding status within or near the natal territory.

Male shrikes, in order to drive away rivals and to court females, sometimes execute a display in which they mimic the action of impaling prey. This is followed by courtship displays in which the male feeds the female and performs a bowing dance, as well as song and sometimes flight displays, about 7 m from the female. The female will accept prey from the male when she is ready to copulate, holding the food and lowering her upper body. Groups of neighbouring shrikes sometimes gather at the edges of territories and call at each other or perform dancing displays, behaviour which is thought to help in the establishing of pairs, as well as in reducing aggression and defining territories, thereby also indicating the location of vacant territories. Individuals may fight others in order to establish territories, but the marking of boundaries is usually done solely with vocalizations. Encounters with intruders involve bowing and fluttering displays, in which the body is held horizontal, the wings drooped and fluttered rapidly, the back feathers fluffed up, the tail spread and the head lowered, the shrike then pecking at the ground while uttering harsh calls. The rivals will face away from each other, and then whirl around to face each other and start the bowing again. If one does not retreat, a brief fight may ensue involving loud rasping calls, foot-grappling, and occasionally pecking.

Courtship feeding has been documented for a number of shrike species, and is probably a regular feature of the family. The provision of nutrients by a male can increase the female's reproductive success, and males can, therefore, use such gifts to influence female choice. Polish researchers investigated courtship feeding by Great Grey Shrikes. It was found that the males offered food both to their mate and to extra-pair females, and that food offered to the latter had a significantly higher energy value than did that offered to their own partners. There are, how-

Shrikes are skilled hunters, and sometimes capable of tackling prey up to their own body size.

In some species, individuals are known to have killed territorial rivals and impaled them in thorny larders. In others, individuals have been observed catching unrelated bird species, often in flight. The number and variety of birds hunted by shrikes is astonishing, but most reports involve small passerines. This Great Grey Shrike is carrying what looks like a sparrow (Passer).

[*Lanius excubitor bianchii*,
Obihiro-si, Hokkaido,
Japan.
Photo: Hirozo Maki]





One of the most famous attributes of shrikes is their habit of caching prey items by impaling them on thorns at traditional sites in the territory. This **Red-backed Shrike** is attending a typical shrike "larder", with one beetle and one male wall lizard (*Podarcis muralis*). The functions of this behavioural trait are unclear, but they may have something to do with mate attraction or reproductive success. For example, it is possible that females choose mates on the basis of how much food they have been able to stockpile, or that a well-stocked larder allows breeding pairs to invest more time and less energy in incubating or provisioning the brood.

[*Lanius collurio collurio*, Ariège, France.
Photo: Dave Watts]

ever, very few definite examples of courtship feeding prior to extra-pair copulations. The size of the prey being offered to a female may enable her to assess a male's quality. The observations revealed that a larger gift resulted in a higher chance of copulation for the male, whether with its own mate or with an extra-pair female, and it was concluded that the energy value of additional food received through courtship feeding by males could explain why females of some species engage in extra-pair copulations.

Ornithologists studying Red-backed Shrikes in Sweden found that courtship feeding had an influence on clutch size. Males, through courtship feeding, directly influenced the number of eggs the females laid, but the mechanism behind the female response is at present unknown. In Japan, however, the rate of courtship feeding by Bull-headed Shrikes was not associated with copulation, but was most frequent in the cold season, during the critical stages of egg-laying and incubation. This suggests that it is important for the early breeders in that it helps the female to build up reserves while the ambient temperature is low and food is scarce.

Most shrike species hold all-inclusive and non-overlapping breeding territories within which mating, foraging and brood-rearing take place. Territory size varies according to the species, and also in relation to such factors as population density, habitat characteristics and resource availability. Males attract mates through song and through the maintenance of large food caches (see Food and Feeding). These stores often include colourful inedible items, presumably to increase their attractiveness to possible mates. Males with more prey in their caches attract more females, and their mates generally lay more eggs and fledge more young than those paired to males with smaller larders.

In studies of Loggerhead Shrikes carried out in Canada, the average size of territories in south-east Alberta, at the northern limit of the species' range, was 8.5 ha. Although there were small differences from one year to another, territory sizes did not differ between the incubation and nestling periods. Territories were larger than those in more central parts of the range, probably because the region is more arid and prey fewer in number.

An important characteristic discovered in recent years is that shrikes appear to "clump" their nests in certain areas, as was found, for example, with Loggerhead Shrikes in Oklahoma. A statistical analysis of Loggerhead Shrike territory distribution

produced some interesting findings. When the data were examined without regard paid to the dates of nest establishment, the results were equivocal. When the times at which nests were established were taken into account, however, the later ones were far more likely to be closer than expected to pre-existing nests of conspecifics. This was true even when the distribution of resources such as suitable nest-sites was included in the analysis. Similarly, in Idaho, Loggerhead Shrikes usually nested in proximity to others of the species, even in large areas of sagebrush, and this was thought possibly to offer additional awareness of nearby predators and/or to increase the ability of individual shrikes to find mates. These findings support the hypothesis that Loggerhead Shrikes, when looking for suitable breeding habitat, are guided by and base their selection on the distribution of breeding conspecifics. This clumping of nests has been reported also for the Red-backed Shrike across much of its distribution, the Brown Shrike and Bull-headed Shrike in Japan, and the Common Fiscal in South Africa.

Predation is possibly an important factor affecting an individual's behaviour and general life, but few studies have focused on the question of whether predators affect the prey species' selection of breeding habitat. A study in Sweden tested whether breeding-habitat selection and reproduction by the Red-backed Shrike were linked to the presence of breeding pairs of the shrike's potential nest predators, which were the Eurasian Magpie (*Pica pica*), the Hooded Crow (*Corvus cornix*) and the Western Jackdaw (*Corvus monedula*). An artificial experiment with nests mimicking those of Red-backed Shrikes indicated that only Eurasian Magpie and Hooded Crow territories were associated with an elevated risk of predation. Among Red-backed Shrike nests in the wild, the predation risk was likewise greater for those close to nests of these two predator species than it was for nests elsewhere in the landscape. Occupation frequency of known Red-backed Shrike territories during the study increased with increasing mean distance to the nearest magpie nest. In addition, changes in the spatial distribution of corvids affected the spatial distribution of the shrikes. It was found that vacant Red-backed Shrike territory sites were more likely to become occupied in the following year when Eurasian Magpies and Hooded Crows had moved away, and, conversely, occupied sites were more likely to be abandoned in the following year when crows had moved closer. The evidence indicates that the breeding territories of nest predators may,



Whether shrike larders are sophisticated foraging adaptations or sexual signals is debatable, but the act of impaling prey seems relatively straightforward to explain in terms of evolutionary origins. It probably arose because it solves a simple mechanical problem, namely prey handling. Shrikes have trouble manipulating vertebrate prey because their bills and feet are relatively small and weak compared with other raptorial birds. Thus, impaling helps to "anchor" vertebrates so that they can be more easily dismembered and eaten. As if to demonstrate this idea, a **Southern Grey Shrike** is able to break up a small rodent into bite-size pieces using only a handy thorn. One outcome of prey caching is parasitism: shrike larders are often raided by neighbouring pairs, or even by other avian predators such as owls or falcons.

[*Lanius meridionalis*
meridionalis,
 Casasola de Arlón,
 Valladolid, Spain.
 Photos: Alejandro Torés]

indeed, have an influence on the breeding-habitat selection of their prey.

Intensity of nest defence increases as the breeding cycle progresses. An example is that of the Red-backed Shrike, which protects its nest aggressively, attacking predators and potential predators which approach the site. In one study, this shrike, in response to the presence of a human observer during the nesting period, became increasingly bold in its defence. The level of aggression was not, however, influenced by the number of offspring present and the time of the season, and, contrary to previous predictions, the researchers did not find any differences between the sexes in nest defence. More aggressive parents, both females and males, had significantly better breeding success than did calmer individuals.

Nests of shrikes are generally large, untidy, uncamouflaged structures, normally incorporating a variety of materials, including man-made ones, found in the breeding pair's territory. The two *Eurocephalus* species and Souza's Shrike (*Lanius souzae*) are exceptions in that their nests are small, neat, well-moulded and camouflaged, the construction and general positioning being much more reminiscent of nests of the malaconotid genus *Prionops* than of those of the *Lanius* species. Laniid nests are almost always built in thorny bushes or small trees, in hedge-rows or in the outer parts of tall trees. There are reports also of nests being placed in strongly entangled barbed-wire rolls, and one nest of a Lesser Grey Shrike was situated at the bottom of a cavity 38 cm deep. Nests are often built one or two metres above the ground, and it seems that the exact site is selected on the basis of structural aspects of the vegetation cover, and not the plant species themselves.

Both sexes gather nest material, but it is generally the female that does the construction work, taking 6–12 days to complete the task. The size of the finished nest is variable, but nests are roughly 15 cm in outside diameter, 10 cm in internal diameter, and 7.5 cm deep. In general, they are tightly woven, bulky, open cups lined with soft material. The nests usually consist of large pieces of vegetation, such as twigs, forbs and bark, with rootlets added; the lining is highly variable, including such items as flowers, lichens, grasses, moss, feathers, fur, cattle hair, string, cloth and the like. Even so, shrikes are able to alter their nest-building behaviour to suit the immediate surroundings. Typically, the nest is very well insulated, with a low level of thermal loss, this being a possible adaptation to cool, wet weather.

Nests may be reused from year to year, but it is more common for the old nest to be dismantled and the materials used for a new one nearby. When re-nesting occurs in the same season, as may occur, for example, after a failed attempt, shrikes generally tend to nest higher above the ground on their second attempt. A study in Germany looked for possible reasons why Red-backed Shrikes did not conceal their nests better. Altogether 296 nests were categorized for degree of visibility from distances of 1 m and 2 m from above and on all four sides of the nesting bush or tree. Almost half of the nests, 47%, were exposed and only 16% were well concealed, and the number of exposed nests increased as the breeding season progressed. The nests are easily detectable by predators, whether foraging actively or by accident, and concealed nests indeed had higher breeding success. The authors of the study considered the findings to reflect the lack of better alternatives in the changing habitat and limited potential nesting sites. For Red-backed Shrikes in Germany, a precondition for the establishment of a territory was the existence of vegetation suitable for nest-building. Shrikes preferred to build nests at heights of 0.8–1.6 m. The importance of the quality of the nesting bush or tree is underlined by the fact that, besides weather and predation, losses occur owing to inadequate attachment of the nest or weakness of the supporting branches, resulting in 7.5% of the nests slipping or tipping over.

In Estonia, nest-card data for the years 1942–2001 revealed that Red-backed Shrike nests had been found in 41 different plant species, but 41% of all the nests were in spruces (*Picea*). The average height of the nest tree was 2.8 m and the average height of the nest placement was 1.2 m; there was no difference in the average nest height between successful and unsuccessful pairs. On Hokkaido, in north Japan, Bull-headed Shrikes nested in dwarf bamboo and vine bushes in the early part of the breeding season, and, as the season progressed, moved their nest-sites to a variety of deciduous shrubs as the foliage load of these plants increased. Nest height increased gradually throughout the breeding season, an observation that was attributed to seasonal changes in the use of vegetation types. Thus, Bull-headed Shrikes exhibited a seasonal change in nest-sites with the progress of plant phenology, and this reduced the risk of nest predation.

In North America, the Loggerhead Shrike is a widely distributed member of Idaho's sagebrush-rangeland avifauna. In a study of its breeding ecology and nesting locations in this semi-arid habitat, most nests, 65% of those found, were constructed in

Shrikes produce a lot of pellets containing indigestible material such as mammal fur or insect chitin. These pellets have proved to be a boon for researchers because they offer a window into foraging behaviour and diet. Pellet analyses of the **Loggerhead Shrike**, for example, have shown that a population on one South Carolina island had a diet comprising 17.1% earwigs (*Dermaptera*), 13.9% ants (*Formicidae*), 13.1% crickets, 8.7% grasshoppers, and 6.7% side-blotched lizards (*Uta*).

[*Lanius ludovicianus*, San Benito County, California, USA.
Photo: Mark Chappell/
Oxford Scientific Films]



sagebrush. The height of the nest shrubs was 0.89–2.97 m, the average being 1.62 m, and the mean height of nests was 0.79 m, with the range 0.33–1.60 m. The nest variables measured did not differentiate successful nests from unsuccessful ones. Nests constructed in dense greasewood shrubs contained fewer medium-sized and large sticks, typically used in construction of the nest substructure, than did nests built in relatively open sagebrush; in contrast, there was no difference in the quantity of lining fibres, twigs and small sticks used in nests constructed in these shrubs. These findings could be due to the different nest-stabilization requirements imposed on the shrikes by structurally dissimilar nesting substrates, and suggest a degree of plasticity in the nest-building behaviour of the shrikes. In another part of the Loggerhead Shrike's range, in central Missouri, success was highest for nests in deciduous trees and lowest for those in multiflora rose (*Rosa multiflora*), possibly because rose bushes are not so structurally sound nor so thorny as those deciduous trees used for nesting. In south-central Washington nests having better concealment produced more fledged young, and in Minnesota nesting success was positively correlated with the percentage cover of grassland and fledging success with percentage cover of herbaceous vegetation and of grassland. In Manitoba, nest-sites with lower amounts of understorey (ground cover and vegetation height) were more successful, and nests in pasture were more productive than were those in cropland or in mixed habitat types.

In Idaho, the breeding density was one pair per 8.9 ha in an isolated 89-ha stand of sagebrush and bitterbrush, with an average nearest-neighbour distance of 203 m; in the same general area, it was one pair per 25 ha in a rugged 475-ha bowl of sagebrush and the average distance to the nearest neighbour was greater, at 328 m. The disparity was attributed to habitat characteristics, as the average shrub height was greater at the site with smaller territories.

Clutch size varies with latitude. Large clutches, containing 7–9 eggs, are laid at high latitudes and small clutches, of 2–3 eggs, are normal in the tropics. If the first clutch is lost, however, a comparatively smaller replacement is laid. From historical records, the average reported clutch size for Loggerhead Shrikes is 5.4 eggs, with a range of 1–9 eggs; 36% of clutches contained six eggs and 34.2% had five eggs, and at the two extremes only 0.4% were of one egg and 0.1% of nine eggs.

Eggs are laid usually in the early hours of the morning, one per day over the course of a week or so. Shrike eggs tend to be variable in colour and pattern. For example, those of the Red-backed Shrike are smooth and oval, with a ground colour varying from pale green to pinkish, buff or creamy white, and with a band of light brown, olive, brownish-red, grey or purple speckles and small blotches near the broad end or, sometimes, with the markings scattered over the whole surface or even, unusually, present only at the narrow end. The eggs of Souza's Shrike are pale green-grey, with grey, brown and purple freckles around the broad end; they seem to lack the blotching typical of other *Lanius* species.

Despite numerous studies of bird eggs, the function of egg-shell patterning remains largely unknown. Possible functions include the signalling of condition, and mimicry. It has been suggested that eggshell patterning, as well as egg size and shape, might be linked to natural selection. Description of egg variability and its causes among Loggerhead Shrikes could be particularly important, because of this species' wide distribution in North America and the uncertainty over the reasons for its population decline.

It has been postulated that egg size could be affected by climate change. During the period from 1971 to 2002, in a long-term study of Red-backed Shrikes in Poland, it was evident that egg volume decreased significantly, the shrikes arrived at the breeding sites significantly earlier, and arrival dates were correlated with the earliest first-egg dates. It was tentatively suggested that the causes of these changes might include, among other factors, changes in temperature and also in food supply, although further studies are required.

Although the mean volume of Bull-headed Shrike eggs in Japan did not change during the course of a season, the variation in volume in six-egg clutches increased in 1994 and 1995 but did not change in 1996. Peaks in arthropod biomass occurred

early in the breeding seasons in the first two of these years, but late in the season in 1996. Increased food availability was associated with reduced variation in egg volume within a clutch. A significant difference in egg size was found within six-egg clutches, the first egg being the smallest. Nevertheless, chicks that hatched from small eggs early in the hatching sequence suffered lower mortality rates than did those from large eggs laid late in the order. It was suggested that egg-size variation within a clutch was perhaps caused by a trade-off between the time required to develop an egg and the volume of the first egg within a clutch. Because eggs hatching first in sequence do not have to be large for the hatchling to survive, the Bull-headed Shrikes may start to lay the clutch earlier at the cost of reducing the volume of the first egg.

Incubation normally starts from either the last egg or the penultimate one. Females incubate while the males forage, but females generally lose weight during the period of incubation, which lasts for about 15–20 days. During this period the females turn the eggs 6–10 times daily, and often more frequently on hot days.

Hatching is typically synchronous, except in cases when incubation was started before the full clutch had been laid. The sequence in which the eggs in a clutch hatch matches the order in which they were laid, the first-laid also being the first to hatch. Hatchlings are altricial, being blind and helpless and usually naked. They vary somewhat according to species, but in very general terms they have pinkish-orange skin and a yellow or orange-yellow mouth lacking spots. On the first day their weight is in the approximate range 3–7 g, and they gain some 3 g or more daily until the twelfth day; growth then slows until the time of leaving the nest, generally between days 17 and 21, when they weigh roughly 40 g. The wings have developed fully by 15 days. The rate at which the parents deliver prey to the nestlings increases from day 6 to day 12, thereafter decreasing until just before the young leave the nest, when it reaches a peak. In the first 4–5 days, the female feeds the young with food presented to her by the male, but after this she normally spends more time in foraging and less time in brooding, while her mate feeds her less and starts to provision the chicks directly.

Many aspects of the begging behaviour of nestlings relate to sibling competition for food within the nest, and one could expect the chicks to exhibit some evidence of adaptive learning and behavioural adjustment in response to experience of the competitive environment. Researchers conducted trials involving the

Shrikes usually produce pellets while foraging or resting, and disgorge them from an elevated perch, as demonstrated by this male **Brown Shrike**. This species is common in East Asia, a region where shrikes have radiated into an impressive variety of species. It breeds from Mongolia and Siberia, to China, Korea and Japan, with non-breeding populations wintering south to Sri Lanka, the Malay Peninsula, and the islands of Sumatra, Java, Borneo, Sulawesi and the Philippines.

[*Lanius cristatus superciliosus*, Hegurajima, Ishikawa-ken, Honshu, Japan. Photo: Hirozo Maki]





Most shrikes breed in monogamous pairs and use fairly modest courtship displays. These displays sometimes involve mock food-impaling or a bowing dance by males, but the most obvious intra-pair behaviour is courtship feeding. Males in many shrike species provision females during the breeding cycle. Studies of the **Bull-headed Shrike** have shown that courtship feeding is most frequent, not prior to copulation, but during the critical stages of egg-laying and incubation. In the courtship phase, the food offered is freshly caught, but when the female is incubating or brooding, the male visits his larder of stored prey to supplement the items brought to the nest.

[*Lanius bucephalus bucephalus*, Itako-si, Ibaraki-ken, Honshu, Japan. Photo: Hirozo Maki]

hand-feeding of Southern Grey Shrike nestlings in an artificial nest, in which they created zones of differing profitability by adjusting either the prey size or the number of food items delivered. The chicks did, indeed, detect the differences and positioned themselves accordingly; by the end of both the prey-size experiment and the delivery-rate trial, the nestlings had increased the amount of time that they spent in the "high-quality zone".

In a study of Bull-headed Shrikes in Ishikari, in northern Japan, seasonal changes in the relationship between brood size, the body mass of nestlings and the body mass of parents were investigated. When broods were twelve days old, the body mass of the heaviest nestling in a brood did not differ with brood size, or throughout the season. The body mass of the lightest nestlings, however, varied according to brood size, and the body mass of the lightest nestling in broods of five and six chicks decreased throughout the season. The lightest nestling in four-chick broods and the lightest and second lightest in five-chick broods had weights significantly lower than that of the heaviest nestling in broods of these sizes. It is likely that shrike pairs with six 12-day-old chicks in the nest can feed at least five of these sufficiently to ensure their survival. The standardized body mass of the parents, defined as the mass divided by the length of the tarsus, did not vary with brood size or with time of the season. The researchers concluded that this constancy, coupled with the seasonal decline in the body mass of nestlings, might indicate that Bull-headed Shrikes have a limit to their parental efforts.

In a study of the body constituents of nestling Red-backed Shrikes in Poland, it was found that, as the chicks became older, the percentage content of protein and fat increased and that of water decreased. The bioenergetics of nestlings are of great interest because of the chicks' fast growth rate, which is dependent on brooding and feeding and may limit brood size. Of 13 broods containing a total of 59 nestling Red-backed Shrikes in Poland, two stages in the nestling period could be distinguished, the first from hatching to 7–8 days of age and the second from 7–8 days to fledging. In the first stage, nestlings have no effective thermoregulation and are brooded by the parent; this allows them to develop under presumably optimal temperatures, and to use most of their assimilated energy for rapid growth. During the second stage, the chicks have effective thermoregulation and brooding is very limited; a large proportion of assimilated energy is then

used for heat production, and the rate of growth decreases. The development of plumage, an increase in body size, and huddling with nestmates prevent excessive heat loss. The chicks' highest energy requirements were in the middle part of the nestling period, and, if conditions were then unfavourable, this period could limit the brood size.

After fledging, the young shrikes remain in the nest tree or bush for a few days before flying to other perches. They perch in heavily foliated trees or in undergrowth, very close together, and they keep quiet, begging for food only when the parents arrive. About one week after leaving the nest, they are able to fly increasing distances, and they begin to follow the parents in order to learn hunting skills. The young remain dependent on the adults for 3–4 weeks after fledging, and they then begin to forage on their own successfully. They begin to perform impaling movements at 20–25 days of age, and can impale food items successfully at 33–35 days, but it is not until they are 40 days or so old that they have fully developed the ability to attack and kill vertebrate prey.

A notable aspect of parental behaviour observed in the Negev Desert of Israel was that of the mother transferring the nestlings to a different place. This was discovered by accident when, at four nests of Southern Grey Shrikes, the entire broods disappeared immediately after having been colour-ringed at the age of 10–13 days. All of the young were subsequently found at the base of different bushes at distances of 3–55 m from the nesting tree or bush; each brood was clumped together in a cavity excavated on the ground and concealed by dense vegetation. The female was seen to prod each individual nestling out of the nest and on to the ground, and then to coax it to the alternative hiding place. During the process the male remained perched in the vicinity, keeping a watch for potential predators. Similar behaviour was reported for Loggerhead Shrikes in Idaho, where the parents were observed to induce nestlings to leave the nest earlier than they would naturally have done. This appears to be the reaction of the parents to human disturbance or to possible discovery of the nest by a predator, and was substantiated by the fact that it was observed at a nest that was partially preyed on by a diadem snake (*Spalerosophis diadema*) and, elsewhere, after a Common Kestrel perched on the nest tree. It appears that the translocation can be made only when the nestlings are sufficiently developed that they do not require brooding. The high ratio of such nestling trans-

Pairs of **Red-backed Shrike**, a widespread European breeding species, arrive from their African wintering quarters each spring to set up territories in a variety of shrubby habitats. Once the territory has been established, the male will contribute to the collection of nesting material, but in most cases the bulk of construction duties fall upon the female. The nest structure contains a wide variety of plant materials, including grasses, twigs, moss, and—in this case—strips of bark. In total, it takes 6–12 days to build.

[*Lanius collurio collurio*,
Ariège, France.
Photo: Dave Watts]



fers suggests that the strategy has adaptive advantages, and that it allows an increase in fledging success that would not be possible if young were left at the nest once discovered by the predator. This behaviour was observed also for Bull-headed Shrikes in Japan and Red-backed Shrikes in Belgium.

Brood parasitism by cuckoos and others also takes place. Red-backed Shrikes in Hungary were parasitized by the Common Cuckoo (*Cuculus canorus*) at a low frequency until the late 1960s, but since then there have been no confirmed cases of parasitism in that country. It seems probable that the cuckoo abandoned this host species because it lost the so-called "arms race", which may be indicated by the shrike's high level of the egg recognition. Experiments showed conclusively that Red-backed Shrikes are able to recognize their own eggs and reject the parasite's eggs. Although this shrike was a host of the cuckoo in the past, it learned to identify accurately the parasitic eggs; the cuckoo, rather than evolving perfectly mimetic eggs to counteract the host's recognition ability, switched host species.

In Germany, no cases of successful nest parasitism were found in a population of Red-backed Shrikes intensively studied for 20 years, during which time more than 1200 nests were monitored. In 1978, three of 22 nests contained young cuckoos, but all three of these broods were unsuccessful because of inclement weather and predation. It was noted that one of the cuckoo nestlings was unable to eject the eggs of the host. In another study, in the eastern Moravian region of the Czech Republic, a total of 45 young Common Cuckoos was found in a total of 2681 Red-backed Shrike nests. Here, the annual proportion of parasitized nests ranged from 0% to 5.5%, the average for the rest of the Czech Republic being 0.5% in 2949 nests. Again, the impression is that the cuckoo appears not to be responsible for any significant reduction in the shrike's breeding capability. In Japan, the frequency of parasitism of Brown Shrike nests by Common Cuckoos on Hokkaido was very low, and the shrikes either removed the cuckoo egg or deserted the nest containing it.

Little is known about the frequency of brood parasitism by Brown-headed Cowbirds (*Molothrus ater*) on Loggerhead Shrikes in North America. The cowbirds opportunities to parasitize shrike nests may be limited owing to the Loggerhead Shrike's aggressive and predatory nature. In fact, only two documented cases of brood parasitism have been recorded: three of 261 nests in south-

west Iowa and two of 1661 nests in Manitoba were parasitized. Experimental attempts to parasitize Loggerhead Shrike nests met with limited success; the shrikes rejected Red-winged Blackbird (*Agelaius phoeniceus*) and Tricoloured Blackbird (*Agelaius tricolor*) eggs that were placed in shrike nests.

Two crucial aspects of fecundity are the age of first breeding and the reproductive output. As with most other songbirds under good conditions, shrikes start to breed in the first spring following the one in which they hatched. Breeding productivity is dependent on a variety of factors, and some examples are given in the paragraphs below.

Food abundance influences various aspects of a bird's breeding ecology, such as the timing of laying, the clutch size, and the success rate. A team of European researchers examined the effects of a natural superabundance of food, in this case cockchafer (*Melolontha melolontha*), on the nesting success of a monogamous long-distance migrant, the Lesser Grey Shrike. In years of cockchafer outbreaks, these beetles make up 88% of the adult diet and 48% of the nestling diet of this shrike. The researchers compared the timing of egg-laying, clutch size and fledging success in three years and chick development in two years, incorporating years with cockchafer outbreaks and years without. In "cockchafer years", laying dates were about one day earlier, clutch size increased by about one egg, and heavier chicks were produced. Fledging success, however, was unaffected, because more eggs failed to hatch during cockchafer years. Increased clutch size in periods of superabundant food did not, therefore, always result in an increase in fledgling production. The team concluded that, in the study population of Lesser Grey Shrikes, limited incubation ability of the adult shrikes or intrinsic problems in physical egg properties, resulting in inefficient incubation, were the most likely explanations for the increase in hatching failure in years with a superabundance of food.

A long-term, 30-year study of the Red-backed Shrike population in south-west Germany found that pairs produce an average of 2.84 fledglings per year, productivity varying between 1.9 and 3.9 fledglings per pair. Years with low breeding success are almost always those with inclement weather, and even brief cold spells, which occur regularly in June, lead to heavy nest losses. In addition to breeding success, the survival of the adults of this migratory species is clearly of critical importance. In the three



Shrike nests are generally large, loosely woven, cup-shaped structures built from a variety of materials, including man-made objects. That of the **Masked Shrike** is typical in being plastered with bits of lichen, bark and wool. It is usually situated 1-2 metres above the ground on top of horizontal branches, or in a fork between upright branches. Like most shrike nests it is balanced on branches, rather than woven into place, and it tends to be very poorly camouflaged. Although males and females often forage independently, they regularly consort at the nest-site throughout the breeding cycle.

[*Lanius nubicus*,
Cyprus.
Photo: Michael Gore]

decades of the study, no change has been detected in the return ratio of adults in consecutive years. In the Karlovy Vary region of the Czech Republic, a comparison of Red-backed Shrikes breeding at two different altitudes, 450 m and 650 m, revealed no difference in the dates of nest initiation and egg-laying, nor in clutch size; breeding success was 77% at lower levels but only 62% at higher-lying sites, because predation was much greater at the higher elevations.

In recent decades, the Brown Shrike has undergone a severe decline on Hokkaido, in north Japan, and a study of the reproductive performance and nestling growth was therefore undertaken. During 1992–1996, 41 active nests were examined, and the mean nesting success was found to be 53.7%. The average clutch size was 5.3, and the average number of eggs hatched per nest was 5.1; successful nests produced an average of 4.4 fledglings each, giving a mean fledging success per successful nest of 90.3%. The main cause of nesting failure was identified as predation, but the identity of the predators was unknown.

Average nest success of Loggerhead Shrikes across North America was reported as 56%. In Oklahoma, the probability of survival from the start of incubation until fledging was 46%, which is low compared with the findings of studies in other areas, but the percentage of Oklahoma nests that produced fledglings was somewhat higher, at 59.5%. Furthermore, nest success at any one site can vary greatly from one year to another, as demonstrated by a study in Missouri, where success decreased from 82.1% in 1980 to 55.5% in 1981. The average number of fledged young per nest varies from less than one to more than four. Mortality in the period from fledging to independence is rather high; for example, 46% of young died during the first week after fledging in Indiana, 33%–53% were lost during the first ten days after fledging in southern Alberta, and mortality of 33% from fledging to independence was recorded in Virginia. In western shrub-steppe communities, average survival decreased from 5.1 young per nest at the time of fledging to just 2.3 two weeks later; similar results were found in Ontario, where the corresponding figures were about four young per nest at fledging and 2.5 when the young became independent.

Most Loggerhead Shrikes of the migratory subspecies have single broods and reneest only after failure with the first attempt. The sedentary populations, however, raise up to three broods per

year, this depending largely on climate, where warmer and longer growing seasons result in more broods. Further, non-migratory shrikes are more likely to attempt second broods, and high nest success increases the probability of additional nesting attempts.

In Africa, in a study of Common Fiscals, young fledged from only 15% of the nests found. Of the 17 breeding pairs studied, only eight produced any young, at an average of 1.9 fledglings per nest.

Various studies have revealed that productivity and breeding success of Red-backed Shrikes in central Europe are reduced in years with wet and cold weather. The same has been found to be true for Loggerhead Shrikes in North America, Great Grey Shrikes in Poland and Southern Grey Shrikes in Israel. Inclement weather in Japan in 1993 allowed comparison, with 1992, of the effects of weather conditions on aspects of the Bull-headed Shrike's breeding biology, such as the timing of breeding, nestling growth and overall nesting success. For both years, the season was divided into two periods, early and late. While the probability of nestling survival was almost the same during both periods, the probability of nest survival in the egg stage during the early period was significantly lower than that during the late period. In 1993, nestling survival during the late period was significantly less probable than during the early period; the late period was colder than the same period in 1992, and with larger fluctuations in precipitation. The number of "lost" nestlings was positively correlated with the mean daily precipitation, and most were the lightest in weight in each brood. It was found that the late breeders fledged lighter young than did the early breeders. Although the shrikes adopted hatching asynchrony, the late breeders could not overcome the effects of the unpredictable adverse weather in 1993.

In contrast, predators were the most important factor in determining the breeding success of Woodchat Shrikes in Spain. It was estimated that predation reduced breeding success by an average of 35% annually. In Mediterranean France, this species' breeding habitats consist of open, dry grassland with a discontinuous short-grass layer and scattered bushes and trees, where about 75% of the Woodchat Shrike's nests were at heights between 1 m and 3 m. The mean survival rate of nests from laying to fledging was 36%, and there was no correlation between breeding success and the site, height and concealment of nests. The main cause of the low breeding success was, again, a high rate of

nest predation. Woodchat Shrikes in the El Kala National Park, in north-east Algeria, nested most frequently in cork oak (*Quercus suber*), at a mean height of 5 m. First clutches were laid on 7th May, about the same as in south France, and average clutch size was 4.9 eggs, slightly less than in France. Approximately 42% of eggs in Algeria produced fledglings. In this case, fledging success was positively correlated with the height of the nest above the ground, as well as with mean egg size of the clutch. It was suggested that heavy predation and poor food availability were probably the major selective pressures shaping the life history of Woodchat Shrikes in Algeria.

A most interesting phenomenon is that of a breeding association between shrikes and other species. Such associations are known to occur between the Red-backed Shrike and the Barred Warbler (*Sylvia nisoria*), the Isabelline Shrike and the Barred Warbler, and the Woodchat Shrike and the Orphean Warbler (*Sylvia hortensis*). In southern France, active nests of both Woodchat Shrikes and Orphean Warblers have been found in the same bush, and this, along with behavioural evidence, suggests that the association goes far beyond being a simple commensalism for the sole benefit of the warbler. It may be considered, instead, an example of mutualism designed to counter the problem of predators, but its precise extent evidently requires further observations. In North America, on the other hand, it was discovered that shrikes could exercise a significant control on the distribution and numbers of passerines in their breeding areas. In one study, Loggerhead Shrikes were observed while feeding on the nestlings of other passerines, resulting in the probable nest loss for the latter. This suggests that, although birds comprise only a small percentage of the shrike's annual diet, the timing of predation on passerines could result in a marked negative effect on the annual production of the passerine community. One must, however, consider other factors, including the broader interactions of predator-prey relationships, competition and habitat structure. For instance, if short vegetation and a greater density of perches lead to an increase in shrike presence and, at the same time, a decline in the broader bird community is detected, this decline is not necessarily attributable to shrikes; the increased number of perches may attract higher numbers of raptors, which could have a negative impact on the entire bird community, including, ultimately, shrikes, through increased predation and competition. Clearly, a great deal of additional research is required before a proper understanding can be gained of the impact of shrikes on the bird communities of which they are a part.

Conversely, prey populations are known to have a direct influence on shrike populations. As would be expected, decreasing abundance of such prey as insects and small mammals leads to the reduction or even the elimination of local shrike populations. Furthermore, predation by other animals is, for shrikes, often the greatest cause of nest failure, although it is not known if this has serious impacts at the population level. In addition, various other birds attack recently fledged shrikes without killing them. In America, for example, young Loggerhead Shrikes are attacked by, among others, Scissor-tailed Flycatchers (*Tyrannus forficatus*), American Robins, Eastern Meadowlarks (*Sturnella magna*), Common Grackles (*Quiscalus quiscula*) and Brown Thrashers (*Toxostoma rufum*). In return, shrikes will harass other passerines, especially during territory establishment, when the shrike often chases the other from its own territory, sometimes causing other birds to move out of the immediate area.

Survivorship of adult shrikes is uncertain. In Oklahoma, a Loggerhead Shrike was recaptured after 11 years, in the same general area in which it had been ringed. Other ringed individuals have been documented as living for six years and more, but there are few data on longevity of laniids. It has been suggested that mortality in the non-breeding areas is the reason for observed reductions in abundance of some species, a possibility which is supported by the low return rates of first-year shrikes. Low return rates, however, cannot be taken as evidence of high winter mortality without considering breeding-site fidelity. In all studies of migratory *Lanius* species, the percentage of juveniles returning to the natal site to breed is very low, which suggests that there is a high rate of exchange of individuals between different populations.

In a colour-ringed population of Common Fiscals, the annual survival was 39%. Since 25% of the adults were known to have resided in two or more territories, however, this is probably an overestimate of mortality because of dispersal out of the study site.

Movements

Whereas many members of this family are resident, some shrikes undertake long-distance intercontinental migrations of several thousand kilometres each year. Red-backed and Lesser Grey Shrikes migrate more than 10,000 km between their Eurasian breeding grounds and their respective wintering areas in sub-Saharan Africa, and Lesser Grey Shrikes breeding in north-west China may travel nearly 12,000 km to non-breeding grounds in Namibia. In eastern Asia, the Brown Shrike covers a distance of up to about 8000 km between its Siberian breeding quarters and its non-breeding grounds in the southern parts of Asia.

In the Afrotropics, the movements of the two wholly African genera, *Corvinella* and *Eurocephalus*, are not well known. It seems that some seasonal movements are made, and occasional nomadic movement occurs. The Yellow-billed Shrike shifts southwards in the dry season, returning north with the rains; it is sometimes seen in large flocks. Its congener, the Magpie Shrike, is thought to make similar dry-season movements in, for example, north Namibia and central Zambia, and occurs as a rare visitor in south Malawi. The Southern White-crowned Shrike appears to be strongly nomadic and rather irruptive in years of drought, and it may also undertake some seasonal movement. Similarly, Northern White-crowned Shrikes possibly make some local seasonal movements, but little information is available for this species.

Lanius species in tropical and subtropical areas are generally resident. They have little need to migrate, as their food supply is fairly constant throughout the year. In contrast, those shrikes breeding in the northern parts of the family's range are mostly long-distance migrants, and this is especially important for the smaller, insectivorous laniids. The availability of invertebrate prey, of course, is normally seasonal at higher latitudes, and insecti-

Incubation in shrikes begins with either the last or the penultimate egg. This ensures that hatching is usually more or less synchronous. Breeding females often take sole responsibility for incubation, which lasts about 15–20 days. Even in the group-living Magpie Shrike, only one bird incubates, the dominant female. She is fed during this period by her mate, and by one or more helpers. As with other shrike species, she rarely strays from the nest, only moving to turn the eggs 6–10 times daily, and perhaps more frequently on hot days.

[*Corvinella melanoleuca melanoleuca*, Nylsvley, South Africa. Photo: Warwick Tarboton/VIREO]





This image shows a male **Common Fiscal** passing the female a prey item, which she accepts without leaving the nest. Despite regular provisioning of this kind, female shrikes tend to lose some weight during the incubation period. Occasionally, male Common Fiscals take over at the nest for brief periods, but in many pairs the female appears to do all the incubating. The nest of this pair is a classic shrike creation, a bulky, untidy cup built loosely from natural and artificial items. In this case the structure consists of grass, twigs, rootlets, animal hair and string.

[*Lanius collaris smithii*,
Liberia.
Photo: Michael Gore]

vores are forced to migrate after the breeding season. Not surprisingly, therefore, the Red-backed, Isabelline and Brown Shrikes, as well as the Tiger Shrike (*Lanius tigrinus*) of east Asia, are long-distance migrants. Similarly, the Woodchat and Masked Shrikes (*Lanius nubicus*), which breed in the Mediterranean region, and the Lesser Grey Shrike, which extends from the north Mediterranean eastwards to Central Asia, feed mostly on invertebrates, and all three are migratory. On the other hand, larger laniids, as typified by the Chinese Grey Shrike, the Great Grey Shrike and the Loggerhead Shrike, are capable of catching small vertebrates, and they can, therefore, to varying degrees adapt to the difficult weather conditions of the winter months, so long as vertebrate prey is still accessible. This means that the northernmost breeders often move southwards when conditions become too difficult, whereas those in more southerly parts of the range are residents.

The Laniidae do not build up large fat reserves prior to migration, and it is assumed that this is because of their ability to exploit exhausted passerines as a food source while on active migration. The shrikes themselves, however, are also heavily preyed upon during migration, this being due chiefly to their relatively straight and comparatively slow flight. As an example, a large proportion of the prey of Eleonora's Falcon (*Falco eleonora*) consists of shrike species migrating across the Mediterranean Sea. From an estimated 100,000 prey items identified, 4% were Woodchat Shrikes, 8% Lesser Grey Shrikes and almost 11% Red-backed Shrikes.

In a ringing study of migrant Brown Shrikes in Peninsular Malaysia, it was discovered that this species migrates by night and on a broad front, descending during the day. The data obtained from a decade or so of ringing indicate that these shrikes arrive at more or less the same time in all parts of their non-breeding grounds in tropical South-east Asia, and that they make the journey from the breeding grounds comparatively rapidly. The fact that passage migrants in Taiwan had an average body mass of 31.7 g, whereas those in Malaysia weighed 28.2 g, suggested that Brown Shrikes depend on fat and muscle reserves for the migration, and that they do not depend only on prey caught along the migratory route.

The Loggerhead Shrike's migration is not well understood. Populations breeding in the northern parts of the range are gener-

ally migratory, moving into the southern states and Mexico during the winter. All of those breeding in areas south to Wyoming, central Colorado, Kansas, Missouri and roughly north of Kentucky are migratory, as also are those in northern California, north Nevada and north Utah. Other parts of the southern USA are home to resident populations, which are augmented in winter by migrants. Farther south, Loggerhead Shrikes are present in east and south Mexico only during the winter months. Christmas Bird Count data suggest that the highest concentrations of wintering Loggerhead Shrikes are found in the Gulf Coast states of Texas, Louisiana, Mississippi and Alabama. Although the factors that trigger this species' migration are unknown, food availability is possibly involved since, in years when rodents are in great abundance, Loggerhead Shrikes sometimes spend the winter farther north than they do in other years. It seems that those breeding in areas experiencing more than ten days of snow cover in the year will migrate.

Migratory individuals of this North American species leave the breeding grounds during the period from about August to late October, some stragglers not departing until November. They migrate singly and by day, moving short distances and feeding en route, sometimes remaining in an area for a few days in order to feed. The nominate race travels up to 3360 km, from the northern Prairie Provinces southwards to Texas or Mexico. They return to the breeding grounds from mid-February to early May.

Adult, experienced shrikes migrate faster than inexperienced juveniles. They also spend shorter periods of time at staging areas. Data from ring recoveries of Great Grey Shrikes in North America and in central Europe suggest that this species is faithful to winter territories and migration stopover sites. Site-fidelity is considered an important strategy for surviving the non-breeding season.

Understanding of the winter distributions of migrant birds is important, because productivity and recruitment are influenced by conditions at several locations and periods in the life cycle of individuals. The Loggerhead Shrike is considered to be threatened in Canada, where its decline has been attributed to potential adverse factors on the wintering grounds. Researchers examined distribution patterns of stable-hydrogen isotope in the feathers of Loggerhead Shrikes, primarily of the western subspecies *excubitorides*, during winter at three places in northern and cen-

tral Mexico, in attempts to establish the relative abundance and origins of migrants; in addition, they investigated potential movements of Mexican winter residents. The results indicated that migrant Loggerhead Shrikes from northern breeding grounds accounted for 28.1% of individuals in north-central Mexico, 73.7% in north-eastern parts and 63.8% in south-central Mexico. The evidence further suggested that a few individuals from the south-western USA and north-eastern Mexico move into the Chihuahuan desert for the winter period.

Lesser Grey Shrikes and Red-backed Shrikes have much smaller ranges on the non-breeding grounds in the Kalahari basin, in southern Africa, than they do on the breeding grounds in Europe and western Asia. A study in Botswana investigated whether, as a result of competition, habitat segregation occurs on the non-breeding grounds. Surveys of these two shrikes were conducted by means of point-transect counts in 19 vegetation types, and it was found that clear differences in habitat distribution were apparent between the species and also, in the case of the Red-backed Shrike, between the sexes. Female Red-backed Shrikes occupied more densely wooded bushveld than males, and Lesser Grey Shrikes occupied the most open habitat and overlapped more frequently with male Red-backed Shrikes than they did with females of the latter. More subtle differences along gradients of herbaceous ground cover suggest that differences in habitat quality may be involved; the Lesser Grey Shrike, being the dominant species, tends to occupy the best habitat, while the most subordinate in rank, female Red-backed Shrikes, were forced into the poorest habitat. The difference between the sexes of the Red-backed Shrike in habitat occupation on the non-breeding grounds are believed to be the first documented example of such differences for any Palearctic-African migrant passerine.

The entire world population of the Lesser Grey Shrike vacates its Eurasian breeding grounds and moves into a non-breeding area, in the thornveld of southern Africa, that is ten times smaller than its breeding range. The species is abundant in open savanna habitat in its non-breeding quarters, chiefly in the Kalahari basin, where it is regularly spaced in individual territories and behaves conspicuously as a perch hunter. It has declined considerably during the last 200 years, and the non-breeding grounds offer highly favourable conditions for assessing and monitoring the world population (see Status and Conservation).

One of the most intensively studied members of the family is the Red-backed Shrike. In a long-term study of a population of this species in south-west Germany, the arrival time, the duration of stay and the time of departure were documented. The arrival phase extended over a period of 20–28 days, with an average of 24 days, and the average date of first arrival was 6th May. The pattern of arrival within the population, however, differed strikingly from year to year. In addition to the influence of the weather, there was an apparent correlation between arrival time and the time of departure in the preceding year. The average arrival of first-year individuals was correlated with the date of hatching and was later than that of older ones. The females reached the breeding grounds on average two days after the males, and laid the first egg 5–15 days after arrival. Among pairs for which the first breeding attempt was successful, the males stayed for an average of 75.5 days and the females for 69.7 days. Those having successfully reared a replacement brood remained for much longer time, males for up to 120 days and females up to 101 days. The duration of stay of unmated individuals was difficult to determine, as these were not faithful to any particular area; as the season advances, they attempt to make contact with breeding pairs and sometimes become involved in the care of the young, even taking over the role of parents (see Breeding). In such cases, their departure from the breeding grounds was delayed until the end of the postnuptial moult. The majority of the adult Red-backed Shrikes left between 20th July and 10th August, the date of departure being determined by the frequency of replacement broods. During a total of 13 years, the latest departures were four times in September and twice in October.

West European breeding populations of the Red-backed Shrike spend the non-breeding season in southern and eastern parts of Africa. Having initially headed east or south-east, they have to change their migratory direction to that of south in order to cross the eastern Mediterranean Sea. A team of researchers radio-tracked six Red-backed Shrikes which departed from the Greek island of Karpathos. The shrikes left the island after sunset, between 19:58 and 21:30 hours MET. Their mean flight direction was 132°, which indicates a south-easterly heading, and suggests that at Karpathos the Red-backed Shrikes had not yet changed their migratory direction. On the basis of the wind speed, wind direction, departure time and flight velocity, it was calcu-

A female **Woodchat Shrike** surveys her nest which is tucked into the shady foliage of a Spanish olive tree. It overflows with a brood of five well-grown nestlings clamouring for food. Once hatched, these hungry nestlings are fed by both parents for 15–18 days, and once fledged they will continue to be provisioned by their parents for up to six weeks. A study of this species in central Europe suggests that breeding success is fairly low: of 553 eggs in 112 nests, only 68.9% hatched, and only 42% produced fledged young.

[*Lanius senator*,
Alcanadre, La Rioja,
Spain.

Photo: Joseba del Villar]



lated that the shrikes would have to fly for ten hours before they reach the Nile Delta at the coast of Egypt.

Migratory populations of two sympatric species, the Bull-headed and Brown Shrikes, were studied in northern Japan between 1992 and 1997. Although 18% of ringed Bull-headed Shrike males returned to the breeding area used in the previous year, no females did so. In the case of Brown Shrikes, however, 43% of ringed males and 13% of ringed females returned to the area. Even Bull-headed Shrikes which had bred successfully did not always return to the same nesting area in the following year, whereas successful Brown Shrikes remained faithful to their past breeding site. Curiously, Brown Shrikes decreased by 67% as a result of habitat loss over four years, whereas the Bull-headed Shrike population was stable. The differences in degree of philopatry were inconsistent with the population trends of the two shrikes. It may be significant, however, that Bull-headed Shrikes exhibited no particular habitat preferences in the study area, whereas Brown Shrikes bred mainly in natural grassland with shrubs. Since available habitat for Brown Shrikes has decreased rapidly in and near the study area, the philopatry demonstrated by this species could result from a scarcity of habitat, which would inhibit dispersal. In contrast, Bull-headed Shrikes, because they are habitat generalists, may have a higher tendency to disperse.

Male Red-backed Shrikes in Germany and Italy demonstrated a high degree of fidelity to the territories which they had established in previous years, and this was found to be true especially of older individuals with several seasons of successful breeding experience. Such site-fidelity is considerably less marked in sub-optimal habitats. Adult and juvenile females, on the other hand, were significantly less faithful to their former territories, and this was the case irrespective of the age and prior experience of the individual. Similarly, male Southern Grey Shrikes in the Negev Desert, in Israel, are resident throughout the year, but females remain only for the breeding season; indeed, no females return to the same territory in subsequent seasons. As a consequence, the males, which are well acquainted with their territory, and with proven breeding success from previous seasons, begin the nest-building process for all breeding attempts and, when pairing occurs, the male leads the female to the nest-site, which is built in the same place every year. Evidence of the male's fidelity to the nest-site was provided by the presence of nests from previous

breeding seasons in bushes and trees with active nests. One saltbush (*Atriplex*) contained 19 nests, suggesting that shrikes in that territory had returned to breed in the same bush for at least nine consecutive breeding seasons.

Male Loggerhead Shrikes may display higher site-fidelity on breeding grounds than females. In south-eastern Alberta, however, there was little difference between the sexes in the numbers that returned to within 4 km of the previous year's territory. Of 48 males and 48 females, all ringed, 18 males and 13 females returned to the site where they had nested in the preceding year.

Relationship with Man

The principal genus of Laniidae is *Lanius*, a name which is Latin for "butcher". Connected with this is the word *laniare*, meaning "to tear" or "to shred", actions associated with a butcher. The scientific name of the shrike is, of course, an allusion to the laniid practice of impaling prey on sharp objects such as thorns, and the habit of subsequently tearing prey to pieces.

The vernacular name of "shrike" is related to the word "shriek", and is the modern form of the Old English *scric*; it is allied to the Icelandic *skrikja* and the Late German *schrik*, among others. Such words surely refer to the vocalizations of laniids, which are generally harsh and, to the ears of many, unpleasant sounds; one might say that they are "shrieking" calls. Perhaps more intuitively, the modern German language refers to shrikes as *Würger*, which means "stranglers". The Great Grey Shrike is the *Raubwürger*, *rauben* meaning "to plunder" or "to take by force", so that its full name conjures up the picture of a somewhat ferocious bird. No less sinister is the Red-backed Shrike, one of the German names of which, *Neuntöter*, means literally "killer of nine". Legend has it that this shrike would "murder" nine creatures before it took a break.

The oldest reference to the shrike appears to be in the Sanskrit literature from ancient Indian cultures. Many of these can be traced back to 2500 BC. Many Indian languages have evolved from the parent Sanskrit, and in one of these, Marathi, the regional language of the Maharashtra state, a few peculiarly descriptive names for shrikes are mentioned, such as *Khatik*, meaning "the butcher", or *Naklya Khatik*, "the butcher who mimics". Another name, *Gandhari*, has a special reference to one of the popular ancient Indian epics, namely the "Mahabharata", the longest poem in any language, and *Gandhari* is the name of the blindfolded Kaurava Queen, who chose to wear a mask over her eyes so that she could experience the same life as her blind husband Dhrutarashtra. In the Marathi language, the Southern Grey Shrike is called *Gandhari*.

The shrike is also mentioned in the epic mythology of Mahabharata, dating from 400 BC to AD 400, where it is referred to as *Latvaka*. It is interesting to note that the Sanskrit name for a staff, with a bulbous club at the top, is *Khatvanga*. *Latva*, which is another Sanskrit name for the shrike, could originate from *Khatvanga*, because the typical shrike, like the staff, has a relatively large head for its size. This, of course, is reflected also in the name "Loggerhead" in North America. The Sanskrit name for the butcher is *Khattika*, probably an original form of the Marathi name *Khatik* for the "butcher bird", alluding to its habit of impaling.

Some shrikes are well-known vocal mimics. The Long-tailed Shrike, the Bay-backed Shrike (*Lanius vittatus*) and the Southern Grey Shrike, which are commonly found in Maharashtra, all mimic the calls of other birds. The two Sanskrit names for the shrike, *Latva* and *Latushaka*, are possibly derived from the root verb *lat*, meaning "to cry", and *vak*, "to speak". Another suggestion regarding the derivation of *Latushaka* is that it comes from the same verb *lat* but combined with the word *ushas*, the latter meaning "morning and evening light": thus, the bird which calls and hunts from daybreak until late evening is the *Latushaka*, or the shrike.

There are numerous references to the shrike in the system of medicine known as "Ayurveda". This ancient practice was widespread in the Indian Subcontinent, where the shrike was supposed to have special medicinal properties. Two second-century Sanskrit texts refer to the shrike as *Lattushaka*, and it is noteworthy

An adult **Southern White-crowned Shrike** brings food to a brood of three nestlings. This species and its congener, as well as Souza's Shrike (*Lanius souzae*), are the only shrikes known to build atypical nests. They plaster the basic structure with cobweb, producing a moulded or sculpted cup with a relatively smooth silvery-grey finish. These smoother, smaller, more camouflaged nests recall those of helmet-shrikes (Prionops).

[*Eurocephalus anguitemens anguitemens*, Marondera, Zimbabwe. Photo: Peter J. Ginn]



The female **Red-backed Shrike** usually lays a clutch containing 3–7 eggs. Clutch size tends to decline from eastern to western Europe, and from early to late in the season. After they hatch out, the nestlings continue to be brooded by the female for the first week, while the male continues to bring food to the nest. Thereafter, the brood is fed by both parents, as seen in this image. The nestling period normally lasts 14–16 days, but it sometimes extends to 18–20 days in bad weather.

[*Lanius collurio collurio*, Huidobro, Burgos, Spain. Photo: Joseba del Villar]



that the ancient Indians placed shrikes in a class “Pratuda”, consisting of pecking birds. These are described as birds that hit, beat or pierce the prey with the beak before consuming them.

Shrikes are mentioned also in a medieval Sanskrit text, *Vasantarajashakunam*, which is devoted to augury, the practice of interpreting omens from bird and animal behaviour. In this text the shrike is called *Ladva*, and it is believed that, if a person sees or hears a shrike in front of him or her, that person’s wish will be granted.

Elsewhere, the earliest documentation of shrikes and their relationship with man appears in art from the XII Egyptian dynasty, 1991–1786 BC. Shrikes are mentioned in almost all ancient natural-history books. They are included also in the *Sherborne Missal*, a lavishly decorated English medieval service book from the early fifteenth century. This magnificent missal incorporates a series of 48 depictions of birds, among them the shrike, which is identified by the Middle English name of “waryghanger”. The species in question appears to be a cross between the Great Grey Shrike and the Southern Grey Shrike, neither of which breeds in Britain, although the former is a winter visitor to that island.

True shrikes are miniature birds of prey. Indeed, the fact that they are able to capture and feed on relatively large animals has resulted in the bigger species of shrike being used in falconry. Unfortunately, however, their raptor-like appearance and behaviour had the effect that, until as recently as the middle of the twentieth century, both in Europe and in North America, they were generally regarded as harmful. This negative reputation was reflected not only in the writings of hunters and gamekeepers, but also, perhaps somewhat surprisingly, in those of some ornithologists. Even today, shrikes are still hunted by humans in many parts of the world, and they are particularly vulnerable when on migration. Many are killed in the Far East, the Middle East and several Mediterranean countries. In Georgia and Turkey, numerous Red-backed Shrikes are caught, blindfolded, and used as decoys to attract Eurasian Sparrowhawks (*Accipiter nisus*); the hawks are then captured, trained and employed in catching Common Quails (*Coturnix coturnix*).

In east Asia, large numbers of Brown Shrikes migrate through Taiwan in September, and many were frequently caught with il-

legal bamboo traps. This species was considered by local inhabitants to be a delicacy, and even in the late twentieth century it was by no means uncommon to see Brown Shrike kebabs being offered for sale at roadsides in rural areas. Remarkably, these shrikes were even barbecued and sold as food to tourists in Kenting National Park, in south Taiwan. Fortunately, conservation laws passed in 1989, and strengthened in 1994, have made these practices much rarer in occurrence, although they do still take place on a smaller scale. Taiwan is, of course, on a major flightpath used each year by massive numbers of migrating birds. In attempts to increase public awareness of the risks faced by these migrants, and especially the plight of certain species, conservationists persuaded the government to issue postage stamps and coins depicting some of them, the Brown Shrike being one such species. Furthermore, one leading scientist, in an effort to stop people from eating the shrike, collected photographs illustrating that the dissected birds were full of parasitic worms; he then had the pictures reproduced on posters, which he set up in the areas where the capturing of Brown Shrikes was most commonly practised.

Birds are still considered a “legitimate” source of food for humans in many parts of the world, particularly in Asia, Africa and South America. It is very likely that shrikes are consumed by people in China, the Philippines and elsewhere, but there is little information on the numbers of shrikes involved.

During the course of excavations of sites of native Pueblo peoples in north-eastern Arizona and southern Utah, a considerable number of bird bones were found. These were associated with archaeological material dated between AD 700 and 1300, and among several avian species were the bones of Loggerhead Shrikes. Whether the natives exploited the shrikes for food or used them for other purposes is not known.

Status and Conservation

Only one member of the Laniidae is currently considered to be globally threatened. This is Newton’s Fiscal, the conservation status of which is listed as Critical. One other species, the Mountain Shrike, is regarded as Near-threatened.



Co-operative breeding has been confirmed in a few group-territorial Afrotropical shrikes, including the **Magpie Shrike**. This image shows the dominant female at the nest, accompanied by two other adults, presumably the dominant male and a helper. It is thought that breeding pairs are always monogamous even though they may be accompanied by up to nine helpers. These subordinate individuals are probably related to the dominant pair, and most likely offspring from earlier broods on the same territory. This kind of delayed dispersal is poorly understood, but usually related to density-dependent processes, such as competition for space and territories.

[*Corvinella melanoleuca melanoleuca*, Marondera, Zimbabwe. Photo: Peter J. Ginn]

Newton's Fiscal, confined to the island of São Tomé, in the Gulf of Guinea, is rare. It was first discovered in 1888, and four decades later, in 1928, 13 specimens were collected from the island. The species was not seen again for more than 60 years and was assumed to have become extinct. In 1990, however, an expedition from Britain encountered a single individual in the south-west part of São Tomé, near the source of the Xufexufe River. Since the mid-1990s, this shrike has been seen with some regularity, mostly in the Xufexufe catchment, but its total population is thought to be very small, numbering probably fewer than 50 individuals. The reasons for its obvious rarity are not known, but it may be relevant that Newton's Fiscal, unlike others of its genus, inhabits forest, much of which on the island has been damaged or destroyed, both in the lowlands and at middle elevations. Most of the cleared areas were used for growing cocoa and coffee, which were valuable exports during the Portuguese administration of the island. In more recent years, however, land privatization has resulted in a huge increase in the number of small farms, with consequent removal of large numbers of trees. Most observations of this species have been made in undisturbed forest below 700 m or so. Introduced predators, such as the black rat (*Rattus rattus*) and the mona monkey (*Cercopithecus mona*), may be having an adverse impact on the shrike's population, but this needs to be verified.

The Near-threatened Mountain Shrike is found only in the Philippines. Although its precise range is small, its habitat is apparently secure, and the species is present throughout this habitat. It is probably not at immediate risk, but further information is needed. The Mountain Shrike has generally been considered uncommon throughout its small range, but it now appears that it is fairly common in upland areas that are not under human pressure. Nevertheless, population surveys are required, as also is research into its basic biology.

Although no other laniids are "officially" at risk, many of them have suffered worrying declines in recent decades. Before examining such phenomena, however, it should be borne in mind that population estimates need to be treated with caution, primarily because of the problems involved in the detection of shrikes, even at relatively short distances. Various studies have revealed that it is difficult to achieve accurate estimates of the numbers of breeding pairs of *Lanius* species. During research on shrike biol-

ogy in western Poland, the numbers of breeding pairs were calculated from special counts made in the pre-breeding period, combined with intensive searches for nests, and colour-ringing. In the matter of estimates of Red-backed Shrike and Great Grey Shrike population sizes, it was demonstrated by means of empirical tests that point counts and line-transect methods led to serious underestimates of the true numbers. Moreover, an "improved mapping technique" underestimated the true numbers of Red-backed Shrike breeding territories by as much as 45–80% and underestimated those of the Great Grey Shrike by just under 40%. It was found, however, that accurate numbers of breeding pairs of Great Grey Shrikes could be obtained by making counts during the pair-formation period, while intensive nest searches were the most effective method of determining Red-backed Shrike numbers.

Notwithstanding the problems of assessing the numbers of shrikes in a population, it is clear that many species have undergone reductions in their numbers since the second half of the twentieth century. In central Japan, for example, a long-term study of the Brown Shrike on the Nobeyama Plateau has documented a massive decline in this species' breeding population, and similar declines are evident elsewhere in Japan, including Hokkaido. The reasons for this are uncertain, but habitat alteration and loss in the breeding areas have been suggested, while some consider that fires on the wintering grounds in Indonesia may be contributory factors.

In Europe, an interesting project for rehabilitating a population of Red-backed Shrikes was undertaken at the Bargerveen peat bogs, a nature reserve in the Netherlands. Following a drastic decline in the numbers of this species breeding there during the past century, a team of conservationists improved the shrikes' food supply by a programme of re-wetting of the peat bogs. This led to a dramatic increase in the number of breeding pairs, from a few singles in the 1970s to more than 100 pairs in the 1990s. The team demonstrated also that a reduced diversity of invertebrates had caused the demise of the Red-backed Shrike in the Dutch dunes. If these restoration projects are to be successful in the long term, it is important to discover the causes of the decrease in the invertebrate diversity.

The Red-backed Shrike breeds mainly in human-altered agricultural areas, and it has declined significantly in western Eu-

rope since the late 1960s. In order to develop effective conservation strategies, it is necessary to gain detailed information on the constituent ecological and environmental elements that make up the species' breeding habitat in this landscape. Species-distribution models are being used increasingly to provide such information. Most studies investigate the environmental pattern of a species' distribution, assuming that records are reliable indicators of habitat suitability, but some individuals and pairs may be located outside the environmental bounds of their species' breeding niche and these could reduce the accuracy of the model and limit its utility. Parameters related to the breeding success of the Red-backed Shrike in southern Belgium were integrated into a fine-scale presence-only modelling framework to demonstrate this problem and to ascertain the critical habitat requirements of this species in relation to conservation management. It was found that, above a certain environmental threshold, individuals occurred but did not breed successfully, which indicated that the species' breeding niche is ecologically narrower than would be suggested by standard distribution modelling. Many elements, such as nest-site availability, food density and availability, and shelter from predators, were important in the breeding habitat of the Red-backed Shrike.

The entire world population of the Lesser Grey Shrike migrates to southern Africa from its breeding grounds in south and east Europe and western Asia. Its non-breeding range in the African thornveld is much smaller than its breeding range. This species has declined considerably during the last 150–200 years, and the non-breeding grounds, where the shrike is abundant in open savanna and is regularly spaced in individual territories, offer favourable conditions for assessing the world population. During the mid-1990s, this was estimated at 5,000,000–7,300,000 individuals. A huge decrease has been reported in the west of the breeding range, where the Lesser Grey Shrike is now extinct in many countries of western and central Europe. Only isolated populations, containing up to 30–50 pairs, remain in Spain and France. This contraction of range towards the south-east, combined with a decline in numbers in most European countries, is evidently part of a longer-term trend that has been apparent since the middle of the nineteenth century, and especially during 1970–1990, affecting up to a third of the European population.

Long-term changes in climate and farming practices have been identified as possibly the main reasons for the decline of the Lesser Grey Shrike. Spanish researchers studied several peripheral populations of this species in southern France and north-east Spain, at the western limit of the breeding range, in an attempt to ascertain the effects of environmental change. They also looked for evidence of climatic changes in the breeding and wintering areas of this shrike and related effects on vegetation. They found that fluctuations from one year to another were closely similar in all of the studied populations, suggesting that the declines were probably influenced by a common factor. In one peripheral population, there was clear evidence of climatic change, in the form of increased thermal oscillation, that could have resulted in a decrease in the vegetation index in the area. It was thought likely that climatic variables in the breeding area could account for fluctuations in abundance of some populations, and it was evident that environmental conditions experienced by some populations could influence the fate of the neighbouring populations, too. The results indicated that the studied populations were spatially synchronized, so that conservation efforts should be applied at a wide scale, encompassing all of the isolated populations at the western border of the Lesser Grey Shrike's range in the Mediterranean area.

Whereas most of the world's threatened bird species face the problem of deforestation, this is not the case with the *Lanius* shrikes. On the contrary, these species live in semi-open habitats and have benefited from forest clearance, having adapted quickly to low-intensity farming. More recently, however, the era of intensive farming and the industrialization of agriculture, which began in the second half of the twentieth century in Europe and North America, shrikes have suffered major setbacks. Large-scale increases in field size have led to the loss of commercially non-productive habitats, such as hedgerows, bushes and isolated trees, ponds, banks and ditches and grassy edges and tracks, which are favoured by shrikes. Coupled with this habitat loss has been the widespread use of pesticides, which have reduced the shrikes' food resources.

Since the 1950s, the Loggerhead Shrike has suffered a serious decline in North America. It is listed as "endangered" in Canada, and as "endangered" or "threatened" in 14 US states.

Parental care in shrikes involves interesting anti-predator behaviour. This was discovered during a field study of the **Southern Grey Shrike** which involved colour-banding nestlings at the age of 10–13 days.

Although the nestlings were too young to fly away, researchers were surprised to find that these broods disappeared almost immediately after banding. It transpired that females of this species responded to extreme disturbance by prodding each nestling in turn until it dropped to the ground, and then coaxing it to an alternative hiding place. In all cases, the entire brood was found together in a cavity excavated in the ground and concealed by dense vegetation, 3–55 m from the original nest.

[*Lanius meridionalis meridionalis*,
La Rioja, Spain.

Photo: José Luis Gómez de Francisco]



According to breeding-bird surveys, this species suffered a mean annual decrease in population size during 1968–2003 of 9.4% in Canada and 3.8% in the USA. In Canada, the small isolated breeding population in south-east Ontario had been reduced to just 18 pairs in 1997, and conservationists decided to establish a captive population in order to preserve the population's genetic diversity and possibly as a means of re-establishing populations elsewhere. A total of 43 nestlings was collected and captive-breeding began in 1998. In 2001, Wildlife Preservation Canada undertook experimental "field breeding" and subsequent release of shrikes. Special cages were constructed from panels that could be bolted together on site, in this case a pasture around a hawthorn within natural shrike habitat. These breeding cages comprised two or three units which had a common wall or were joined by a corridor. The male and female shrikes were initially placed in separate units, and provided with plenty of insect food and nesting material. As soon as courtship behaviour commenced, the door separating the units was opened, allowing breeding to take place. The parents reared the young, which learned how to kill and impale live prey, including not only that provided but also frogs, snakes and others that entered the cages and were quickly caught; the young learned also to recognize the parents' hawk-alarm call, which prompted them to hide in the hawthorn. At the time when the juveniles would normally leave the parents, they were moved into a release cage with one or two sets of young from other broods. They remained for 7–10 days in this cage, and were released when they were seen to hunt and impale their own prey. The parents were then removed to the "wintering facilities" until the following spring. Supplementary feeding areas were set up, with crickets and mealworms provided, until the released juvenile shrikes either stopped feeding from these or left the area.

The project started with three pairs in 2001 and six in 2002, and very soon there were two field breeding-and-release sites, one with 14 sets of breeding cages and the other with 12 sets. Between 2001 and 2005 a total of 110 young was released into the wild, and in 2006 111 young were released and 17 others retained in order to augment the captive population. From 2005 onwards, captive-bred shrikes have paired with wild individuals and bred successfully, indicating that they are able to migrate southwards, survive the winter and return in the following spring to breed.

Farther south, in south-west USA, the Loggerhead Shrike of the subspecies *mearnsi* has been saved from near-extinction by

the efforts of the San Clemente Loggerhead Shrike Rescue Team, housed at the San Diego Zoo. The population of this taxon, which is confined to the island of San Clemente, off southern California, had fallen to a critically low level, with just four breeding pairs and ten hatchlings in 1998, and urgent action was required in order to save it. The team, having successfully eradicated introduced predators on the island, instigated a captive-breeding programme and released artificially incubated and hand-reared Loggerhead Shrikes. In 2006, there were more than 40 pairs breeding on the island and these produced 160 young. It is estimated that more than 80% of the island's current Loggerhead Shrike population consists of released captive-bred individuals and their descendants.

Protective fencing resulted in a higher abundance and a greater species richness of birds, including the Loggerhead Shrike, which was found also to nest more frequently inside the fenced area than outside it. This increase in abundance may be related to an increase in abundance of seed and invertebrate food resources and, particularly for the shrike, an increase in reptile species. Sites used by Loggerhead Shrikes in the USA did not differ in accordance with disturbance, such as that caused by military training, with harvesting of hay or with the number of years since burning took place. Moreover, the shrikes dispersed along connecting corridors of vegetation, rather than directly between equally sized isolated patches of habitat. Management for resident shrikes should, therefore, include a patchwork of grassy habitats and sparsely vegetated bare areas at the scale of individual shrike territories. Similarly, comparisons of occupied and unoccupied sites in southern Alberta, in Canada, indicate that the amount of suitable breeding habitat could be increased by management practices that increase the area of grassland. A very important nesting habitat for Loggerhead Shrikes is scrubland, the loss of which has been accompanied by a corresponding reduction in both the range and the numbers of shrikes.

Invading species appear to have a negative impact on shrike populations in North America, as evidenced by the reaction of shrikes to the red imported fire ant (*Solenopsis invicta*), which is an aggressive, non-indigenous species that is a threat to native biota in the south-eastern USA. One study in Texas investigated whether the ants reduced the insect prey available to the shrikes, and it was found that both insect biomass and shrike abundance were negatively correlated with the level of *Solenopsis* infestation. The data suggested also that the shrikes avoided wintering in areas invaded by the ants and that this avoidance might result from reduced insect availability in such areas.

In some studies, the reproductive success of Loggerhead Shrikes has been relatively high, something that would seem incompatible with the recent decline in the species' numbers. Although much good habitat has been lost, there is still sufficient suitable but unoccupied habitat to accommodate a larger population. Management initiatives for this shrike should be directed towards increasing the amount of medium-height and perhaps tall grass in areas that are favourable for the species, and one way of achieving this is to control the grazing and mowing of grasslands. In addition, hedges, brush along fence lines, and scattered trees in pastureland and fields should be retained as potential nest-sites, and also as hunting perches. The Loggerhead Shrike's continuing decline may be due, at least partially, to its withdrawal from parts of the range where human activities have reduced the density of perches.

Several key management priorities have been identified for the conservation of the Loggerhead Shrike. Among them are the determining of migration stopover sites and wintering areas and the species' susceptibility to human disturbance at these locations; assessment of its dietary needs and the influences of weather, season, land use and biocides on food availability; determining of the mortality rates of juveniles and adults throughout the annual cycle in different habitats; and research into the degree of niche overlap between the Loggerhead Shrike and potential competitors in order to determine whether the shrike's productivity is correlated with the presence or absence of these species. D. A. Keinath and C. Schneider, in 2005, summarized the several decades of work carried out on the Loggerhead Shrike in North America, and their recommendations for the conserva-

Once fledged, young shrikes remain in or near the nest tree or bush for a few days. During this phase they are vulnerable to predation and therefore tend to remain in dense cover, although this **Grey-backed Shrike** is already a little more adventurous. After about one week it will fly increasing distances, usually prompted by its attempts to follow the adults around the territory. Overall, it will remain more or less dependent on them for 3–4 weeks after fledging, after which it will be able to subsist by foraging independently. A few weeks later it will leave the territory entirely.

[*Lanius tephronotus*, China.

Photo: Zhang Ming]



There are no globally threatened shrikes, but **Souza's Shrike** is one of the least common. It is sparsely distributed and local in a fairly large range from Rwanda and Tanzania to Namibia and Zimbabwe. It is associated with light woodland and the forest-savanna ecotone, habitats which in Africa have suffered from overgrazing, burning and the intensification of agriculture. There is a shortage of information about changes in distribution or abundance, and while this species is not likely to be immediately threatened its status requires monitoring.

[*Lanius souzae*,
Dzalanyama Forest
Reserve, Malawi.
Photo: Johannes
Ferdinand]



tion of the species effectively apply to all of the laniid shrike species throughout the range of the family.

Whereas localized declines can often be attributed to proximate causes, the synchronous range-wide decline in shrike populations is difficult to explain. It can probably be attributed in part to loss of open habitat and, to some extent, reforestation in some northern regions, but there are places where a good deal of suitable habitat remains currently unoccupied by shrikes, and declines have occurred even in regions with much open habitat. Furthermore, in some non-breeding quarters where the habitat has not changed, the numbers of shrikes have fallen. A variety of factors, mostly anthropogenic but also natural, would seem to be involved in these declines.

Anthropogenic impacts fall into the main categories of direct mortality and habitat reduction. A combination of pesticide effects and habitat loss seems likely to lead to declines. Both breeding and wintering habitats have been shrinking in most areas where shrikes are found, primarily because of intensive agricultural practices that have resulted in the removal of shrubs and shelter-belts. Although pesticides can lead to the thinning of eggshells or have adverse effects on the behavioural development and hunting ability of young shrikes, it is more likely that their most serious impact is indirect, in that they cause a long-term reduction of insects. Another problem is that shrikes often nest at roadsides, at least in some parts of their ranges, and, because they fly low to the ground, they are frequently hit by vehicles; fledglings and juveniles, being inexperienced, are especially vulnerable. This is likely to become an increasing risk as more shrikes are forced to use roadside breeding habitats, and as road traffic has increased greatly and continues to grow in volume throughout the world.

Invasive species have been particularly problematic for island populations, such as that of the Loggerhead Shrike on San Clemente Island. Habitat loss on islands is caused partially by overgrazing by introduced feral livestock, especially domestic goats. Moreover, feral domestic cats are responsible for high rates of nest loss and the deaths of incubating adults, and the replacement of native vegetation with introduced annual grasses and exotic plants decreases the quality of foraging habitat. Overgrazing and crop monoculture reduce insect abundance and diversity, and exotic grass species growing in solid masses make for harder hunting than is the case with native varieties, which

grow in bunches and allow the shrike to see its prey. In the southwest USA, invasive plants such as cheatgrass (*Bromus tectorum*), introduced from Europe, cause native bushes to grow in small stands, surrounded by the exotic. It was found that Loggerhead Shrikes in this situation might be forced by the habitat limitations to breed closer together than normal.

Some of the range contractions and population declines suffered by shrikes may result from natural successional change in habitats, such as reforestation, but the importance of this compared with anthropogenic changes is unclear. Other natural events, primarily predation and random weather events, have been shown to cause nesting failure and local reductions in numbers, but these factors are not thought to be responsible for more widespread declines, although they can add to the existing pressures on populations. For example, reduced nest success is associated with roadside and fence-line habitats, where predators are more common. Further, the spread of some major nest predators, including feral cats and corvids, has been facilitated by patterns of human settlement.

The following recommendations, here summarized, were compiled by the Canadian Wildlife Service for the conservation of Loggerhead Shrikes, but they could equally well be regarded as a guide for ensuring the future of laniids in similar habitats in Europe, Asia and Africa. Native grassland in breeding and wintering areas should be preserved; where this is not possible, seeded pastures should be provided. Agricultural policies that encourage the conversion of native grassland to cropland should be altered. Scrub habitat in the shrike's breeding range should be preserved. Suitable habitat should be protected through incentive programmes, donations, land trusts, leases and purchases, or through designation of suitable habitat as natural areas. Provision of areas of adequate size for breeding shrikes is required, taking into consideration the fact that females sometimes mate with more than one male or switch mates. Areas should be large enough to support several average-sized territories (about 2.7–25 ha/territory) of asymmetrical shape. Low, thick shrubs and trees should be maintained along fence lines, in abandoned farmyards and throughout otherwise open pastures and fields. Shelter-belts should be diversified by incorporating thorny trees and bushes, and a strip of grass 2–4 m wide should be planted around them to increase foraging areas near nest-sites. In areas with taller vegetation, grazing should be implemented where pastures provide suitably short

vegetation for shrikes to forage; pastures are often the preferred habitat of certain species. A few areas of tall grass should be maintained within pastures, as they encourage small mammals, which are potential shrike prey, and in areas with naturally short vegetation areas of taller grass, taller than 20 cm, can be increased by control of grazing and mowing; although shrikes prefer to forage in short grass, success may be higher in areas of tall grass, where vertebrate prey are more abundant. The use of biocides should be reduced whenever possible in order to protect insects and other prey species exploited by shrikes. A number of additional recommendations with regard to habitat management were given.

In order to understand the decline of shrikes, as well as that of other wildlife living in agricultural habitats, it is necessary to include parasitic species in ecological and environmental studies, at the same time gathering information on the general condition and health of individuals. As big changes are likely to occur on a large scale in agro-ecosystems in Europe, this information could prove to be useful, at least in the short term. Polish researchers extracted chewing lice (Mallophaga) of the species *Docophorulus coarctatus* from 36 museum specimens of the Great Grey Shrike. They gathered samples of five female and five male lice from each bird. Female lice were bigger than the males, although the size of both sexes of lice was positively correlated with the size of the individual shrike, and also with the density of lice on the individual host. In a similar study in Slovakia, during 1962–1974, the louse parasite community on Great Grey Shrikes was studied. This consisted of three species, *Docophorulus coarctatus*, *Brueelia cruciata* and *Lanicanthus camelinus*, all characteristic of this shrike; lice were present on 104 of the 108 specimens examined. Sex ratios of lice were biased towards females and were not correlated with the subpopulation size of lice on individual hosts. While the risk that parasites and pathogens pose to endangered species is evident, this factor is normally overlooked by scientists when considering the causes of decline of species.

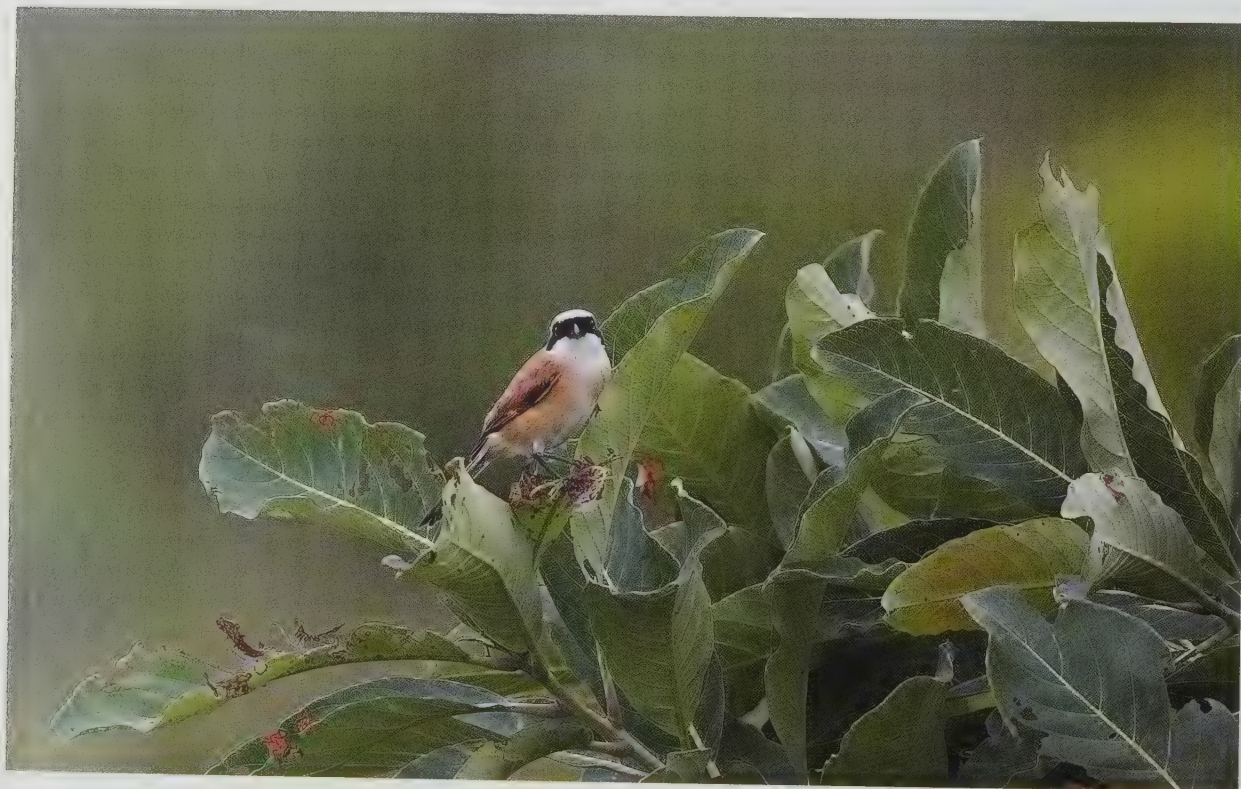
In a study of adult and nestling Lesser Grey Shrikes from a stable population in central Europe, three species of haemoparasite (of the genera *Haemoproteus* and *Trypanosoma*) and two ectoparasite taxa, namely *Menacanthus camelinus* and feather mites (Acarina), were found. Although this particular shrike population, breeding in an area with traditional and extensive farming, seemed not to be under any heavy parasite pressure, indirect measures of immunocompetence revealed an association between haemoparasites and a reduced health status. The effects on the

shrikes of other parasites, such as helminths, need also to be assessed. *Haemoproteus lanii* was found to be the most common blood parasite in Red-backed Shrikes in the southern Czech Republic. Female shrikes infected by this parasite started egg-laying later in the season than uninfected females, and this could ultimately have an impact on the reproductive output of the shrike. Infected males had significantly longer wings and a larger black tail than uninfected individuals. Moreover, mating was assortative with regard to infection status.

We still know relatively little about which factors contribute to mortality during the various life stages of shrikes, and no systematic study has been made of the lifespan and adult survivorship largely because of the difficulties posed by undetermined levels of dispersal between breeding seasons. It is important, therefore, to ascertain the mortality rates of juveniles and adults throughout the annual cycle in different habitats, and at the same time to throw light on those factors contributing to mortality and to causes of decline. In addition, there are very few data on disease and body parasites, which may have an important role in the widespread decline of shrikes.

Shrikes can be bred with relative ease in captivity, as has been found to be the case with Loggerhead, Great Grey, Long-tailed, Woodchat and Red-backed Shrikes. Captive-breeding programmes, followed by the releasing of the young into their natural environment, can help to maintain shrike populations in the best possible way. Of course, an understanding of their habitat requirements and behavioural traits is essential before such releases of captive-bred individuals are made.

Although shrikes have in the past sometimes had a bad reputation among humans (see Relationship with Man), this is undeserved and, in the modern world, they are generally regarded in a better light. While shrikes have gained a better reputation, however, they are confronted with drastic habitat changes in many parts of the world. The decline of *Lanius* shrikes, combined with their attractive appearance and the fact that they are generally conspicuous and easy to study, prompted the creation of an International Shrike Working Group. This group of enthusiasts, which met for the first time in Florida, USA, in 1991, organizes regular meetings, which are followed by the publication of proceedings. So far, it has taken a strong interest only in the laniid shrikes, but the other shrike-like birds, such as the malaconotid bush-shrikes, should not be forgotten. Very little is known about them, but it is obvious that a few species are already endangered.



Emin's Shrike is generally uncommon and localized in shrubby savanna and forest clearings. It is distributed discontinuously from Mali and Ivory Coast in the west to Sudan, DR Congo and Uganda in the east. This range is fairly extensive, roughly 130,000 km² in occupied area, while the global population is estimated at fewer than 70,000 individuals. Although these figures surpass the thresholds for threatened status, they are based on sparse information and suggest that the species may need conservation attention.

[*Lanius gubernator*, Laminga, Jos Plateau, Plateau State, NC Nigeria. Photo: A. P. Leventis]

The **Mountain Shrike** is a restricted-range species present in some important Philippine Endemic Bird Areas: the Mindoro EBA, the Luzon EBA, and the Mindanao and Eastern Visayas EBA. It is generally uncommon, but healthy populations appear to persist in upland and mountain-top habitat that remains free from anthropogenic habitat loss. Thus, although the species is generally uncommon in a small range it is not thought to be in immediate threat of extinction. It is currently considered *Near-threatened*.



[*Lanius validirostris hachisuka*, Lake Venado, Mount Apo National Park, Mindanao, Philippines. Photo: Doug Wechsler/VIREO]

General Bibliography

Allen *et al.* (2001), Anderson & Duzan (1978), Anon. (1994b), Antczak *et al.* (2005a, 2005b, 2005c), Arcas (1998), Ash (1956, 1970), Atkinson (1901), Bartholomew & Cade (1963), Beaud (2000), Bengston (1981), Bensch *et al.* (1991), Biebach *et al.* (1983), Bildstein & Grubb (1980), Bjorge & Kiliaan (1997), Bjorge & Prescott (1996), Bock (1994), Bogdanov (1881), Bohall-Wood (1987), Brahimia *et al.* (2003), Brooks, B.L. & Temple (1990a, 1990b), Brooks, M. (1999), Bruderer (1994, 2007), Budden & Wright (2000, 2001a, 2001b, 2005), Burnside (1987), Burton (1999), Busbee (1977), Cade (1967, 1992, 1995), Cade & Woods (1997), Campos & Lizarraga (2000), Campos *et al.* (2006), Carlson (1983, 1985a, 1985b, 1989), Chabot, Titman & Bird (1995, 2001), Chapman & Casto (1972), Chavez-Ramirez *et al.* (1994), Cicero (1993), Collister & De Smet (1997), Collister & Henry (1995), Collister & Wicklum (1996), Craig (1978), Cuddy (1995), Cunningham (1979), Degen *et al.* (1992), DeGeus & Best (1991), Dementiev *et al.* (1954b, 1968), Desai & Malhotra (1986), Devereux *et al.* (2000a, 2000b), Dickinson (2003), Diehl (1972, 1995), Diehl & Myrcha (1973), Dittami & Knauer (1986), Dohmann (1980), Dowsett & Dowsett-Lemaire (1993), Eck (1971), England (1971a, 1971b), Erdman (1970), Esely & Bollinger (2003), Etterson (2003), Flickinger (1995), Fornasari *et al.* (1994), Frye & Gerhardt (2001), Fuisz & Yosef (2001), Gawlik (1991), Gawlik & Bildstein (1990, 1993), Gawlik *et al.* (1991), Geertsma *et al.* (2000), Golawski (2006), Gotzman (1967), Grant *et al.* (1991), Greaves (1978), Greenwood (1967), Grimes (1985), Grubb & Yosef (1994), Grunwald (1991), Gwinner & Biebach (1977), Haas (1985, 1987, 1995), Haas & Ogawa (1995), Haas & Sloane (1989), Haffer (1993h), Hall & Moreau (1970), Hargrave (1939), Harris (1995), Harris & Arnott (1988), Harris & Franklin (2000), Hartman (1955), Hayes & William (1987), Hernández (1993a, 1993b, 1993c, 1993d, 1995a, 1995b, 1995c, 1995d), Hernández, Purroy & Salgado (1993), Herremans (1995, 1997a, 1998), Hoi *et al.* (2004), Holan & Sviecka (1996), Hoogstraal *et al.* (1964), Hromada *et al.* (2003), Hubalek (2003), Hunter *et al.* (1995), Imanishi (2002), Infante & Peris (2004), Ingold & Ingold (1987), Isenmann & Bouchet (1993), Isenmann & Debout (2000), Isenmann & Fradet (1995, 1998), Isenmann & Lefranc (1994), Isenmann *et al.* (2000), Ishigaki (1966), Jakober & Stauber (1980, 1981, 1983, 1987a, 1987b, 1989a, 1989b, 1994, 2000a, 2000b, 2002, 2004), Jakober *et al.* (2007), Jany (1948), Johns & Johns (2001), Karasawa (1976), Karlsson (2001, 2002, 2004, 2007), Kaufman (1973), Keinath & Schneider (2005), Kiliaan (1996), Kobayashi (1980), Koskimies (2004), Kridelbaugh (1983), Kristín, Hoi *et al.* (1999, 2000, 2007), Kristín, Valera *et al.* (2007), Kuczynski *et al.* (2003), Kuehler, Lieberman, McIlraith, Everett, Scott, Knight *et al.* (1999), Kuehler, Lieberman, McIlraith, Everett, Scott, Morrison & Winchell (1993), Kumar (1980), Kuper *et al.* (2000), Lane (1987), Lefranc & Wofolk (1997), Lefranc *et al.* (1989), Lepley, Ranc *et al.* (2004), Lepley, Thévenot *et al.* (2004), Lohrer (1974), Lorek (1991, 1995a, 1995b), Lorek *et al.* (2000), Lovaszi & Moskát (2003), Luukkonen (1987), Lyman & Temple (1991), Massa *et al.* (1993), Medway (1970),

Michaels & Cully (1998), Miksik (1993), Miller (1928, 1931), Mizzell (1993), Morrison (1979, 1981), Morrison & Winchell (1993), Moskát (2001), Moskát & Fuisz (1999, 2002), Moskát *et al.* (2000), Mundy, Winchell, Burr & Woodruff (1997), Mundy, Winchell & Woodruff (1996, 1997), Münster (1984), van Nieuwenhuysse (1992a, 1992b, 1996, 1999a, 1999b, 2000), van Nieuwenhuysse & Iweins (1995), van Nieuwenhuysse, Nollet & Coussens (1995), van Nieuwenhuysse, Nollet & Evans (1999), van Nieuwenhuysse, Vandekerckhove *et al.* (1992), Nikolov (2003, 2004, 2005), Novak (1989, 1995), Olsson (1980, 1981, 1984a, 1984b, 1984c, 1985, 1986, 1988, 1995a, 1995b, 1995c, 2001), Pande (2004), Pande *et al.* (2004), Panov (1989, 1995, 1996), Parkes (1958), Parrott (1980), Pasinelli *et al.* (2007), Patten & Campbell (2000), Pearson (2000), Pérez & Hobson (2006, 2007), Peterjohn & Sauer (1995), Poole (1992), Porter *et al.* (1975), Poulin *et al.* (2001), Prescott & Collister (1993), Probst (2001, 2002), Probst *et al.* (2002), Rand (1960), Reid & Fulbright (1981), Reynolds (1979), Ristow *et al.* (1986), Roos & Part (2004), Rothstein (1982, 2001), Safriel (1995), Sauer, Hines & Fallon (2004), Sauer, Orsillo & Peterjohn (1995), Schaub (1996b), Schifferli (2001), Schön (1979, 1994a, 1994b, 1994c, 1994d, 1994e, 1994f, 1994g, 1994h, 1995a, 1995b, 1996, 1998a, 1998b, 2000), Scott & Morrison (1990, 1995), Severinghaus (1996), Sibley (1996), Sibley & Ahlquist (1990), Sibley & Monroe (1990, 1993), Simek (2001), Slack, H.E. (1992), Slack, R.S. (1975), Smith, E.L. & Kruse (1992), Smith, S.M. (1972, 1973a, 1973b, 1980), Sonerud (1989), Soobramoney *et al.* (2004b, 2005), Stauber & Ullrich (1970), Surmacki *et al.* (2006), Szczukowicz *et al.* (2006), Takagi (1996a, 1996b, 1999, 2000, 2001, 2002a, 2002b, 2002c, 2002d, 2003a, 2003b, 2003c, 2004), Takagi & Abe (1996), Telfer (1992), Telfer *et al.* (1989), Temple (1995a, 1995b), Tenovuo & Varrela (1998), Took (1966), Tryjanowski (1999, 2002), Tryjanowski & Golawski (2004), Tryjanowski & Hromada (2005), Tryjanowski & Kuzniak (1999), Tryjanowski & Sparks (2001), Tryjanowski, Hromada & Antczak (1999), Tryjanowski, Hromada, Antczak, Grzybek *et al.* (2003), Tryjanowski, Karg & Karg (2003a, 2003b), Tryjanowski, Kuzniak & Diehl (2000), Tryjanowski, Sparks & Crick (2006), Tye (1984), Tyler, J.D. (1991, 1992), Ullrich (1987a, 1987b, 1993), Vahinsberg & Evans (2002), Valera, Hoi & Kristín (2006), Valera, Kristín & Hoi (2001), Vali (2005), Valliantos *et al.* (2001, 2002), Vaurie (1955), Voous (1979), Votypka *et al.* (2003), Ward & Pinshow (1995a, 1995b), Weathers *et al.* (1984), White (1962), Wiggins (2005), Wilkinson & English-Loeb (1982), Willis (1983), Wirtitsch *et al.* (2001), Woods (1993a, 1993b, 1995a, 1995b, 1995c), Woods & Cade (1996), Wofolk (2000), Yamagishi (1982, 1995), Yamagishi & Saito (1985), Yamagishi *et al.* (1992), Yosef (1992a, 1992b, 1992c, 1992d, 1993a, 1993b, 1993c, 1994a, 1994b, 1996, 2004), Yosef & Deyrup (1998), Yosef & Grubb (1993, 1994a, 1994b), Yosef & Lohrer (1995, 1998), Yosef & Pinshow (1988a, 1988b, 1989, 2005), Yosef & Tryjanowski (2002), Yosef & Whitman (1992), Yosef & Zduniak (2004), Yosef, Carrel & Eisner (1996), Yosef, Mitchell & Pinshow (1991), Yosef, Layne & Lohrer (1993), Yosef, Maritz *et al.* (2000), Young *et al.* (2004), Zack & Ligon (1985a, 1985b, 1986).



Genus *LANIUS* Linnaeus, 1758

1. Tiger Shrike

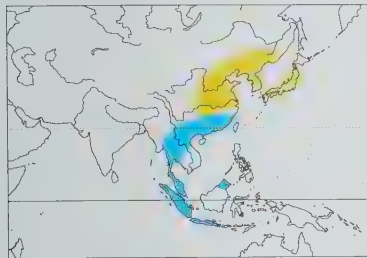
Lanius tigrinus

French: Pie-grèche tigrine **German:** Tigerwürger **Spanish:** Alcaudón Tigre
Other common names: Thick-billed Shrike

Taxonomy. *Lanius tigrinus* Drapiez, 1828, Java.

Appears closely related to the superspecies formed by *L. collurio*, *L. isabellinus* and *L. cristatus*; possibly closest to last of those, which has similar mating system and with which hybridization recorded in Russia and Japan. Monotypic.

Distribution. Breeds extreme SE Russia (Ussuriland), NE & E China (E from Shaanxi, Sichuan and Guizhou), Korea (except S coast) and Japan (Honshu, Sado, E Kyushu); non-breeding E Myanmar and SE China S to Peninsular Malaysia, Singapore, N Laos, C Vietnam and Greater Sunda (including N Borneo).



Descriptive notes. 17–18.5 cm; male 27–29 g, female 29–37 g. A relatively small shrike with rather short, graduated tail, strong and heavy bill with hooked tip. Adult male has light grey crown to upper mantle, black frontal band, lores and ear-coverts forming facial mask; lower mantle to rump and uppertail-coverts deep rufous-brown with coarse blackish bars; upperwing brown with pale or reddish fringes; tail warm brownish-rufous, outer feathers paler; throat, cheek and underparts white, flanks sometimes faintly dark-barred; iris dark brown; bill blue-black, tip black; legs greyish-black. Female is similar to male but variably duller, usually with

much white on lores, sometimes faint paler supercilium, less blackish face mask, duller grey crown and nape, duller brown upperparts more prominently barred, underparts with buff-tinged flanks and side of breast, blackish bars on flanks and belly. Juvenile is like a very dull female but with face mask faint, obvious pale supercilium, has crown to side of head and upper mantle dark reddish-brown or greyish-brown with contrasting narrow dark bars, rest of upperparts reddish-brown and heavily barred, becoming brighter rufous on lower back, rump and uppertail-coverts, dirty white below, chin whiter, breast and flanks with buff wash and heavily dark vermiculations. Voice. Song described as a resonant and musical warble, but subdued at beginning of courtship. Call a loud, sharp “chick” or repeated “tsik-tsik-tsik-tsik...”; territorial call “tcha-tcha-tcha...” or “gichi-gichi...”; alarm a loud, scolding chatter, like that of *L. cristatus* and *L. bucephalus* but louder and harsher.

Habitat. Breeds in temperate, deciduous and mixed lowland and hill forests with thick undercover and small open areas, also forest edges, thickets, wooded cultivated areas, orchards and, rarely, suburban parks; in SE Russia found along rivers and on gentle slopes with deciduous woods of elm (*Ulmus propinqua*, *Ulmus japonica*), Japanese alder (*Alnus japonica*) and Mongolian oak (*Quercus mongolica*). In non-breeding season found in edges and clearings of primary and secondary evergreen and broadleaf lowland forests; also cultivated areas, mangroves and gardens. Usually from sea-level to 1000 m; in SE Russia below 150 m and in Japan below 800 m; during spring migration in Peninsular Malaysia mostly below 800 m, sometimes above 900 m.

Food and Feeding. Almost exclusively insects, mostly Orthoptera and beetles (Coleoptera); rarely, small birds and other small vertebrates (frogs, lizards and rodents). Forages singly, in pairs or in family parties. Rather inconspicuous, keeping more to the forest than most other members of family. Hunts in unusual manner, by skulking at all levels of trees and bushes and gleaning from branches and leaves; hunts also in typical shrike fashion, hawking for insects from exposed perch.

Breeding. Season May–Jul, and laying starts Jun in Russia and Japan; single-brooded. Monogamous; territorial. Nest a compact, thick cup made of weeds, grasses, twigs, roots, pliable bark and other vegetable material, lined with fine grass, seeding grass-heads and fresh leaves, average external diameter 13 cm, height 7.5 cm; placed 1.5–6 m (sometimes higher) above ground on horizontal branch, 1.5–4 m from trunk, in deciduous tree such as oak, elm or apple (*Malus*), in S of range also in bramble (*Rubus*) or low bush. Clutch 3–6 eggs, mostly 5 (mean in Russia 5.3), variable in colour, whitish to bluish-green or pale orange with brown, grey or violet spots, patches and streaks, chiefly at large end; if clutch lost, replacement frequently recorded; incubation by female, period 15–16 days; nestling period c. 14 days; juveniles remain in parental territory for a further 14 days.

Movements. Migratory, although few remain in Japan. N limits of non-breeding range just S of S limits of breeding range. Leaves Russian breeding grounds in Aug, returning end May to mid-Jun; Japanese breeders depart Aug–Sept, returning May. Scarce to uncommon passage migrant and probably also winter visitor in SE China, E & S Myanmar, N, C & S Thailand, N Laos and Vietnam; fairly common to common passage migrant and winter visitor in Peninsular Malaysia (late Aug to early May), Singapore and surrounding islands, and Sumatra (recorded between 3rd Sept and 22nd Apr); scarcer and more irregular in Java and Bali. In Peninsular Malaysia, passage migrants mist-netted at Fraser’s Hill from 9th Sept to 2nd Nov and from 11th Apr to 7th May. Vagrants recorded Hokkaido, in N Japan (during summer months), and on some offshore Japanese islands, also in Hong Kong (Sept), Philippines (Apr), and Sulawesi.

Status and Conservation. Not globally threatened. Few precise data on population size and trends; locally fairly common, but rare in some parts of range. Status in S Japan (on most parts of Kyushu, Shikoku and Tsushima) not known. Range estimated at more than 1,000,000 km². N populations have declined considerably over last 30–40 years, now rare in SE Russia and NE China; in Japan once common and widespread, even in suburban parks in Tokyo, but now very local and uncommon. Fairly common breeder in E China and Korea. Local and scarce to fairly common in non-breeding range. Densities generally low; estimated 1 pair/2.5–3 km² in far N of range, although some nests here are only 10–12 m apart.

Bibliography. Brazil (1991), Chen Fuguan *et al.* (1998), Dementiev *et al.* (1954b, 1968), Étiénnecopar & Hùe (1983), Flint *et al.* (1984), Harris & Franklin (2000), Imanishi (2007b), Jeyarajasingam & Pearson (1999), Kennedy *et al.* (2000), Kryukov (1995), Lefranc & Worfolk (1997), MacKinnon & Phillips (1993, 2000), Meyer de Schauensee (1984), Ohata (1991), Panov (1983, 1995, 1996), Robson (2000b), Sheldon *et al.* (2001), Smythies (1986), Tomek (2002), Wells (2007), Yan Chongwei & Xu Weishu (1996).

2. Bull-headed Shrike

Lanius bucephalus

French: Pie-grèche bucephale **German:** Büffelkopfwürger **Spanish:** Alcaudón Bucéfalo
Other common names: Highland Shrike (Japanese populations)

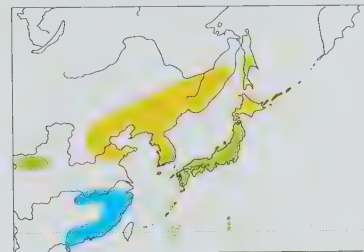
Taxonomy. *Lanius bucephalus* Temminck and Schlegel, 1845, Japan.

Probably closest to the superspecies formed by *L. collurio*, *L. isabellinus* and *L. cristatus*. Two subspecies recognized.

Subspecies and Distribution.

L. b. sicarius Bangs & J.L. Peters, 1928 – breeds S Gansu, in C China.

L. b. bucephalus Temminck & Schlegel, 1845 – breeds SE Russia (Ussuriland), NE China (S Manchuria S to Hebei and Shandong), Korea, S Sakhalin I, S Kurils, Japan (including many smaller islands), Ryukyu Is, Daito Is and Ogasawara Is (Bonin Is); non-breeding also E & SE China.



Descriptive notes. 19–20 cm; male 35–46 g, female 34–52 g. A medium-sized shrike with relatively long tail. Male nominate race has rufous crown, black facial mask from lores back to rear side of neck, narrow white supercilium (individually variable), greyish-rufous nape; upperparts greyish; upperwing mostly black, primaries with conspicuous white patch at base, inner secondaries and tertials fringed greyish, upperwing-coverts slightly fringed whitish; uppertail grey, central feather pair darker, fresh rectrices have white tip and black subterminal band; chin and throat off-white, underparts bright orange-buff, whiter on centre, side of

breast and flanks often faintly barred or scaled brown, undertail-coverts and underside of rectrices brownish-grey; iris dark brown; bill black, base of lower mandible yellowish or pinkish-white in non-breeding season (turns black in breeding season), palate deep red; legs black. Female has crown burnt umber, facial mask dark brown (mask sometimes absent on individuals on Minami-daito I), buff supercilium individually variable in width and length, greyish-umber nape and upperparts; rectrices greyish-umber; upperwing similar to male, but no white primary patch (or sometimes a very narrow one), secondaries and tertials dark brown, inner feathers fringed rufous-brown, wing-coverts dark brown and slightly fringed rufous-brown; chin and throat off-white, underparts washed brown-buff and heavily vermiculated dark brown, undertail-coverts brown-buff, underside of tail light brown, rectrices with white tip and black subterminal band; bare parts as male. Juvenile has dark brown facial mask, small buff supercilium over eye, crown and upperparts dark-barred rufous-brown, tail dark brown, flight-feathers and upperwing-coverts mainly dark brown, inner secondaries and tertials fringed rufous-brown, greater coverts slightly fringed rufous-brown, median and lesser coverts barred brown, primary coverts and alula with buff tips or fringes; young male has white primary patch, lacking on female; chin and throat off-white with faint barring, underparts brown-buff with heavy dark brown vermiculations (dark subterminal bands on each feather), undertail-coverts unbarred, underside of tail light brown, rectrices with white tips, outer rectrices fringed white. Race *sicarius* male has darker grey back and less conspicuous white wing patch than nominate, female has heavier vermiculations on flanks than nominate female, both sexes lack pale collar at base of bill. Voice. Male song, from top of tree or utility pole, a repeated trilling “gyun-gyun-gyun”, sometimes “kyurururururu” in flight early in morning. Female gives “jiá-jiá-jiá” call, like begging call of nestling, with wing-fluttering; male gives same “jiá-jiá-jiá” call, also with wing-fluttering, before copulation. Male, especially, imitates vocalizations of other birds, e.g. Brown-eared Bulbul (*Microscelis amaurotis*), Japanese White-eye (*Zosterops japonicus*), Brown-headed Thrush (*Turdus chrysolaus*), Oriental Greenfinch (*Carduelis sinica*), Latham’s Snipe (*Gallinago hardwickii*), and even insects such as cicadas (Cicadoidea) in breeding season. Both sexes give trilling calls in autumn.

Habitat. Wide range of open habitats, e.g. farmland, suburban parks, gardens in villages, areas with scattered shrubs, hedgerows, shelter-belts, and forest edge. Some individuals winter in woodland, which in N Japan (Hokkaido) is completely snow-covered in that season. From near sea-level to 2700 m; breeding to c. 1500–1800 m in C Honshu, in Japan. In C China, race *sicarius* found in highlands from 1000 m to 2150 m.

Food and Feeding. Invertebrates, especially beetles (Coleoptera); also small vertebrates; some seeds also taken. In study in C Japan (Shizuoka), 49 pellets during breeding season contained 393 prey remains composed of insects (of eight orders, 24 families, 34 genera) and frogs, of which beetles (mainly of genera *Amara* and *Anisodactylus*) represented 72% (283 items), Orthoptera (of genus *Gryllotalpa*) 7.6%, and Hymenoptera (of genera *Cyphononyx*, *Vespa*, *Polistes*, and *Apis*) 6%; in winter, 102 pellets contained 1077 items, consisting of insects (eight orders, 23 families, 36 genera), woodlice (Isopoda), spiders (Araneae), centipedes (of genus *Scolopendra*), birds, rodents, and seeds of *Eucynimus japonicus* and *Ligustrum japonicum*, with beetles (of at least five genera) 51.7% of total and Hemiptera next in frequency (13.8%). Of 731 items detected in stomach analyses of 116 individuals, larvae of weevils (Curculionidae) represented 23.5%, and adult beetles only 6.8%; remains of birds and rodents also found in stomachs. Of 88 impaled prey, locusts 70.5%; other impaled prey included small fish e.g. loach (Cobitidae), amphibians, reptiles, birds e.g. Eurasian Tree Sparrow (*Passer montanus*), Black-faced Bunting (*Emberiza sspodicephala*), Great Tit (*Parus major*), Japanese Bush-warbler (*Cettia diphena*), Oriental Greenfinch and Daurian Redstart (*Phoenicurus aureus*), and mammals e.g. shrews (Soricidae) and rodents. In Chiba (C Japan), 88% of prey during nestling period in Jul consisted of arthropods, e.g. the robber fly *Promachus yesonicus*, the orthopteran *Atractomorpha bederi*, tabanid spiders, adult Lepidoptera, etc., and 12% of vertebrates (Tree Sparrows and reptiles). On Hokkaido (N Japan), arthropods constituted 95% of all prey delivered to nestlings (i.e., Lepidoptera larvae 34.5%, Orthoptera 30.3%, Arachnoidea 16.4%); of 129 impaled prey items in autumn and winter, frequency of reptiles 7.8% (of amphibians 9.3% and of fish 9.3%, with remainder of prey invertebrates, mainly Locustidae (21.5%) and Lepidoptera larvae (12.4%). On Sakhalin I, prey items by pellet analyses were mainly beetles, Hymenoptera (bumblebees, wasps), lizards (Lacertidae), rodents, shrews and birds, e.g. Siberian Rubythroat (*Luscinia calliope*), Middendorff’s Warbler (*Locustella ochotensis*), Oriental Greenfinch, etc. Forages singly and in pairs. Hunts from fairly high perches, including utility wires and fences, from which it pounces on prey on ground. Maintains lairs.

Breeding. In Japan, laying from Apr to Jul in N (Hokkaido) and, in C regions, from early Mar to late Jun in Mie and from late Feb to late Jul in Osaka, and breeds late Jan to Aug on Minami-daito I;

breeds May–Jul in C China (race *sicarius*); occasionally double-brooded, e.g. 10% of pairs that had bred successfully initiated a second nesting attempt. Monogamous; territorial, home range variable according to availability of perching sites, in one study 0.92–4.29 ha. Courting male moves raised head and tail to right and to left, and pursues female while displaying the white patch on wing. Nest an open cup made from twigs, bark, moss, leaves and grass stems, lined with rootlets, hair and other fine material, external diameter 12.5–16 cm, height c. 10 cm, internal diameter 7–8 cm, depth c. 7 cm, placed c. 0.3–4.5 m above ground in bush or tree, often surrounded by thorns and/or nettles (*Urtica*), on Minami-daito I mainly in evergreen tree *Calophyllum inophyllum* at mean height of 2.52 m; on Hokkaido, nest built at average of 0.75 m in dwarf bamboo or vine bush in early breeding season, but at average of 1.35 m in variety of green deciduous shrubs later in season. Clutch 2–7 eggs, usually 5 or 6 (3–6 on Hokkaido and in S Ussuriland, mode 5 on Minami-daito I), in C China (race *sicarius*) 4–6, colour variable, e.g. buff with fine dark brown spots or reddish-white with fine reddish-brown spots; incubation by female, fed on nest by male, period 13–16 days, generally c. 15 days (*sicarius* 14–15 days); chicks brooded by female for first week, fed by both parents, in one study hourly feeding rates (number of deliveries per nestling) when chicks 6 days were 1.9 by male and 0.92 by female, and when chicks 12 days were 2.1 by male and 2.6 by female; nestling period c. 13–15 days (13 days for C China race *sicarius*); fledglings fed by parents for at least 15 days after leaving nest. Nests parasitized by Common Cuckoo (*Cuculus canorus*) and Horsfield's Cuckoo (*Cuculus horsfieldi*). First breeding, by both sexes, at 1 year. Longest recorded lifespan in Japan 8 years 1 month (female) and 5 years 11 months (male).

Movements. Migratory, partially migratory and resident. Summer visitor in SE Russia, Sakhalin and NE China, moving to non-breeding grounds mainly in E & SE China, Korea and C & S Japan; arrival from Apr. departure Aug–Sept, occasionally not until early Oct (e.g. S Sakhalin). Mainly resident in S & SE of range, including islands. In Japan, mostly migratory on Hokkaido and N Honshu, whereas populations S of there are more or less sedentary or undertake local movements; some of latter, however, winter in N Honshu and even Hokkaido; altitudinal movements also recorded, with descent from higher elevations of Honshu (800–1800 m). Race *sicarius* apparently resident in C China.

Status and Conservation. Not globally threatened. Not uncommon in much of range; declining. Nominate race declining in Japan, where breedings pairs observed at less than half the number of sites in 1990s compared with 1970s; has disappeared from 134 sites in the last three decades in Tokyo, and only 44 reported as as occupied in 1990s, this decrease correlated with shrinkage of farmland in Tokyo; in a study area on Hokkaido, number of pairs approximately constant over the four years 1993 to 1996, but almost certainly reduced more recently by opening of a large roadway in area. This species appears certainly likely to be threatened by developments in the near future in Japan. Rare on Sakhalin I; no information on status of nominate race in rest of range, but considered probably fairly secure, at least in the short term. Occurs Pangqiangou National Nature Reserve, in NE China (N Shanxi). No accurate details of population size of race *sicarius*, but likely to be very small, and distribution of this taxon very restricted within narrow area of C China.

Bibliography. Brazil (1991), Chen Fuguan *et al.* (1998), Chiba (1990), Chong Lillian Tsin (1938), Dementiev *et al.* (1954b, 1968), Etchécopar & Hûe (1983), Haas & Ogawa (1995), Harris & Franklin (2000), Imanishi (2007a), Ishigaki (1966), Karasawa (1976, 1982), Kiyosu (1952), Kurata (1967), Lefranc & Worfolk (1997), MacKinnon & Phillips (2000), Matsui *et al.* (2006), Meyer de Schauensee (1984), Moskai *et al.* (2000), Nechaev (1991), Ogawa (1977a, 1977b), Panov (1973), Robson (2000b), Seebohm (1890), Takagi (1999, 2000, 2001, 2002a, 2002c, 2003a, 2003b, 2003c, 2004), Takagi & Abe (1996), Takagi & Ogawa (1995), Tomek (2002), Uchida (1914), Vaurie (1955), Yamagishi (1982), Yamagishi & Saito (1985), Yamagishi *et al.* (1992), Yamashina (1934), Zheng Guangmei & Wang Xiangting (1985).

3. Red-backed Shrike

Lanius collurio

French: Pie-grièche écorcheur **German:** Neuntöter **Spanish:** Alcaudón Dorsirrojo

Taxonomy. *Lanius collurio* Linnaeus, 1758, Europe = Sweden.

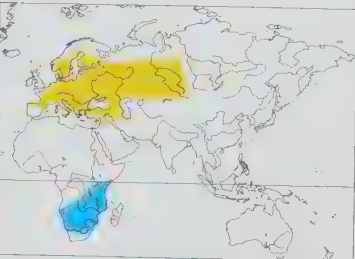
Thought to form a superspecies with *L. isabellinus* and *L. cristatus*; has in the past been considered conspecific with one or both of those, but recent genetic analyses support treatment as separate species. Degree of reproductive isolation between this species and *L. isabellinus* relatively low, and mixed pairs and hybrids regularly occur where ranges overlap in SW, W & C Asia; occasional hybridization with *L. cristatus* in C Asia. Races intergrade; *pallidifrons* and *kobylini* possibly result from influence of these two neighbouring species, and are individually strongly variable, such that recognition of either is dubious; species perhaps better treated as monotypic. Additional proposed race, *juxtus* (described from east Suffolk, in E England), is indistinguishable from nominate. Three subspecies tentatively recognized.

Subspecies and Distribution.

L. c. collurio Linnaeus, 1758 – breeds Europe (except N, NW & SW) E to W Siberia, S to N Iberia, Sardinia, S Italy, Sicily, Balkans (S to Croatia), C Romania, Ukraine, and plains N of Caucasus; non-breeding S & E Africa.

L. c. kobylini Buturlin, 1906 – breeds Balkans (S from Bosnia) E to Crimea and Caucasus, S to Asia Minor, Cyprus and NW Iran; non-breeding S & E Africa.

L. c. pallidifrons H. C. Johansen, 1952 – breeds W & WC Siberia (E to NW Altai); non-breeding S & E Africa.



Descriptive notes. 17 cm; 22.5–34 g. Rather small shrike with fairly short wings and longish tail; when excited, indulges in tail movement in form of loose flick or curving swing, accompanied by partial spreading of tail. Male nominate race has bluish-grey upper forehead and crown to nape and hindneck, black lower forehead and mask from lores to rear of ear-coverts; mantle, scapulars and back bright chestnut, rump and uppertail-coverts bluish-grey; upperwing blackish, feathers edged chestnut, sometimes a very small white patch at base of primaries; tail black, all except central pair of feathers with white base, outermost

greyish (variable, some with head pattern more like male); rump and uppertail-coverts grey to greyish-brown, tail dark brown to rufous-brown with whitish edges and tip (variable, some with tail like that of male), upperwing as male but fringes paler and duller; creamy below, often with pale pinkish-buff wash on side of breast and flanks, vermiculated with blackish (except on throat and undertail-coverts); bare parts as male, but bill and legs slightly paler. Juvenile is similar to female but with even less contrast in plumage, entire upperside, including top of head, rump, upperwing-coverts and tertials, rufous-brown to buffish-brown with heavy blackish crescentic barring, underside more heavily vermiculated than female. Races differ little, are also individually variable: *kobylini* is somewhat duller than nominate, usually with greyer upper mantle; *pallidifrons* has paler crown and hindneck than nominate. VOICE. Main call a hoarse, muffled “gä”, “gwä” and “krew”, or rougher “gek, gek”, also as shorter “tek-tek” for contact; during excitement varied to “tschä” or “tschäck”, which can end in alarm call, “dschrää-dschrää...”. Male gives “tschok” call for marking territory and simultaneously attracting females; “hiää” calls by food-begging female, as well as nestlings. Male song (without territorial function) during display a soft warble, incorporating songs and calls of a wide range of other bird species (learned during immature imprinting between leaving nest and autumn migration, thus no birds from winter range imitated), in Middle Europe most common songs copied from Common Blackbird (*Turdus merula*), Great Tit (*Parus major*), European Crested Tit (*Lophophanes cristatus*), Barn Swallow (*Hirundo rustica*), *Acrocephalus* warblers, *Sylvia* warblers, *Emberiza* species, and calls of Common Chaffinch (*Fringilla coelebs*) and White Wagtail (*Motacilla alba*), also of non-passerines such as Grey Partridge (*Perdix perdix*), Common Quail (*Coturnix coturnix*) and Little Grebe (*Tachybaptus ruficollis*); no clear verses or repetitions, and most verses introduced and closed with “dschä”-calls; songs can last for more than 10 minutes without pause.

Habitat. Requires sunny, warm, usually dry, and level or gently sloping terrain, with scattered bushes, shrubs or low trees (1–3 m tall) providing hunting posts overlooking areas of short grass, heath or bare soil (suitable for small prey); high-quality habitats tend to feature mosaic-like grassy vegetation with alternating areas of tall and short growth and bare areas, with perches. In agricultural areas occupies neglected overgrown patches, heaths, open downs, overgrown orchards and gardens, hedgerows, and scrub along railways or roadsides; found also in temporary steppe-like habitats, e.g. military training areas, burned forests, forest clearings and spruce (*Picea*) plantations. In W Europe associated mostly with cattle breeding, as often found in hilly regions or at middle altitudes. Regular near agricultural roads, as these combine easy prey accessibility (bare ground, regularly mown road edges) with fence posts for perches, scattered shrubs or hedges for breeding, and unmown vegetation as prey habitat. Sometimes occupies atypical habitat when breeding pairs “clumped” in loose colonies. Avoids very dry areas, and confined to mountainous areas in N Iberian Peninsula; in Alps ascends mostly to 1000 m, exceptionally 2050 m; in Caucasus usually to 2000 m, less often on subalpine meadows to 3200 m; to 1400 m in Sicily. On S African wintering grounds occupies habitats with vegetation structure similar to that in breeding quarters; occurs widely in savanna, and extends into other grasslands and karoo. In N South Africa shows preference for low scrub (1–3 m tall) and open bush (10–50% coverage); uses perches 1.5–3 m high in open areas with herbaceous layer rich in insects.

Food and Feeding. Opportunistic, taking mainly insects, especially beetles (Coleoptera), Orthoptera and Hymenoptera, also other invertebrates; also small mammals, mostly voles (Microtini), birds, and reptiles; at end of summer and in autumn diet sometimes complemented by berries, especially of wild cherry (*Prunus avium*) and elder (*Sambucus nigra*). Great majority of bird prey are nestlings and fledglings; adult birds taken are generally weak or injured, and any healthy ones probably taken at nest. Small or soft prey regularly fed to small nestlings. Most prey located from exposed, usually low perch, by sit-and-wait strategy. Large moving insects spotted up to 30 m away, and caught in bill after shallow direct glide, which may terminate in brief hover before bird drops into vegetation; also drops straight on to prey below perch. Flying insects taken in rapid, sometimes lengthy, aerial pursuit. Prey (even small items) almost always carried back to perch for consumption or impaling. Many prey items impaled on thorns, broken twigs, barbed wire, etc., in caches (larders), although individual items may be widely scattered throughout territory. Deals with invertebrate prey by beating them on substrate to remove extremities, wingcases, etc., or picks these off by bill while holding prey under, or in, foot or after impaling. Vertebrate prey killed by blow to back of head or neck; brain often consumed on ground and animal decapitated before being cached. Unable to dismember vertebrate prey held only under foot, and these therefore impaled for treatment.

Breeding. Laying from early May or mid-May (according to latitude) to Jul; usually one brood, rarely two (two recorded in Belgium, France and Germany). Pair formation fairly rapid, mostly in breeding territory, although occasionally during spring stopovers. Nest untidy-looking, a loose foundation of often green plant stems (some thick or woody), roots, grass, lichen, hair, etc., compactly lined with grass, hair, moss, fur, reed (*Phragmites*) or reed-mace (*Typha*) flowerheads, plant down and similar material, situated at 0.3–5 m but generally low down (1–1.5 m on average) in dense, often thorny bush such as hawthorn (*Crataegus*), blackthorn (*Prunus spinosa*), bramble (*Rubus*) or dog-rose (*Rosa*). Clutch 1–8 eggs, mostly 3–7, in W Europe first clutches usually 4–6 eggs (7-egg clutches much more frequent in E than in W), clutch size decreases during course of season; replacement clutches contain fewer eggs on average, eggs very variable, subcylindrical to oval, very slightly glossy, pale green to pinkish or creamy white with band of light brown, olive, brownish-red, grey or purple specks and small blotches near broad end (markings sometimes scattered over whole surface, or even present only at narrow end); several replacement clutches may be laid (particularly in second half of Jun) if earlier ones lost; incubation almost exclusively by female, although rarely male assists, period 12–16 days, mostly 14 days; chicks brooded by female and fed by male for first week, thereafter fed by both sexes; very occasionally, one or more unmated individuals help in brood-rearing, at times taking over almost entire task from breeding pair; nestling period normally 14–16 days, sometimes longer (up to 18–20 days) in very bad weather, or sometimes predators cause young to jump out of nest when only 11 days old; fledglings begin to catch insects for themselves from c. 14 days after leaving nest, become independent c. 20 days later.

Movements. Migratory; non-breeding range in E & S Africa S from extreme S Somalia (rare) and SE and coastal Kenya, but main bulk of population S from Zambia and Malawi. N passage in spring following more E course than autumn passage, and notable for concentration of migration routes across and around E end of Mediterranean, even by populations breeding in extreme W of Europe. Nocturnal migrant. Leaves breeding grounds from late Jul, mostly in second half Aug and early Sept, general direction of movement SE or SSE towards E Mediterranean; those crossing Mediterranean Sea make landfall on N African coast almost entirely E of 20° E; passage through Egypt mainly mid-Aug to early Nov, first arrivals in extreme S of wintering areas in late Oct. Return migration from winter quarters begins second half Mar, all having left extreme S by about middle of Apr; more E course of N migration evident in E Africa, and divergence between spring and autumn routes more pronounced farther N. Arrival on breeding grounds in Apr in N Israel, mostly May in Europe; males generally reach breeding areas a few days before females (up to five days earlier in Europe).

Status and Conservation. Not globally threatened. Locally common to uncommon or rare. European breeding population estimated as exceeding 6,300,000 pairs, but underwent moderate decline

pair with white outer web (in flight, all-black central tail feathers and black terminal band on others form inverted T-shape on white background); chin and throat white, underparts very light salmon-pink, undertail-coverts white, sometimes some dark barring on flanks (present on 4% of males trapped in Germany); iris dark brown; bill black or blackish, paler or bluish base in non-breeding season; legs black or dark brown. Female is similar to male but generally paler and duller, with creamy lower forehead and supercilium and brown ear-coverts (facial mask thus restricted and much less distinct), crown and upperparts warm brown or greyish-brown, nape usually tinged

between 1970 and 1990; although declines continued in several countries during 1990–2000, most E populations remained stable. Species probably declined only slightly overall, and is provisionally evaluated as “depleted”. Range has contracted in Iberia, Belgium, Netherlands, Denmark, and Ukraine, but has expanded in Norway. More or less extinct in Britain (formerly locally common in England), but recently bred N Scotland (Shetland). Elsewhere, numbers greatly reduced in many areas, but without apparent reduction of range on broad scale. Decline probably due mainly to loss and fragmentation of habitat resulting from afforestation and agricultural intensification, increased use of pesticides causing loss of food resources. In N & W edges of range, breeding affected by cooler, wetter summers. Increase in 1990s observed in W Europe, and resulted in recolonization of a restored peat-bog reserve (Bargerveen) in Netherlands, where this species increased from a few pairs in 1970s to 105 pairs in 1992. Spread in S & W Norway since 1970s, and expanded N in Sweden 1970–90. Small isolated populations nest in mountainous areas of W Syria (Anti-Lebanon), N Israel (Mt Hermon) and Lebanon.

Bibliography. Ash (1970), Beusink *et al.* (2003), Biebach *et al.* (1983), Brandl *et al.* (1986), Bruderer & Bruderer (1993), Burfield & van Bommel (2004), Carlson (1985a, 1985b), Cramp & Perrins (1993), Dementiev *et al.* (1954b, 1968), Ellenberg (1986), Fornasari, Bottoni, Sacchi & Massa (1994), Fornasari, Bottoni, Schwabl & Massa (1992), Golawski (2006, 2007), Haffer (1993h), Hagemeijer & Blair (1997), Harris & Franklin (2000), Hockey *et al.* (2005), Hölzlinger (1987), Hušek & Adamík (2008), Jakober & Stauber (1978, 1980, 1981, 1983, 1987a, 1987b, 1989a, 1989b, 1994, 1998, 2000a, 2000b, 2002, 2004), Jakober *et al.* (2007), Kuzniak & Tryjanowski (2003), Lefranc (1979, 1993, 2004), Lefranc & Worfolk (1997), McCarthy (2006), Moskat (2001), Moskat & Fuisz (1999, 2002), Neuschulz (1988), van Nieuwenhuyse (1998, 2000), van Nieuwenhuyse & Vandekerckhove (1992), van Nieuwenhuyse *et al.* (1999), Olivier (1944), Panov (1983), Reino (2005), Rothhaupt (1991), Scott *et al.* (1975), Solari & Schudel (1988), Stepanyan (1978), Svensson (1992), Tryjanowski & Yosef (2002), Tucker & Heath (1994), Ullrich (1971), Vaurie (1955), Verheyen (1951).

4. Isabelline Shrike

Lanius isabellinus

French: Pie-grièche isabelle **German:** Isabellwürger **Spanish:** Alcaudón Isabel
Other common names: Rufous-tailed/Red-tailed Shrike, Central Asian/Pale-brown/Daurian Shrike; Turkistan (Red-tailed) Shrike (*phoenicuroides*)

Taxonomy. *Lanius isabellinus* Hemprich & Ehrenberg, 1833, Gumduda (= Al Qunfidhah), Arabia. Thought to form a superspecies with *L. collurio* and *L. cristatus*; has in the past been considered conspecific with one or both of those, but recent genetic analyses support treatment as separate species. Degree of reproductive isolation from former relatively low, and mixed pairs and hybrids regularly occur where ranges overlap in SW, W & C Asia. Nomenclature of races recently revised, as true identity of nominate *isabellinus* had been confused: race *arenarius* previously treated as nominate until examination of the type specimen of *isabellinus* (collected on non-breeding grounds in W Arabia) showed it instead to be identical to the form hitherto listed as *speculigerus*; as a result, form previously known as *speculigerus* becomes nominate, with name *speculigerus* as a synonym, while form previously treated as nominate takes the oldest available name applicable to it, *arenarius* (see page 733). Races form two groups, nominate and *phoenicuroides* representing one group and *arenarius* and *tsaidamensis* the other; these groups treated by some Russian authors as two separate species, but nominate race probably intergrades with *arenarius* in N China (S Nei Mongol). Proposed race *karelini* (from S Kazakhstan) included within *phoenicuroides*. Four subspecies recognized.

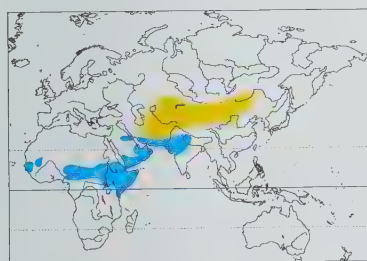
Subspecies and Distribution.

L. i. phoenicuroides (Schalow, 1875) – breeds S & E Kazakhstan S to Transcaspiya, NE & E Iran, Afghanistan, Pakistan (N and probably W of R Indus) and extreme NW China (NW Xinjiang); non-breeding mainly Arabia and NE & E Africa, with some in W Africa.

L. i. isabellinus Hemprich & Ehrenberg, 1833 – breeds Mongolia (except NW) and S & E Russian Transbaikalia S to NW & N China (SE Altai and NE slopes of Tien Shan, in NE Xinjiang, E to C Nei Mongol); non-breeding mainly Arabia and NE Africa.

L. i. arenarius Blyth, 1846 – breeds W & NC China from SE slopes of Tien Shan and Tarim Basin E to NW Gansu and W Nei Mongol, S to Ningxia; non-breeding mainly Pakistan and N India.

L. i. tsaidamensis Stegmann, 1930 – breeds WC China (Qaidam Basin, in N Qinghai); non-breeding mainly Pakistan and N India.



Descriptive notes. 17.5–18 cm; 25–34 g. Rather small, compact but long-tailed shrike, with calls and behaviour as *L. collurio*. Male nominate race has pale greyish crown, tinged isabelline on forehead, complete black facial mask with narrow whitish border above, rather warm sandy grey on upperparts to upper rump, rufous lower rump and reddish-brown tail; upperwing contrastingly blackish, feathers edged pale sandy buff, white patch at base of primaries; throat whitish, underparts sandy cream to isabelline; iris brown; bill dark brown to dull blackish; legs grey-black. Female resembles male but slightly duller, with browner

and less extensive facial mask, smaller patch at base of primaries (sometimes absent), slightly scaled underparts, and pink bill base, legs browner or greyer. Juvenile is greyish-brown with narrow blackish vermiculations above, tail rufous-brown, creamy buff with brownish vermiculations below, throat and narrow band down to undertail-coverts generally plainer; first-winter has remnants of juvenile barring above and below, whitish-buff supercilium, brown ear patch, subterminal dark bars on tertials, lower rump, uppertail-coverts and tail, white patch on base of primaries little developed. Races differ mainly in coloration and size: *phoenicuroides* is darker than nominate, male has crown tawny to rufous, upperparts buffish-brown, usually bolder white supercilium, and whiter below with vinous-pink wash on flanks, variable, some (mainly in lowlands) closer to nominate, with greyer crown and upperparts, less prominent supercilium, and buff-tinged underparts (“*karelini*”); *arenarius* has relatively shorter and less pointed wing than previous and nominate, is also pale, male uniform greyish or sandy grey above, less well-defined facial pattern, pale lores, pale primary patch small and less white, tail dull cinnamon (less rufous), underparts sandy pinkish to pale buff, whiter on centre of belly; *tsaidamensis* is very like last but longer-winged and slightly paler. **VOICE.** Considered a much better singer than *L. cristatus*, and calls somewhat reminiscent of those of *L. collurio*, but courtship calls more nasal “tschre...tschre...” (race *arenarius*) and “zauzat-zauzat...” (*phoenicuroides*), while contact call of nominate “kscha-kscha”. Male territorial calls described as “tsch-ef...tsch-ef”, “zech-zeck” and “zea-zea”, but in presence of mate change to “ko-ick”, and “zauzat...zauzat” and “tzauzat...tzauzat”, respectively. When disturbed, “zeec” or sometimes “dzikhk-dzhikhk-dzhikhk”; wide variety of alarm calls reported, from typical “ktschaaa” and chattered “chak-chak-chak” to rattling “krkrkrkr...”, “tschek-tscheck” can be given as alarm, as

well as during courtship. Intraspecific begging calls of mates are series of “kikikiki...” or “keee-keee-keee” (nearly identical to begging calls of juveniles). Song said to be a relatively quiet warble, often replaced by harsher and squeaker melodies; mimics other birds.

Habitat. Breeds in tamarisk (*Tamarix*) thickets in river valleys, patches of scrub in dry steppe, in mountains extending up to zone of prostrate juniper (*Juniperus*), e.g. in S Turkmenia; on hills and barren plains, and in mountains to 3500 m (Pamir Mts, in Tajikistan). In non-breeding quarters, found in India and Pakistan on edges of cultivation in semi-desert and among sparse acacia (*Acacia*) and tamarisk trees, often in open grassland near water; in E Africa occurs in relatively open country with scattered bushes, and in dry lowlands, generally preferring drier and more thorny vegetation than that used by *L. collurio*, but in Chad observed in marshy areas. As with other shrikes, from several of which it seems not to be segregated in winter quarters, foraging requirements include much exposed soil.

Food and Feeding. Almost exclusively insectivorous. Prefers mostly beetles (of families Elateridae, Tenebrionidae, Scarabaeidae) and crickets and grasshoppers (Orthoptera), with other invertebrates taken less often; also some small vertebrates taken, including voles (Microtini), lizards, and small birds such as leaf-warblers (*Phylloscopus*). Uses sit-and-wait foraging technique, utilizing a variety of lookouts, including wires, fence lines and tree branches; mean height of perch 2.1 m on non-breeding grounds in Kenya. Most insects taken on ground (73% of 175 prey items in Kenya). Impaling of prey not rare.

Breeding. Laying end of Apr in S of range (S Turkmenistan) to end May in N (Kazakhstan, Altai); one brood. Mating normally begins with loud calls by male, which often followed by gliding display-flights of competing males; male has aerial display, flying to and fro in front of female while calling loudly, also bowing perched display with fanned tail raised, this often followed by fluttering flight by both partners. Nest-site chosen by male; nest a deep open cup made from twigs, bark, rootlets, leaves and grass, lined with grass stems, moss and similar soft material (resembles nest of *L. collurio*), built c. 0.3–5 m but generally low (mean 1–2 m) above ground in bush, often thorny one. Clutch 3–7 eggs, mostly 4–6 (mean 5 in N Iran), pale bluish-green, with light-brown spots concentrated toward broad end; replacement clutches frequent if earlier ones lost; incubation by female, fed on nest by male, period 13–17 days; nestling period 13–16 days; young fed by parents for c. 1 month after leaving nest. Nests regularly parasitized by Common Cuckoo (*Cuculus canorus*), e.g. 14.5% of 90 nests of race *phoenicuroides* in L Balkash area of Kazakhstan. Breeding success in Tajikistan relatively low, c. 53% of nests failed during incubation stage. First breeding at 1 year of age.

Movements. Migratory. Non-breeding grounds from sub-Saharan Africa (mostly E from Nigeria, S to NE Tanzania) and Arabia E to Pakistan and NW India; present in winter quarters Nov–Mar, in extreme cases from Oct and up to May. Heading in autumn varies between SW (most *phoenicuroides*, fewer nominate) to Arabia and Africa, and S to SE to Iraq, S Iran, Pakistan and India (most *arenarius* and *tsaidamensis*); regular autumn passage migrant through Iraq in Sept. Those wintering in Nigeria must head almost due W within Africa; in addition, *phoenicuroides* is a rare winter visitor also in W Africa (Senegal, Gambia, Mauritania). Return migration in spring apparently along same routes as used in autumn; peak spring movement in NE Africa mid-Apr, in NW India in Mar; occasional in Israel and NE Egypt (Sinai) in spring. Breeding population of *phoenicuroides* arrives in Turkmenia from early Mar to early Apr, and nominate race reaches S Mongolia at end May; males arrive on breeding grounds earlier than females. Vagrants recorded increasingly in Europe, even in NW (Britain), mainly in autumn.

Status and Conservation. Not globally threatened. Not well known; probably not uncommon in much of range, but locally uncommon. Global population size not quantified, but believed not to be close to the thresholds that would indicate that this species is at risk. Protected in most countries; in some listed as “endangered”. A decrease in the use of agricultural pesticides, combined with conservation of semi-open habitats (pastures, meadows) with scattered bushes, would probably be the most effective measure to ensure its future. Present in several national parks and other protected areas in its non-breeding range.

Bibliography. Ali & Ripley (1972b), Baillie *et al.* (2004), Chen Fuguan *et al.* (1998), Cheng Tsohsin (2002), Clarke (1985), Cramp & Perrins (1993), Dementiev *et al.* (1954b, 1968), Etchécopar & Hüb (1983), Haffer (1993h), Harris & Franklin (2000), Iljitshev (1976), Lack (1985), Lefranc (1993, 1999a, 2007), Lefranc & Worfolk (1997), Ma Ming (1993), McCarthy (2006), Neufeldt (1978), Panov (1983), Pearson (2000), Reeb (1977), Sagitov & Bakaez (1980), Saligbaev & Boghdanov (1967), Scott, D.A. *et al.* (1975), Scott, M. (2006), Shirihai (1996), Stepanyan (2003), Welch & Welch (1984), Zhang Wei *et al.* (2007).

5. Brown Shrike

Lanius cristatus

French: Pie-grièche brune **German:** Braunwürger **Spanish:** Alcaudón Pardo
Other common names: Red-tailed Shrike; Japanese Shrike (*supercilius*); Philippine Shrike (*lucionensis*)

Taxonomy. *Lanius cristatus* Linnaeus, 1758, Bengal, India.

Thought to form a superspecies with *L. collurio* and *L. isabellinus*; has in the past been considered conspecific with one or both of those, but recent genetic analyses support treatment as separate species. Occasional hybridization with *L. collurio* recorded in C Asia. Geographical variation partially clinal; race *confusus* poorly differentiated, intergrades with nominate and perhaps better merged with it. Four subspecies currently recognized.

Subspecies and Distribution.

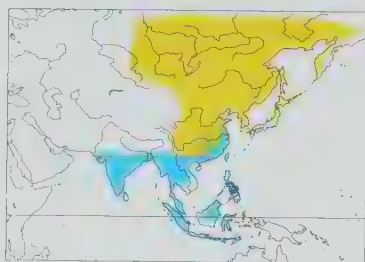
L. c. cristatus Linnaeus, 1758 – breeds C & E Siberia S to N Mongolia, L Baikal area, N Sakhalin and W Kamchatka; non-breeding C & S India, Sri Lanka, Bangladesh, Myanmar (mainly coastal) and Malay Peninsula.

L. c. confusus Stegmann, 1929 – breeds E Mongolia, SE Russia (SE Transbaikalia E to Amurland and Ussuriland) and Manchuria; non-breeding S Malay Peninsula and Sumatra.

L. c. superciliosus Latham, 1801 – breeds S Sakhalin I, S Kuril Is and N & C Japan (Hokkaido, N & C Honshu); non-breeding mainly coastal S China, Hainan, NE & E Indochina, Sumatra, Java and W Lesser Sundas.

L. c. lucionensis Linnaeus, 1766 – breeds E China, Korea and S Japan (Kyushu); non-breeding mainly coastal SE China, Taiwan, Philippines, N Borneo and N Sulawesi.

Descriptive notes. 17–20 cm; male 27–34 g, female 28–37 g. A medium-sized shrike with rather large head. Male nominate race has black facial mask from lores back to rear ear-coverts, broad white supercilium; lower forehead buffish-white, becoming dull brown on forehead, rufous-brown crown to nape, very slightly duller russet-brown upperparts, but rump and uppertail-coverts a little brighter (as crown); upperwing dark brown, wing-coverts and inner flight-feathers fringed whitish; tail dull rufous, outer feather pair edged and tipped paler; throat white, underparts whitish with pale rufous wash, undertail-coverts pale brownish-grey; iris brown; bill and legs black or blackish. Female is very like male, and sometimes identical, but generally supercilium creamy-tinged, dark mask slightly less distinct in loreal area, and side of breast and flanks with fine dusky vermiculations; in non-breeding season bill usually duller, with pinkish base. Juvenile has supercilium duller and



blurred, facial mask brown and less extensive, top of head and upperparts rufous with heavy cinereous-brown barring, upperwing brown, wing-coverts, secondaries and tertiaries fringed rufous-buff, tail as in adult, throat whitish, cheek and underparts buff with heavy dark vermiculations, centre of belly to vent usually plain. Races differ mainly in plumage coloration and pattern: *confusus* is very similar to nominate, but male has upperparts somewhat paler and greyer and pale band on forehead broader, female has pale rufous upperparts; *superciliosus* is distinctive, brighter than others, male has wider white band on forehead

merging with broad white supercilium, strongly contrasting jet-black mask from bill base to near nape, bright rufous crown, nape and upperparts, wing edgings rufous (not buff or whitish), sometimes a very small white patch at base of primaries, underparts more orange-tinged, female duller than male, with white frontal band and supercilium narrower, never has pale primary patch, flanks paler and slightly vermiculated: *lucionensis* also is distinctive, much greyer than others and with narrower supercilium, male has light grey crown and nape, brownish-grey upperparts except for russet-brown rump and uppertail-coverts, buff belly and flanks to undertail-coverts, female somewhat paler than male, has mask blackish-brown (not jet-black), supercilium less distinct. **VOICE.** Male song a repeated trilling "jun-jun-jun" and/or "kichi-kichi-kichi" and/or "gey, gey, gey" as it moves around tops of trees; male imitates songs and calls of other birds, e.g. Japanese White-eye (*Zosterops japonicus*), Azure-winged Magpie (*Cyanopica cyanus*) and White-cheeked Starling (*Sturnus cineraceus*). During mate attraction, male pursues female while uttering trilling subsong. Female calls "jih-jih-jih", like begging call of nestling, with wing-fluttering.

Habitat. Generally in open areas with bushes and scattered small trees, but variable; sometimes in urban parks. Nominate race breeds mainly in taiga, tundra forest and tundra edge, in bogs and boggy meadows with scattered trees, often in burnt areas, in Kamchatka in grassland with larches (*Larix*), coastal grassland with scattered alders (*Alnus*) or dwarf pines (*Pinus*) or willow (*Salix*) thickets, or edges of birch (*Betula*) woods; in S of range also in steppe-like habitats (especially along river valleys). Found also in tropical forest and edge in China (race *lucionensis*). In S Ussuriland, *confusus* prefers unwooded areas around lower rivers in coastal plain, and occurs also along upper rivers. Race *superciliosus* breeds mostly in grassland with scattered deutzia shrubs (*Deutzia*), or coastal thin oak (*Quercus*) woods, or farmland with hedges; in Japan, found only in open land on Hokkaido, where exhibits rather strict habitat preferences, but in C Honshu breeds also in residential area, using shrubs (e.g. *Vitis coignetiae*, *Malus baccata* etc.) for nesting. Breeds from sea-level to low mountains, to 1800 m in Altai region of S Siberia; to c. 450–650 m in Kamchatka; in Japan, to 1400 m in C Honshu but mainly in coastal areas on Hokkaido. In non-breeding quarters occurs in open lowlands with cultivations, forest edge, clearings, scrubland, grassy hillsides with scattered bushes and small trees.

Food and Feeding. Diet mainly insects, also other arthropods and small vertebrates. Orthoptera and beetles (Coleoptera) usually main prey; vertebrates taken are mostly small mammals, lizards, amphibians, and small passerine birds (including nestlings). On Sakhalin I, stomachs contents of ten individuals revealed remnants of Orthoptera, various beetles i.e. *Pterostichus* (ten items), *Dytiscus*, *Silpha perforata* (three), *Phosfuga atrata*, *Xylodrepa sexcarinata* (six), *Necrophorus*, a curculionid, and *Geotrupes laevistriatus*, also three bumblebees (*Bombus*), three wasps (*Vespa*), a lacerid lizard, and a frog; pellets contained the weevil *Byssopogon sachalinensis* (nine), a *Vespa* wasp, ants (Formicidae), Lepidoptera larvae, and a lizard. Items delivered to nestlings included spiders (Araneae), insects, vole and lizard; in another nest, main prey items delivered were spiders (36.8%), beetles (27%), and adult and larval Lepidoptera (13.9%). In S Ussuriland, main prey during summer were large grasshoppers, but adults also hunted frogs and nestlings of Chestnut-eared Bunting (*Emberiza fucata*). On Hokkaido (race *superciliosus*), arthropods constituted 99% of prey delivered to nestlings (Lepidoptera larvae 33.1%, Orthoptera 24.1%, Arachnoidea 20.5%); food remnants in nests consisted of beetles (*Silpha*, Scarabaeidae, Harpalidae, Elateridae, Carabidae including *Carabus conciliator*), also *Vespa pacifica*, and bumblebees; impaled prey of a pair in breeding season were scarabeid beetles (of genus *Anomala*), Hymenoptera, and *Locusta migratoria*; adult seen to take juvenile Black-faced Bunting (*Emberiza spodocephala*). Uses low hunting perches, 1–3 m (mostly below 2 m) high, from which swoops or sallies for prey; most prey caught on ground. Regularly caches food.

Breeding. Laying from Jun in Siberia and S Ussuriland, from end May on Sakhalin and in Amurland, and from May in E China; in Japan laying from late May to Jun; single brood. Nest built by both sexes, mostly by female, work taking less than one week, an open cup made from twigs, grass stalks, rootlets, dry leaves and moss, lined with hair and fine grass, in S Ussuriland outer wall chiefly of bark fibres and inner part of thin dry grasses, outer diameter 11.5–13 cm, height c. 10.5–12 cm, internal diameter 6.5–8 cm and depth 4.5 cm; placed 6–9 m (exceptionally, to 18 m) above ground in tree or tall bush, but in N & E of range (nominate race and *confusus*) usually lower, below 3 m, sometimes even on ground in grass or among leaves, e.g. nest of *confusus* at base of solitary shrub in grassland. Clutch 3–8 eggs, usually 4–6, from reddish-white with fine reddish-brown spots to greenish or buffish with brown, grey and/or purple spots; replacement clutch laid if first attempt failed during laying or incubation stages; incubation by female, fed on nest by male, period 12–16 days, mostly 12–14 days (mean 12.8 days on Hokkaido); chicks fed by both parents, nestling period 13–16 days, mostly 14–15 days; young remain near nest for minimum of 2 weeks after fledging. Nests parasitized by Common Cuckoo (*Cuculus canorus*), Indian Cuckoo (*Cuculus micropterus*) and Horsfield's Cuckoo (*Cuculus horsfieldi*); e.g. 5% of pairs on Hokkaido thus parasitized. On Hokkaido, mean hatching success 87.8–100%, and of 19 failed nests twelve (63%) were preyed on and seven (37%) were deserted; nesting success decreased annually, from 75% in 1992 to 56% in 1993, 55% in 1994, 50% in 1995 and 29% in 1996.

Movements. Nominate race, *confusus* and *superciliosus* migratory; *lucionensis* partially migratory. Migration routes poorly known, but non-breeding grounds situated in C & S parts of Indian Subcontinent E to Myanmar and Malay Peninsula (nominate race), extending S to Sundas; race *confusus* seems to spend non-breeding season in S Peninsular Malaysia and Sumatra, and *superciliosus* migrates to S China, Hainan, SE Asia (mainly Indochina), Sumatra, Java and W Lesser Sundas. Race *lucionensis* apparently resident in S Korea and probably E China, but most of population migrates to non-breeding grounds in coastal SE China, Taiwan, Philippines, Borneo, Sulawesi (mostly N), less frequently Moluccas (vagrant Halmahera and Seram).

Status and Conservation. Not globally threatened. Few data on population levels. Possibly fairly common in much of range; uncommon to rare in Japan. No information on current status of nominate race and *confusus*. In Japan, race *superciliosus* has declined drastically, and may even be in danger of extinction: on Hokkaido, populations of this race declined by c. 80% during period between 1973–74 and 1990, also decreased by 67% over the four years 1993–1996 at one site (Ishikari), declined by 86% near Sapporo and by 50% in C Hokkaido, and became extinct at two sites; in C Honshu, population on Nobeyama plateau was between 50 and 60 pairs, but declined to

20 individuals in 1998, and then remained stable at fewer than ten individuals, but in 2005 no pair bred, and at other sites (Akita, Miyagi, Gunma, Tokyo, Tochigi, Yamanashi, and Shizuoka) numbers gradually declined over c. 10 to 30 years since late 20th century. Status of race *lucionensis* in Japan uncertain; local on Kyushu, and apparently bred in Daito Is (Kita-daito and Minami-daito) in the past, but shrike population on those islands from middle 1970s to late 1980s identified as *L. bucephalus*; further research required on current breeding distribution of *lucionensis* in Sea of Japan and elsewhere. Known to occur in several protected areas in non-breeding range, from Kaziranga and Nagarhole National Parks, in India, E to Cat Tien National Park, in Vietnam.

Bibliography. Brazil (1991), Chen Fuguan *et al.* (1998), Cheng Kwangmei & Wei Chaosheng (1973), Chien Yenwen & Cheng Tsohsin (1960), Dementiev *et al.* (1954b, 1968), Dickinson *et al.* (1991), Échécopar & Hùe (1983), Haas & Ogawa (1995), Haneida & Takahashi (1968), Harris & Franklin (2000), Imanishi (1994, 2002, 2007b), Imanishi *et al.* (1992), Ishigaki (1966), Ishizuka (1990), Kiyosu (1952), Kryukov (1995), Leader (2007), Lefranc & Worfolk (1997), Lobkov (1986), McCarthy (2006), Medway (1970), Meyer de Schauensee (1984), Morishita & Higuchi (1999), Nechaev (1991), Ohata (1991), Panov (1973, 1995), Rasmussen & Anderton (2005b), Ripley & Rabor (1958), Robson (2000b), Rogacheva (1992), Sheldon *et al.* (2001), Stepanyan (2003), Stresemann & Stresemann (1971), Takagi (1996a, 1996b, 2002b, 2003b), Takagi & Ogawa (1995), Tomek (2002), Uchida (1914), Wells (2007), Yosel (2004).

6. Burmese Shrike

Lanius collurioides

French: Pie-grêchée à dos marron **German:** Burmawürger **Spanish:** Alcaudón Birmano
Other common names: Myanmar/Chestnut-backed/Chestnut-rumped Shrike

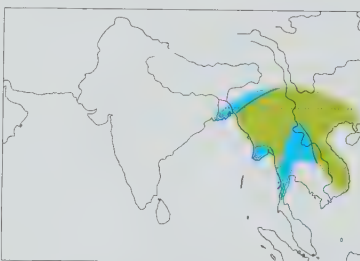
Taxonomy. *Lanius collurioides* Lesson, 1831, Pegu, Myanmar.

Sometimes thought to form a superspecies with *L. vittatus*, the two being separated geographically by R Brahmaputra. Two subspecies recognized.

Subspecies and Distribution.

L. c. collurioides Lesson, 1831 – breeds Myanmar (S to C Tenasserim), S China (W & C Yunnan E to S Guizhou and SW Guangdong), NW & W Thailand, Laos, E Cambodia and N Vietnam.

L. c. nigricapillus Delacour, 1926 – SC & S Vietnam (S from Da Lat Plateau).



Descriptive notes. 19–21 cm; one immature female 26 g. A medium-sized shrike with long slender tail. Male nominate race has black forehead and facial mask, slaty-grey crown and nape to upper mantle; rest of upperparts, including rump and uppertail coverts, plain rufous-chestnut; upperwing dark brown, wing-coverts, tertiaries and secondaries with chestnut-buff fringes, clear white patch at base of primaries; tail black, outer feathers white; throat white, underparts white with faint buff wash, undertail white with black feather tips; iris dark reddish-brown; bill grey-brown with dark tip; legs greyish-black. Female is similar

to male but slightly duller and paler, with lores and nasal feathers striped with white to buff; some barring may be present on breast. Juvenile is like female, but mask brown with some buffy streaks, crown to upper mantle greyish-brown with black barring, upperparts warm buffish with black subterminal bars, upperwing darker brown with pale fringes and no or small white primary patch, tail brown with paler outer retrices, undertail dull white, underparts dirty white with buff wash, heavily vermiculated on breast and flanks; immature very like female but with barring on upperparts. Race *nigricapillus* is darker than nominate, male with blackish-slate crown and nape and darker chestnut upperparts, female less different from male (than in nominate) but with slightly paler hindcrown and nape and duller chestnut upperparts. **VOICE.** Song quiet, variable, starts hesitantly but becoming a musical series of rapid and scratchy rattles, squeaks and trills. Call a harsh single "jao"; alarm a loud, rapid chatter, "chikachikachitit", "chekochekochechitititit" or "cheteteter". **Habitat.** Clearings and edges of secondary broadleaf forest and pine (*Pinus*) forest, scrubby open woodland, cultivation, roadside vegetation and gardens; in non-breeding season widespread in cultivated lowland areas. Occurs from sea-level to 2500 m; in SE Asia mainly 600–1830 m, in S Vietnam to 2400 m and in S China to 2500 m.

Food and Feeding. Feeds primarily on insects, including especially Orthoptera; also lizards and other small terrestrial vertebrates. Found singly and in small parties; when in parties very noisy and active, with wing-flapping and screeches while squatting on bushes; this behaviour possibly connected with pair formation. Often confiding and easy to approach. Hunts in typical shrike fashion from exposed vantage point, e.g. top of bush or tree or on telegraph wire, from which it dives down to take prey on ground; also uses more shaded perches, and hops on ground when seeking prey.

Breeding. Season Mar–Jun; laying mostly Apr–May in Myanmar, recorded in Jun in S China (possibly referring to second brood); probably two broods per year. Probably monogamous and territorial. Nest an open cup, size varying greatly, made from leaves, grasses, feathers and lichens, covered with spider webs, lined with fine grasses, built 1.5–3.5 m above ground and usually in thorny bush, sometimes in tall thin bush, small sapling or fir tree (*Abies*). Clutch 3–6 eggs, generally 5, variable in colour, mostly pale greenish-white but sometimes yellowish-white, and with pale purplish and yellow-brown spots chiefly at large end; no information on incubation and nestling periods.

Movements. Resident and migratory populations. Much overlap in breeding and non-breeding ranges, but in winter extends more to S & W and probably also SE; widespread in some lowland areas in winter. In NE India, migrant or winter visitor in S Assam hills and Manipur in Oct and Feb–Apr; reported also in SE Bangladesh (Chittagong region), but apparently rare. In Myanmar migration starts in Jun, when young and adults observed in C, SW & S plains, probably as far S as Tenasserim; returns to breeding areas in N from Mar onwards; some irrigated areas only temporarily vacated (from Mar to Jun). In Thailand resident in NW & W areas; non-breeding visitor in N & E plains, but absent in C & SE regions. Chinese populations apparently resident, with some altitudinal movements: same probably applies to Indochina populations S to S Vietnam, including those in Laos and Cambodia. Vagrant in Hong Kong (Mar).

Status and Conservation. Not globally threatened. Generally not uncommon; quantitative data on population levels lacking. Locally fairly common to common in Myanmar, Thailand, Cambodia, Laos and Vietnam; uncommon in S Chinese provinces of Yunnan, Guizhou, Guangxi and Guangdong. In NE India, scarce passage migrant and non-breeding visitor in S Assam hills but commoner in Manipur; breeding status in this region uncertain, nest reported in N Cachar (Assam) in late 19th century but no breeding reports since then.

Bibliography. Ali & Ripley (1987), Chen Fuguan *et al.* (1998), Échécopar & Hùe (1983), Grimmett *et al.* (1998), Harris & Franklin (2000), Kazmierczak (2000), Lefranc & Worfolk (1997), MacKinnon & Philipps (2000), Rasmussen & Anderton (2005b), Ripley & Bechler (1990), Robson (2000b), Smythies (1986).

7. Emin's Shrike

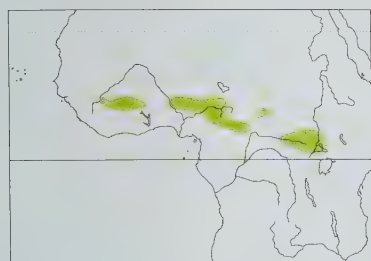
Lanius gubernator

French: Pie-grièche à dos roux **German:** Rotbürlwürger **Spanish:** Alcaudón de Emin
Other common names: Emin's Red-backed Shrike

Taxonomy. *Lanius gubernator* Hartlaub, 1882, Central Africa = Langomeri, Uganda.

May form a superspecies with *L. souzae*. Monotypic.

Distribution. S Mali (R Niger) and N Ivory Coast E discontinuously to S Sudan, NE DR Congo and N Uganda.



Descriptive notes. 14–16 cm; 23.5 g. The smallest *Lanius* shrike. Male has black facial mask extending narrowly over base of bill, bordered above by thin whitish supercilium; crown to hindneck and upper mantle pale grey, merging into bright chestnut of mantle, back, scapulars, rump and uppertail-coverts; upperwing dark brown, greater wing-coverts, secondaries and tertials with broad chestnut edges, white patch at base of primaries; tail dark brown with light rufous wash, white outer feathers; white below, lower breast, belly and flanks washed pale rufous to reddish-buff (more intensively on flanks); iris dark brown;

bill black; legs greyish-black. Differs from very similar *L. collurio* in smaller size, rufous (not grey) rump, rufous-buff (not pinkish) underparts and more contrasting white throat, presence of white wing patch. Female is duller than male, black areas of male more brownish, grey extending farther on to mantle; differs from *L. collurio* female in uniformly coloured (unbarred) underparts. Juvenile has dark brown facial mask, grey-brown crown, neck and upperparts with black barring, white throat, whitish with black crescents below but tawny on flanks and breast. **VOICE.** Song consists of a short and rapid series of a few simple varied whistles, e.g. “tweet-u-wee-u-weet” and “trip-tu-trip-srtp”, mixed with low hoarse “chweehh” notes. Calls include low hissing note and a loud clear note; also various twitterings, whistles and a low harsh “zut zut”, “chuz-zoo-wit” and “chark chark”. Apparently often quiet, as seen frequently but no call heard.

Habitat. Little studied. Grassland savanna with bushes, grass-covered open woodland and forest clearings; also in degraded soudanian-guinean savanna, gallery forest, also abandoned cultivated fields and villages in open bushy grassland with woodland. At 150–1500 m.

Food and Feeding. Insectivorous. Stomach contents included beetles (Coleoptera), mantises (Mantodea) and small Orthoptera. Solitary or in small groups of 4–5 individuals; occasionally joins mixed feeding parties. Perches openly on top of bush, fence or telephone wire; takes most food from ground, but observed also to make aerial captures and to search in middle and upper levels of woodland.

Breeding. Starts in Mar–Apr (at beginning of rains) in DR Congo, where juveniles seen in Jul; possible breeding also Mar–Apr in Sudan; female with incubation patch in Mar and courtship feeding observed in Apr in Ivory Coast; adults with recently fledged juveniles in mid-Jun in Nigeria. Described as monogamous, but possible co-operative breeding suspected. No other information.

Movements. Little known. Apparently resident, with no evidence of regular movements. A few observations, however, suggest at least occasional wanderings, e.g. all Mali records in Aug–Nov.

Status and Conservation. Not globally threatened. Little information available. Generally uncommon to rare; global population estimated at fewer than 70,000. Range not small, estimated 130,000 km², but presence very localized. Recorded in nine countries; rare in Mali (Niger R), where may be only non-breeding visitor; uncommon in Ivory Coast (two localities), rare in N Ghana and rare in Nigeria (7–8 localities), rare or uncommon in NC Cameroon, uncommon in Central African Republic and S Sudan, uncommon to locally frequent in NE DR Congo, and uncommon and local in N Uganda. Probably present but overlooked in Burkina Faso, Togo and Benin. Present in several protected areas: recorded in Comoé and Mont Sangbé National Parks, in Ivory Coast; regular in Kainji National Park and recorded in Yankari National Park, in Nigeria; uncommon in Manovo-Gounda-Saint Floris National Park, in Central African Republic; present in Garamba National Park, in DR Congo; and present in Kipedo Valley and Murchison Falls National Parks, in Uganda.

Bibliography. Borrow & Demey (2001), Chapin (1954), Demey & Fishpool (2008), Fishpool & Evans (2001), Fry *et al.* (2000), Hall & Moreau (1970), Harris, T. (1998), Harris, T. & Franklin (2000), Lefranc & Worfolk (1997), Salewski (2001), Sinclair & Ryan (2003), Stevenson & Fanshawe (2002).

8. Souza's Shrike

Lanius souzae

French: Pie-grièche de Souza **German:** Rostmantelwürger **Spanish:** Alcaudón de Souza

Taxonomy. *Lanius souzae* Bocage, 1878, Caconda, Angola.

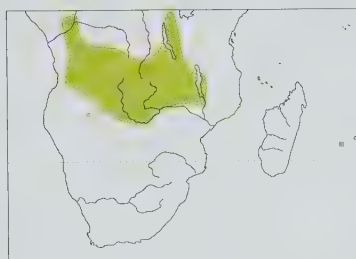
May form a superspecies with *L. gubernator*. Three subspecies recognized.

Subspecies and Distribution.

L. s. souzae Bocage, 1878 – S PR Congo, SW DR Congo and Angola (excluding W & S).

L. s. burigi Chapin, 1950 – Rwanda, Burundi and W Tanzania.

L. s. tacitus Clancey, 1970 – SE Angola (Cuando Cubango) E to SE DR Congo (Katanga), Zambia, Malawi, W Mozambique, extreme N Zimbabwe and NE Namibia, probably also in N Namibia (Okavango) and N Botswana (R Chobe).



Descriptive notes. 17–18 cm; 21–30 g. Smallish shrike with barred upperparts and long slender tail. Male nominate race has black facial mask from bill base through eye to rear of ear-coverts, whitish supercilium; crown, nape and mantle pale grey, scapulars white, back rufous-brown, finely barred black, rump as back but less barred and generally greyer; flight-feathers dull brown, tertials and upperwing-coverts rufous-brown and finely barred black; tail dull brown with thin rufous-brown and black bars, all except central pair of feathers tipped white, outermost pair with much white; throat white, underparts creamy

to whitish-buff, occasionally with faint barring; iris dark brown; bill black, pale base of lower mandible; legs dark grey. Distinguished from similar *L. collurio* mainly by duller coloration, with grey upperparts becoming browner on lower back, both narrowly barred blackish. Female is similar to male but slightly duller, with distinctly tawny flanks. Juvenile has mask brown, crown and upperparts rufous-brown with narrow blackish barring, whitish scapulars barred dark, whitish underparts densely vermiculated with dark brown. Races differ mainly in size and in colour of upperparts and flanks: *burigi* is smaller than nominate, has back more brownish-grey, less russet-brown, without dusky vermiculations on lower back to uppertail-coverts, wings and tail darker, much less rufous, and less barred blackish, female has larger and distinctly deeper rufous area on lower flanks; *tacitus* also is smaller than nominate, has mantle drab or dull olive-brown, wings paler, female has smaller, paler and duller rusty wash on flanks. **VOICE.** Quiet; various chattering and whistling sounds, rarely heard. Territorial call probably a muted “tzzeeee” whistle; contact call “tzzz” or “ziz”; alarm a discordant “tzz-jert” and quiet “tzzz”; low “tzzzzick” by wary individual near/on nest, also a low grating chirp and low chattering uttered at intervals by female while human observer examined nest.

Habitat. Woodland, mainly in areas where forest thins out, also edges of wooded gardens. In most of range strongly associated with light miombo (*Brachystegia*) woodland with patches of short grass, but occurs also in mixed broadleaf and more open savanna; seems to be strictly associated with *Pericopsis* savanna in Rwanda, and occurs in both miombo woodland and *Burkea* savanna in Zambia. Few data on elevational range; occurs at 1000–1800 m in Malawi.

Food and Feeding. Few data. Recorded food arthropods, i.e. insects and large spiders (Araneae); possible that vertebrates occasionally taken. When hunting, usually perches in middle stratum below forest canopy, scanning the ground for prey. Small items usually consumed immediately; larger ones carried back to a perch before being eaten.

Breeding. Season at least Sept in Angola, Sept–Nov in DR Congo and Zambia, and Sept–Dec (mainly Oct) in Malawi. Possible co-operative breeding has been suggested on basis of apparent prevalence of small groups during breeding period. Nest can take up to 3 weeks to build, a small open cup made from leaf petioles, twigs and grasses, bound together with spider web, lined with fine roots, tendrils and grasses, exterior often decorated with fluffy seedheads or lichens, generally well camouflaged, placed usually c. 5 m from ground in fork or on horizontal branch of trees (e.g. *Brachystegia* or *Uapaca*), sometimes on lichen-covered branch or in bare tree. Clutch 1–4 eggs, usually 3, pale buffish or greenish-grey with brown, grey and purple freckles around larger end; incubation apparently by female alone, fed away from nest by male; no information on duration of incubation and nestling periods.

Movements. Mainly resident, but information scarce. Possibly some local movements in dry season; records in S of range could involve individuals originating from farther N. Believed to be migratory in Malawi, as it is absent in certain areas outside breeding period.

Status and Conservation. Not globally threatened. Generally uncommon. Has large range, with estimated global extent of occurrence of 1,700,000 km², but within this it is sparsely distributed and local. Little information available on any changes in distribution or abundance, but thought not to be at any immediate risk. As an African species associated with forest-savanna ecotone and other woodland habitats, it probably merits conservation research priority. Occurs in several protected areas, e.g. Dzalanyama Forest Reserve, in Malawi.

Bibliography. Benson (1950), Borrow & Demey (2001), Chapin (1954), Clancey (1970a), Dean (2000), Dowsett *et al.* (2008), Eck (1975), Hall & Moreau (1970), Harris & Arnott (1988), Harris & Franklin (2000), Harrison *et al.* (1997), Hockey *et al.* (2005), Immelmann (1968), Lefranc & Worfolk (1997), Olivier (1944), Schwind (1968).



PLATE 58

Family LANIIDAE (SHRIKES) SPECIES ACCOUNTS

9. Bay-backed Shrike

Lanius vittatus

French: Pie-grièche à bandeau German: Rotschulterwürger Spanish: Alcaudón Dorsicastaño

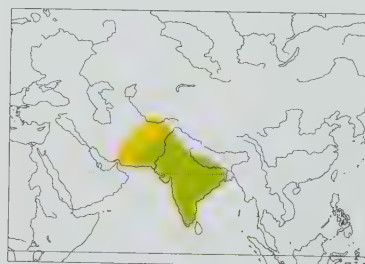
Taxonomy. *Lanius vittatus* Valenciennes, 1826, Pondicherry, India. Sometimes thought to form a superspecies with *L. collurioides*, the two being separated geographically by R Brahmaputra. Other studies suggest close relationship either with *L. collurio* on basis of coloration or with *L. cristatus*; also resembles *L. minor* in territorial flight display and *L. schach* in vocalizations. Races intergrade in E Pakistan (NW Punjab and Sind). Two subspecies recognized.

Subspecies and Distribution.

L. v. nargianus Vaurie, 1955 – breeds SE Turkmenistan, SE Iran (Hormuzgan, Sistan and Baluchistan, probably also Khorasan), Afghanistan and Pakistan (Baluchistan E to Sind and Punjab).

L. v. vittatus Valenciennes, 1826 – S & E Pakistan, Kashmir, India (except N & NE) and S Nepal.

Descriptive notes. 17–19 cm; 18–26 g. A comparatively small shrike with relatively long and graduated tail. Nominant race has black forehead and facial mask, pale grey crown and nape, dark grey upper mantle merging into chestnut-maroon mantle, back and scapulars; rump and uppertail-



coverts greyish-white; upperwing black, conspicuous white primary patch, tail black, outermost pair of rectrices mostly white; chin and throat whitish, underparts whitish with buff-brown to rufous-brown wash, flanks deeper rusty-coloured; iris dark brown; bill and legs black. Sexes alike; some females identifiable by narrower frontal band. Juvenile has facial mask brown and less extensive, is greyish-brown above, crown and mantle barred black and buff, wing-coverts and tertials edged buff, no white wing patch, tail rufous-brown, underparts dull white to pale brown with dark barring, mainly on breast and flanks; immature

between juvenile and adult, with greyish-brown head and mantle, but back, wings (including white wing patch), tail and underparts more adult-like, although some feathers may still be barred. Race *nargianus* is larger than nominant, with longer bill and wing, and with paler, less brightly coloured upperparts, female often identifiable by duller plumage although this race more individu-

ally variable than nominate. VOICE. Song a pleasant, rambling warble intermixed with harsh notes and much mimicry. Call a harsh churring “chur-r” or “chee-urr” or “keechuw”; alarm a rapid chatter, “tzzrr”, “krrrr-krrrr”, “trrrr-trrrr” or “cha-a-a-a”.

Habitat. Variety of open, dry bushy areas with scattered trees, also cultivated areas and edge of more wooded areas. Preferred habitat intermediate between dry semi-desert (favoured by local race *lahtora* of *L. meridionalis*) and more wooded, watered areas (favoured by *L. schach*). In N & W or range found in semi-desert and dry rocky areas with bushes and some trees, in pistachio (*Pistacia*) woods, in cultivated areas in plains, valleys, foothills and slopes; in Iran in dry riverbeds, plains and slopes with acacia (*Acacia*), *Prosopis* and *Ziziphus* trees. In Turkmenistan almost entirely at 600–800 m in hilly, south-facing pistachio woodland with *Pistacia vera*. S populations breed in diverse habitats, from e.g. open scrub and thorny tree jungle to grazing land and cultivated areas around villages, gardens, parks and, especially in Indus Valley, in tree plantations along canal banks; avoids desert landscape of Thar. Non-breeding habitat similar, with preference for scrub with agricultural cropland (rather than solely scrub or cropland). Occurs from sea-level to 2000 m, but in Nepal observed at 2600 m, 2810 m and 3965 m; vagrant in Bhutan at 3760 m.

Food and Feeding. Almost exclusively insects, mainly beetles (Coleoptera) and Orthoptera, also Lepidoptera, Neuroptera, flies (Diptera) and Hymenoptera; lizards and occasionally mice (Muridae) and nestling birds observed as prey. In Turkmenistan 90% of items brought to nestlings were Orthoptera. Solitary or in pairs; conspicuous and relatively tame. Typical shrike hunting behaviour: watches from exposed perch, preferably bush or electric wire, usually 2–2.5 m above ground, diving down to catch food on ground within radius of 10 m. Stores prey in caches.

Breeding. Season May–Jul in Turkmenistan, Mar–Aug in Pakistan, and in India Apr–Jul in NW, Feb–Sept in C and in Feb–Apr in S; usually two broods per year, seldom three. Monogamous, and at all seasons highly territorial. Solitary nester, inter-nest distance mostly 150–200 m or more, but pairs sometimes less than 50 m from each other in very favourable habitats. Nest a quite small and neat cup, diameter c. 10.5 cm and height c. 7 cm, built from grass, feathers, wool and fibres, often with lichens on outside, lined with grass and other soft material, placed 0.9–10 m (mostly 1.5–4 m) above ground in fork or crotch of thornbush or small tree, wide variety of trees used, but thorn trees such as *Acacia* locally favoured, and in Turkmenistan only pistachio trees selected; territory size appears to be 1–2 ha. Clutch 3–5 eggs, usually 4, often whitish or pink-white to green-white with brown spots and blotches; incubation mostly by female, fed on or near nest by male, period 14–15 days; male supplies most food, passes this to female and she feeds young, nestling period 14–15 days.

Movements. Resident and migratory. Race *nargianus* mainly migratory, but little information about populations in extreme W of range. In Iran appears to be absent in Jan, when none found during surveys since year 2000 in S & SE; in S Turkmenistan leaves breeding areas Aug–Sept, migrating to India, returns end Apr. In Pakistan, birds from higher elevations in Baluchistan leave breeding grounds in Oct, return end Mar. Nominate race mostly resident, but with some marked seasonal movements, particularly in N parts. Rare non-breeding visitor to United Arab Emirates (Sept–Apr). Vagrant Saudi Arabia (Apr), Oman (Apr, May, Oct), Bhutan, Bangladesh and Sri Lanka.

Status and Conservation. Not globally threatened. Generally common in India and Pakistan; sparse information from Iran but at least locally common, e.g. in Genu Protected Area and near Chabahar; local in Turkmenistan, where known from Badchyzskij and Kushka areas; very local in Afghanistan but little information, recorded Lashkar Gah, Kandahar, Punjab and Kabul. Densities range from 25–30 pairs/km² in N India to 12–14 pairs/km² in S Turkmenistan. Although present in many protected areas, core habitat consists of cultivated areas, which are not protected.

Bibliography. Ali & Ripley (1987), Dementiev *et al.* (1954b, 1968), Desai & Malhotra (1986), van Diek *et al.* (2004), Eriksen *et al.* (2003), Flint *et al.* (1984), Grimmett *et al.* (1998), Harris & Franklin (2000), Hasan (2001), van der Have *et al.* (2001), Inskipp & Inskipp (1991), Kazmierczak (2000), Lefranc & Worfolk (1997), Mansoori (2001), Pandé *et al.* (2004), Panov (1995, 1996), Pedersen (2006), Porter *et al.* (1996), Rasmussen & Anderton (2005b), Ripley & Beehler (1990), Roberts (1992), Scott *et al.* (1975), Vaurie (1955).

10. Long-tailed Shrike *Lanius schach*

French: Pie-grièche schach **German:** Schachwürger **Spanish:** Alcaudón Schach
Other common names: Black-headed/Black-capped/Schach Shrike, Rufous-backed/Red-backed(1)/ (Southern) Rufous-rumped Shrike; Large-nosed Shrike (*nasutus*); Dusky Shrike (melanistic variant “*fuscatus*”)

Taxonomy. *Lanius schach* Linnaeus, 1758, “Canton area”, Guangdong, south-east China. Closely allied with *L. tephronotus*, and formerly treated as conspecific, but differs in morphology; moreover, the two are largely sympatric and, although race *lahulensis* of *L. tephronotus* sometimes considered to represent a hybrid population between them, no definite proof of interbreeding. Mainland races tend to intergrade; intermediates between *erythronotus* and *tricolor* described as *nigriceps*. Other proposed races are *formosae* (described from Taiwan) and *hainanus* (from Hainan I), but both are considered inseparable from nominate; name *fuscatus*, given to melanistic birds from SE China and Hainan, has no taxonomic significance. Nine subspecies currently recognized.

Subspecies and Distribution.

L. s. erythronotus (Vigors, 1831) – breeds SE Kazakhstan, S Uzbekistan, Kyrgyzstan, S Turkmenistan, Tajikistan, Afghanistan and Pakistan (except SW) E to N & NC India; probably also NE Iran.

L. s. caniceps Blyth, 1846 – NC & peninsular India and N Sri Lanka.

L. s. tricolor Hodgson, 1837 – Nepal and E India E to Myanmar, S China (S Xizang, Yunnan), N Laos and N Thailand.

L. s. schach Linnaeus, 1758 – C, S & SE China (including Hainan), Taiwan and N Vietnam (Tonkin and Annam).

L. s. longicaudatus Ogilvie-Grant, 1902 – C, SE & S Thailand and S Laos, possibly also S Myanmar (Tenasserim).

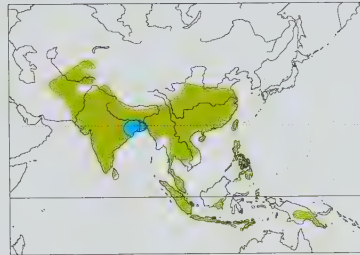
L. s. bentel Horsfield, 1821 – S Malay Peninsula, Sumatra, Java, SE Borneo and Lesser Sunda Is (E to Timor).

L. s. nasutus Scopoli, 1786 – Philippines (except Palawan and Sulu Is).

L. s. suluensis (Mearns, 1905) – Sulu Archipelago (Jolo), in S Philippines.

L. s. stresemanni Mertens, 1923 – E New Guinea (Huon Peninsula and adjacent hinterland, S slopes of mountains in SE).

Descriptive notes. 20–25 cm; 50–53 g (nominate), 33–42 g (*erythronotus*). Medium-sized shrike with long to very long, graduated tail. Nominate race has forehead and facial mask (extending as broad band through lores and eye to lower nape side) black, crown to mantle dark grey, back and rump rufous; upperwing blackish, tertials edged pale buffish-white, secondaries narrowly tipped pale, conspicuous white patch at base of primaries; tail black, tipped white, outer rectrices edged



absent), blackish tail feathers with buffy tips, throat white, underparts whitish with rufous-buff wash and variably vermiculated dark. Races differ mainly in size (nominate largest), tail length, and colour of head and upperparts: *erythronotus* is similar to nominate but distinctly smaller, somewhat duller, and with narrower black band on forehead; *caniceps* is paler, with less rufous on upperparts; *tricolor* has complete black cap, small greyish area on upper mantle, rest of upperparts deep rufous; *longicaudatus* is similar to previous but tail much longer (longest of all races), upperparts darker rufous, primary patch larger; *bentel* has tail almost as long as last, amount of black on head variable, upperparts similar to *caniceps*, primary patch very variable, but normally small or lacking; *nasutus* is like *tricolor* but mantle all grey, back paler rufous; *suluensis* is very similar to previous but somewhat paler above, mantle whitish-grey; *stresemanni* also is similar, but darker rufous above, with less extensive grey on mantle. VOICE. Calls harsh, squealing or yapping, described as “scha-scha-scha-schi, schi, schi” and “scha, schach-schach” (race *nasutus*) and “ketch-ketsch...” or “tchert...”; also a disyllabic “tch-ick”, “cha-dit” or “kerr-ick” (nominate race), and repeated “ger-lek” or “jülek” (*erythronotus*). Race *stresemanni* extends call to a yapping “yaou-yaou” or “choo-wee”, *nasutus* to a repeated “keoo-keoo”. Some notes described as reminiscent of Common Quail (*Coturnix coturnix*). Also a great variety of harsh buzzy and rustling sounds, including alarm “kerr-kerr...”, “zerr-zerr...” and similar; *nasutus* and *bentel* recorded as uttering intense “keek-keek-keek...” chatter. Song, lasting for up to 15 minutes, includes melodious warbles and whistles, similar to those of *Acrocephalus* warblers, and may incorporate songs of other bird species.

Habitat. Open country with scrub, light woodland and bushes, mainly in cultivated areas, also steppe and semi-desert, grassland with scattered bushes, young plantations, gardens, parks, occasionally edges of evergreen forest. In C Asia, commonly by cultivation with planted trees, such as shelter-belts along roads and railways, avenues and parks in towns, and orchards in villages. In Sri Lanka, breeds in scrub-jungle near coast; in Thailand in paddyfields; in Sumatra found in reedbeds bordering cultivation. Requires presence of suitable perches, shade and accessible food. Mainly in lowlands, but up to limits of deciduous tree cover in mountains; nominate race typically to 1500–1700 m, but in valleys of small tree-fringed rivers to c. 3050 m; *tricolor* reaches 3000 m and occasionally 4300 m in Himalayas; in New Guinea, *stresemanni* widespread only in mountain areas at 1100–2600 m.

Food and Feeding. Very opportunistic. Wide variety of insects, with preference mostly for larger species and groups, e.g. grasshoppers and crickets (Orthoptera) and beetles (Coleoptera); also, regularly takes vertebrates such as small mammals, lizards, frogs, crabs and small birds, including nestlings up to size of Laughing Dove (*Streptopelia senegalensis*). Comparatively bold and fearless. Hunts from prominent perch; takes most of its prey on ground, but also hawks insects in air; hops on ground. Occasionally steals food from other birds. Impales some of its victims.

Breeding. Laying from end Mar to Jul, mainly from Apr/May, in N & C parts of range; in S laying recorded in Feb, Jun–Sept and Dec in Malay Peninsula, in all months (peak May–Aug) in Java, and Jun–Nov in New Guinea; locally double-brooded (lower elevations in Afghanistan, Pakistan and India). Monogamous. Nests often in loose groups, e.g. up to 6–7 pairs/8 ha in green urban area of Kabul (Afghanistan) and 26 pairs in 7 ha in Turkmenistan. Nest built by both sexes (race *erythronotus*), a generally rather bulky open cup made from grasses, thorny twigs, moss, roots and leaves, often man-made materials incorporated, lined with finer grasses and the like, placed in thorny bush or in tree, locally in reeds or tall grass, at variable height, usually 3–5 m (sometimes down to 1.5 m, exceptionally up to 24 m) in most of range, often at 4–12 m in tall tree in urban sites; in N Philippines at 0.75–3 m, and in Malay Peninsula at 0.9–3.5 m in bushy vegetation among creepers or ferns. Clutch 2–6 eggs, mostly 4–6, apparently varying geographically, occasionally up to 8 in C Asia, and normally 4 in Sri Lanka, 3 in Malay Peninsula and 2 in New Guinea; whitish to pale olive, with reddish-brown speckles on underlying greyish spots, markings often in band around broad end; replacement clutches frequent if earlier ones lost; incubation by female, period 13–16 days; nestling period 14–17 days; juveniles remain in natal territory for up to 2 months. Nests regularly parasitized by cuckoos, in India including Common Cuckoo (*Cuculus canorus*), Common Hawk-cuckoo (*Cuculus varius*) and Jacobin Cuckoo (*Clamator jacobinus*).

Movements. Resident, partially migratory and migratory; some altitudinal movement also occurs. Non-breeding range lies entirely within breeding range. In NW part of range (C Asia) race *erythronotus* migratory, wintering Oct–Mar in Indian plains; in Himalayas, *tricolor* often winters within breeding range, but generally in foothills below 1700 m; *caniceps* in S India appears to make only local seasonal movements. In China, nominate race resident or partial migrant in N territories. Populations in S & E of range mainly, if not entirely, sedentary. Several sight records and two specimen records from NE Borneo probably refer to vagrant *nasutus*. Vagrants of race *erythronotus* recorded W to Middle East, Sweden and Britain.

Status and Conservation. Not globally threatened. Locally common to uncommon; rare in extreme NW of range, and possibly extinct in e.g. Tajikistan. Has large global range, with extent of occurrence estimated in range 1,000,000–10,000,000 km². General decline in W of range offset by increase in E. Protected in most countries; in some listed as “endangered”. A decrease in use of agricultural pesticides, combined with effective conservation of semi-open habitats (pastures, meadows) with traditional farming and old orchards, would probably be the most effective measure to ensure this species’ future survival.

Bibliography. Ali & Ripley (1972b), Baillie *et al.* (2004), Biswas (1950, 1962), Chen Fuguan *et al.* (1998), Cheng Tsohsin (2002), Coates (1990), Dementiev *et al.* (1954b, 1968), Dickinson *et al.* (1991), Dufoigny (2006), Dunajewski (1939), England (1971a), Galushin & Polozov (1998), Haffer (1993b), Harris & Franklin (2000), Iljitshev (1976), Lefranc (1993), Lefranc & Worfolk (1997), Lu Changhu & Chang Jiachuan (1993), McCarthy (2006), Medway & Wells (1976), Panov (1983), Rabor (1936), Rasmussen & Anderton (2005b), Reeb (1977), Robson (2000b), Sagitov & Bakaev (1980), Saligbaev & Boghdanov (1967), Shirihai (1996), Smythies & Davison (1999), Stepanyan (2003), Wells (2007), Zhang Wei *et al.* (2007).

11. Grey-backed Shrike

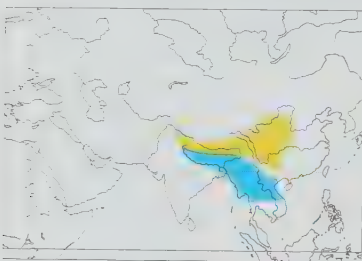
Lanius tephronotus

French: Pie-grièche du Tibet

German: Tibetwürger

Spanish: Alcaudón Tibetano

Other common names: Tibetan Shrike

Taxonomy. *Collurio tephronotus* Vigors, 1831, Himalayas = near Darjeeling, India.Closely allied with *L. schach*, and formerly treated as conspecific, but differs in morphology; moreover, the two species are largely sympatric and, although race *lahulensis* sometimes considered to represent a hybrid population between them, no definite proof of interbreeding. Two subspecies recognized.**Subspecies and Distribution.***L. t. lahulensis* Koelz, 1950 – breeds N Kashmir E to CN India (Uttaranchal Pradesh), and probably SW China (W Xizang).*L. t. tephronotus* (Vigors, 1831) – breeds Nepal E to NE India (Arunachal Pradesh), and C & S China (S Gansu, Ningxia and E Shaanxi S to SE Qinghai, S & E Xizang, SE Yunnan and C Guizhou); non-breeding also S to Bangladesh, Myanmar, Thailand and Indochina.**Descriptive notes.** 21–23 cm; 39–54 g. Rather small shrike with long tail. Nominant race has black lowermost forehead (just over base of bill) and facial mask through lores and eye to rear ear-coverts; crown to nape and most of upperparts dark grey, small rufous rump patch; upperwing black, most wing-coverts, secondaries and tertials fringed pale rufous to whitish, sometimes tiny white patch at base of primaries (often lacking); tail chestnut-brown, tipped buffish, outermost pair of rectrices light brown; throat and underparts white, breast side and flanks rufous, undertail brownish-grey; iris dark brown; bill black; legs dull black. Sexesvery similar. Juvenile is browner above than adult, with less marked brown (not black) facial mask, horn-coloured lower mandible, has crown finely barred, upperparts and much of underparts heavily barred dark brownish. Race *lahulensis* is smaller and weaker-billed than nominate, also much paler, brownish-grey above, with rufous lower back and rump, white primary patch usually slightly larger and more visible, tail sometimes blackish (not brown). **Voice.** Little known. Territorial call described as harsh “zzert-zzert...”, “tchert-tchert...” or “tzt-zt-zt...”; repertoire includes also a repeated “ktcht-ktcht-ktcht” given at dusk or as alarm. Breeding song subdued and musical, with mimicry of other bird calls lasting several minutes. Voice seems to be similar to that of *L. schach*. **Habitat.** Breeds at high elevations in forest clearings, plateau plains and mountain meadows dotted with small trees or fairly large bushes; to at least 4500 m in Nepal (becoming common from 2700 m upwards) and in S China (Yunnan). Post-breeding habitat in Sichuan (C China) either young open coniferous stands with forest clearings dominated by bushes, or pastures at higher elevations; at lower altitudes occurs in extensive agricultural valleys near human settlements. On non-breeding grounds in valleys and plains found in variety of habitats, including gardens and abandoned cultivation.**Food and Feeding.** Mostly insects, such as crickets and grasshoppers (Orthoptera), beetles (Coleoptera) and caterpillars; small vertebrates, such as lizards, frogs, birds and small rodents, may also be consumed. Hunts from open perch, taking prey mostly on ground; some insects hawked in air. Impales prey; keeps larder.**Breeding.** Season Jun–Jul in India and Apr–Jul/Aug (mainly May–Jun) in S China (Xizang); possibly two broods in China but proof lacking. Territorial; residents maintain territory throughout year. Nest a bulky, rather untidy-looking cup, external diameter 13–20 cm and height c. 8–5 cm, made mainly from twigs and grass, placed c. 2 m up in small tree or bush, either isolated or in streamside thicket or row of trees. Clutch 4–6 eggs, pale greyish with brown or grey-brown blotches and spots, and with numerous lavender marks; no information on incubation and fledging periods.**Movements.** Most individuals winter at lower altitudes within breeding range. NW race *lahulensis* appears to be resident or to descend to foothills of Himalayas, whereas nominate race either undertakes altitudinal movements or migrates to non-breeding areas farther S. Non-breeders recorded from plains of S China, India S to West Bengal, Bangladesh, Myanmar, N Thailand, Laos and N Vietnam. Migrants arrive back on breeding territories by early May. Chinese breeders appear to be mainly altitudinal migrants within their breeding range.**Status and Conservation.** Not globally threatened. Not uncommon. Population trends not known, but apparently not at any immediate risk. High-elevation habitat considered more secure than lower-lying ones.**Bibliography.** Biswas (1962), Chen Fuguan *et al.* (1998), Grimm (2006), Harris & Franklin (2000), Lefranc & Worfolk (1997), Li Guiyuan *et al.* (1976), Luo Shiyu *et al.* (1992), MacKinnon & Phillips (2000), McCarthy (2006), Olivier (1944), Rasmussen & Anderton (2005b), Robson (2000b), Tryjanowski & Reino (2004), Vaurie (1955, 1972).

12. Mountain Shrike

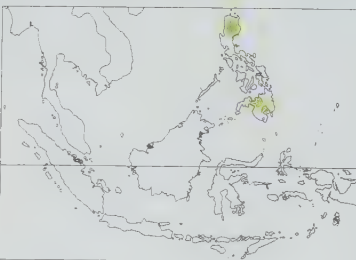
Lanius validirostris

French: Pie-grièche des Philippines

German: Philippinenwürger

Spanish: Alcaudón Filipino

Other common names: Philippine/Strong-billed/Grey-capped Shrike

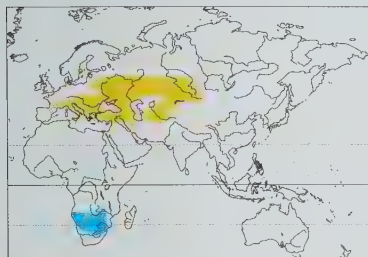
Taxonomy. *Lanius validirostris* Ogilvie-Grant, 1894, mountains of north Luzon, Philippines.Possibly part of the superspecies formed by *L. schach* and *L. tephronotus*, being very similar to latter, especially in plumage. Proposed race *quartus* (from Duminagat, Mt Malindang, on Mindanao) considered synonymous with *hachisuka*. Three subspecies recognized.**Subspecies and Distribution.***L. v. validirostris* Ogilvie-Grant, 1894 – N Luzon (Cordillera and N Sierra Madre), in N Philippines.*L. v. tertius* Salomonsen, 1953 – N Mindoro (Mt Halcon and Mt Dulungan), in NC Philippines.*L. v. hachisuka* Ripley, 1949 – Mindanao (Mt Malindang, mountains of Misamis Oriental, Mt Kitanglad and Civolig, Mt Apo), in S Philippines.**Descriptive notes.** 20–22.5 cm; 34–44.9 g. A medium-sized to large shrike with longish tail and relatively strong and heavy bill. Nominant race has thin black band above bill extending into black facial mask through lores and eye to rear of ear-coverts, narrow whitish supercilium (often short and barely noticeable); crown, nape and mantle to uppertail-coverts dark grey, rump and uppertail-coverts sometimes with rufous tinge; upperwing uniform dark brown with paler fringes, tail dark brown; chin, throat and breast white, breast sometimes faintly rufous tinged, rest of underparts whitish or greyish-white, rufous-brown on flanks and undertail-coverts; iris dark brown; bill and legs black. Sexes alike in plumage, female slightly smaller than male. Juvenile/immature has facial mask blackish-brown and reduced in extent, wing and tail similar to adult, crown and upperparts greyish-brown or brown with dark barring, underparts greyish-white with rufous flanks, side of breast and breast, and vermiculated dark, bill grey-brown with dark horn-coloured base of lower mandible. Race *tertius* is smaller than nominate, with pale rusty wash on breast and belly, deeper rufous on flanks and undertail-coverts; *hachisuka* is intermediate in size between other two races, richer rusty and rufous below than previous. **Voice.** Song like that of a sylviid warbler, incorporating high-pitched whistles. Call a series of harsh, loud “piaaoo” or “chaaoo” whistles, repeated two times per second for period of 4–5 seconds; abrupt, harsh “chrr-chrr-chrr” alarm.**Habitat.** Clearings within and edges of tropical montane oak (*Quercus*) and pine (*Pinus*) forest, open secondary growth and woodland, and grassland with shrubs; 1200–2400 m.**Food and Feeding.** Arthropods, mostly insects; beetles (Coleoptera) probably important in diet, and thick bill possibly adapted for cracking extremely hard-bodied beetles. Occurs singly or in pairs, fairly conspicuous; behaviour said to be same as that of *L. bucephalus*. Hunts by perching upright on exposed perch on top of bush or tree, from where it dives down on to prey; probably also hops on ground. No other information available.**Breeding.** Birds with enlarged gonads in Feb, Mar, May and Jun, and pair feeding juveniles in mid-May. Probably monogamous and territorial. No further information.**Movements.** No information. Possibly resident, with some local altitudinal movements.**Status and Conservation.** Not globally threatened. Currently considered Near-threatened. Restricted-range species; present in Mindoro EBA, in Luzon EBA, and in Mindanao and the Eastern Visayas EBA. Generally considered uncommon throughout its small range, but now appears fairly common in upland habitat that is not under pressure from humans. Although this species' area of occurrence is small, its habitat is apparently secure and it is present throughout this habitat. Species requires basic biological research and population surveys. Probably not at any immediate risk.**Bibliography.** Anon. (2007m), Butchart & Stattersfield (2004), Collar *et al.* (1999), Delacour & Mayr (1946), Dickinson *et al.* (1991), Hahnke (1998), Harris & Franklin (2000), Kennedy *et al.* (2000), McGregor (1909), Meyer de Schauensee & duPont (1962), duPont (1971), Poulsen (1995), Rand & Rabor (1958, 1960), Ripley & Rabor (1961), Sibley & Monroe (1990), Stattersfield & Capper (2000).

inches 4
cm 10

PLATE 59



13. Lesser Grey Shrike

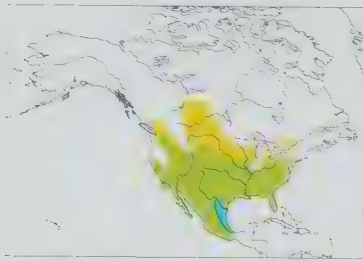
*Lanius minor***French:** Pie-grièche à poitrine rose **German:** Schwarzstirnwürger **Spanish:** Alcaudón Chico**Taxonomy.** *Lanius minor* J. F. Gmelin, 1788, Italy, Spain, Russia = Italy.Affiliations uncertain; nearest relative seems to be *L. schach*. Geographical variation insignificant and clinal, plumage coloration becoming paler and size larger from W to E; species sometimes treated as monotypic. Two subspecies currently recognized.**Subspecies and Distribution.***L. m. minor* J. F. Gmelin, 1788 – breeds NE Spain and S France, Italy (from Piedmont E to Venezia, S patchily to Sicily), E Austria, Slovakia, Hungary and Balkans (S to N Greece and E to Black Sea), also S Lithuania, Belarus and SW Russia (E to Urals, S to Crimea and Caucasus), S to Turkey, N Syria, Lebanon and N Iraq; non-breeding S Africa.*L. m. turanicus* Fedushin, 1927 – breeds W Siberia (E of Ural Mts) E to Russian Altai and extreme NW China (NW Xinjiang), S to Azerbaijan and NW & N Iran, N Turkmenistan and NE Afghanistan; non-breeding S Africa.**Descriptive notes.** 19–23 cm; 41–61 g. A medium-sized shrike with long wings (long primary extension), relatively short, rounded tail, and stubby-looking bill. Male nominate race has black forehead, lores and facial mask (extending to nape side), grey to bluish-grey crown, nape and upperparts; upperwing black, conspicuous broad white band across primaries (near base), tail black, outer feathers tipped white, outer two feather pairs entirely or almost entirely white; chin and throat white, underparts pinkish-white, undertail-coverts white; iris brown or dark brown; bill black; legs blackish. Distinguished from *L. excubitor*and *L. meridionalis* mainly by more compact shape (shorter tail, shorter bill), longer wings, more black on forehead, lack of pale supercilium, little or no white on scapulars, from former additionally by pinkish (not pure white) underparts. Female is similar to male but slightly duller, facial mask greyer or browner, especially on forehead, next-to-outermost tail feather (T5) with more black (nearly 93% of 72 females had black spot on T5, 67% of 97 males lacked spot). Juvenile is pale brownish-grey above, finely and rather indistinctly barred brown (feathers with darker subterminal band), with quite long black-brown patch on ear-coverts, whitish tips of scapulars (can form pale patch on folded wing), wing feathers tipped buffish, primary patch as adult's, underparts creamy or off-white, sometimes faint bars on flanks, bill flesh-grey at base; first-winter plumage similar to adult but duller, often tinged browner above, with forehead greyish (not black), wing and tail as juvenile, sometimes a hint of faint barring above and/or below. Race *turanicus* is larger and paler than nominate, and upperparts of immature and first-winter rather brownish-buff, less greyish. **VOICE.** Territorial calls are long series of "djejek-dschejek-dschijek...", "kerrib-kerrib...", "tschertscherb, tschertscherb..." or "tschilip-tschilip...", often given during display-flights. Aggression calls include "keeee" or "rrrrr"; alarm a repeated "kshek", "gä" or "geer"; "krett" note described as contact, and begging call (female and young) "gäh-gäh..." or similar. Male song, used in intrasexual displays and courtship by unmated males without territory during breeding season or during non-breeding, consists of mixture of fluting warbles and harsh chatters, usually introduced by characteristic "krjé", and incorporating songs of wide range of other species e.g. from finches (Fringillidae), larks (Alaudidae) and tits (Paridae) to waders (Charadriiformes) and partridges (Phasianidae), and even crow (Corvidae) calls and barking of dogs; similar to but somewhat louder than that of congeners.**Habitat.** Open habitat with plenty of scattered or grouped trees, and fewer bushes; requires presence of features offering perches, shade and accessible food. Breeding habitats in Europe include extensively managed orchards, potato, beetroot and melon fields, and tobacco fields, as well as vineyards and meadows; tall trees necessary for nesting. Prefers open or disturbed lowland and hilly areas to 700 m, rarely to 900 m in C Europe; to 1500 m in Russia, and even up to 2200 m in Kazakhstan. Need for drier and sunnier conditions than those tolerated by other European shrikes possibly connected with more specialized diet of large insects. In S African non-breeding quarters inhabits semi-arid savanna and thornveld; Kalahari region in Botswana holds locally dense population, mainly in dry acacia (*Acacia*) thornbush country and open acacia parkland.**Food and Feeding.** Almost exclusively insectivorous, but spiders (Araneae) also consumed; vertebrates such as small mammals or birds taken only very rarely. Prefers mostly larger insects such as crickets (Gryllidae), mole-crickets (Gryllotalpidae) and other Orthoptera, and larger beetles (Coleoptera), average body length of prey reaching 22.7 mm in some studies, but eats caterpillars also; beetles mainly coprophagous scarabaeids and zoophagous carabids, and diet dominated by cockchafers (*Melolontha melolontha*) during outbreaks of this scarabaeid. Of 1382 prey items in C Slovakia, 99.8% were invertebrates (of 92 species), of which 28.2% crickets, 18.2% scarabaeids, 18.3% carabids, 11.9% grasshoppers (Acrididae) and bush-crickets (Tettigoniidae), and 5.9% lepidopteran larvae. Usually forages alone, or pair-members feed in close proximity. Uses sit-and-wait foraging technique, utilizing variety of lookout perches 2–15 m above ground, e.g. wires, fence lines, tree branches, very occasionally houses or other buildings; most insects taken on the ground, in fine weather also caught in air (slow-flying ones, e.g. bibionid flies, cockchafers). Very often hovers in manner of a kestrel (*Falco*), much more so than any other European shrike; also hops on ground like a wheatear (*Oenanthe*), particularly in wet weather. Rarely impales prey, although some individuals do so more regularly; during temporary increases in food supply, however, may keep larders more frequently and impale items even on unusual substrates.**Breeding.** Laying May to early Jun (in C Europe, mean 17th–19th May), replacement clutches to early Jul; one brood. Monogamous; territorial, but breeds often in loose groups, with recorded maximum of 4 pairs/ha in traditionally farmed orchard. Nest built by both sexes, a well-made structure with loose foundation of twigs, grass, rootlets, string, etc., often with high proportion of green plants (especially aromatic species), lined with rootlets, feathers and hair, occasionally unlined, placed on lateral branch of tree, usually fruit tree or poplar (*Populus*), at 2.5–20 m but generally high above ground (mean of 401 nests in C Europe 8.5 m); territory size 2.9–14 ha. Clutch 3–7 eggs, mainly 5–6 (no known geographical variation in clutch size), pale bluish-green, with olive-brown spots concentrated toward broad end, eggs laid one daily; size of replacement

clutches significantly smaller than first ones; incubation by female, fed on and away from nest by male, period 14–16 days; chicks brooded by female, fed by both sexes, nestling period 14–19 days, mostly 16–18 days; young independent 2–3 weeks after fledging, but remain with parents for c. 2 months or longer. Breeding success relatively high in optimal condition, e.g. 4.9–6 young fledged from each of 117 nests in C Europe; rarely, seven chicks raised from single brood. First breeding at 1 year.

Movements. Long-distance migrant, entire breeding population wintering in S Africa (within a range five times smaller than breeding range), from extreme S Angola and Namibia E to S Mozambique and parts of N South Africa. Those breeding in NW China may even travel nearly 12,000 km to Namibia. In autumn, birds from W of range initially head SE through Greece and Aegean Sea, all populations entering Africa on narrow front, principally through Egypt and Arabian Peninsula. Movement begins late Jul and Aug in C & W Europe, passage reaching peak in second half Aug; crosses Aegean Sea up to end Sept and Egypt to late Nov, arriving in winter quarters from late Oct (Zimbabwe) to late Nov (South Africa). Some pass over high-lying terrain, E birds recorded at up to 3400 m. Return migration in spring along similar route but a little farther E, e.g. in Zimbabwe E of c. 30° E (W of this longitude in autumn); starts late Mar, main passage in Zambia first half Apr, main exodus apparently via E Africa, Ethiopia and Somalia and continuing through Middle East. In C Europe (Slovakia), earliest arrival on breeding grounds in late Apr to mid-May, sometimes when still winter conditions there; arrival in W Siberia mid-May. Vagrants recorded in e.g. Scandinavia, Britain, Ireland, Channel Is (Jersey, Alderney), Heligoland, W & NW Africa and offshore islands, C Siberia (Mirnoye), Pakistan, Aldabra and Madagascar.**Status and Conservation.** Not globally threatened. Locally common to rare. Maximum of 320,000 breeding pairs thought to occur in Europe, with strongholds in Russia and Turkey (each with up to 200,000 pairs) and Romania (up to 70,000); from roadside counts in S Africa, total world population in mid-1990s estimated at 5,000,000–7,000,000 individuals. Decreasing trends reported in Europe, and now extinct in many countries of N, W & C Europe, e.g. last bred in Belgium in 1930, in Luxembourg in 1930s, in Germany (in S) in 1980s, in Switzerland mid-1980s, in Czech Republic in 1990s, and in Poland (SE) in early 1990s; only small population remaining in Austria (4–10 pairs in extreme E), and only isolated populations (up to 30–50 pairs) survive in Spain and France. Range contraction towards SE combined with decline in numbers in most European countries evidently part of longer-term trend apparent since middle of 19th century and later, during 1970–1990, affecting up to 30% or more of European population. Few data on status of populations farther E, in Asia, but seems to be fairly common. Protected in most countries; in some listed as "highly endangered", in others regarded as "vulnerable" or "endangered". Heavy use of fertilizers since middle of 20th century has led to increase in vegetation cover, causing wetter and colder micro-climate close to soil, this, in turn, having negative effect on the large arthropod fauna on which this species relies. It would benefit from a decrease in use of agricultural pesticides and from the maintenance of traditional farming methods, with old orchards.**Bibliography.** Chacón (1996), Clancey (1980a), Cramp & Perrins (1993), Dementiev *et al.* (1954b, 1968), Dowsett (1971), Dvorak *et al.* (1993), Haensel (1963, 1965), Haffer (1993h), Hagemeijer & Blair (1997), Hantge (1957), Harris & Arnott (1988), Harris & Franklin (2000), Hernández (1993a), Herremans (1998), Hockey *et al.* (2005), Hoi *et al.* (1997), Horvath (1959), Isenmann & Debout (2000), Kren (2000), Kristin (1991, 1995), Kristin & Zilinec (1998), Kristin, Hoi *et al.* (2000, 2007), Kristin, Valera *et al.* (2007), Kristin, Vanhinsbergh *et al.* (1998), Lefranc (1978, 1993, 1995), Lotti (1988), Niehuis (1968), Panov (1983), Patrikeev (2004), Rashkevich (1956), Ristow (1966, 1977), Rogacheva (1992), Roselaar (1995), Salvo (1988), Samwald & Samwald (1993), Schmick (1980), Scott *et al.* (1975), Shirihai (1996), Tucker & Heath (1994), Ullrich (1971), Valera *et al.* (2001), Warnke (1958), Western (1992), Wirtitsch *et al.* (2001), Yeatman-Berthelot (1995).

14. Loggerhead Shrike

*Lanius ludovicianus***French:** Pie-grièche migratrice **German:** Louisianawürger **Spanish:** Alcaudón Americano
Other common names: Migrant Shrike, Butcherbird**Taxonomy.** *Lanius ludovicianus* Linnaeus, 1766, Louisiana, USA.Forms a superspecies with *L. excubitor*, *L. meridionalis* and *L. sphenocercus*. Recent molecular-genetic studies suggest that present species is possibly closest to *L. meridionalis*, but further research required. Races intergrade, making subspecific delimitation difficult. Other proposed races include, in USA, *gambeli* (described from Calaveras County, in EC California), *nevadensis* (Inyo County, in E California) and *sonoriensis* (Chiricahua Mts, in SE Arizona), all subsumed in *excubitorides*; and *miamensis* (Cutler, Miami-Dade County, in SE Florida), merged with nominate; and, in Mexico, *nelsoni* (S Baja California), which is synonymized with *mexicanus*. Seven subspecies currently recognized.**Subspecies and Distribution.***L. l. excubitorides* Swainson, 1832 – breeds SW Canada (S British Columbia, C Alberta, S Saskatchewan and SW Manitoba) S in W USA to E Washington, extreme S Oregon and S Idaho and to California, Arizona, New Mexico, Texas (except NE), E to North Dakota, South Dakota, Nebraska, Kansas and W Oklahoma; non-breeding in S parts of range and S to W Mexico (including Baja California).*L. l. grinnelli* Oberholser, 1919 – extreme S California (S from San Diego County) S to extreme NW Mexico (C Baja California Norte).*L. l. anthonyi* Mearns, 1898 – Channel Is (Santa Rosa, Santa Cruz, Santa Catalina), off S California.*L. l. mearnsi* Ridgway, 1903 – San Clemente I, off S California.*L. l. migrans* Palmer, 1898 – breeds SE Canada (S Ontario, S Quebec, S Michigan) and, in USA, from E edge of Great Plains (E from Nebraska, Kansas, Oklahoma and NE Texas) E to New York and Atlantic coast, and S into Mississippi Valley to N Mississippi, Arkansas and N Louisiana; non-breeding in S of range and S to Gulf Coast states and E coast of Mexico.*L. l. ludovicianus* Linnaeus, 1766 – E & S USA (E of Appalachian Mts) from North Carolina S to Gulf Coast states and S tip of Florida.*L. l. mexicanus* C. L. Brehm, 1854 – W & C Mexico (including S Baja California) S to Oaxaca.**Descriptive notes.** 18–22 cm; 43–54 g. A medium-sized shrike with medium-length tail. Male nominate race has black facial mask from lores and (very narrowly) over base of bill back to rear ear-coverts, sometimes very narrow whitish supercilium (often invisible); forehead and crown to lower back variably slate-grey to pale grey (palest in S), rump and uppertail-coverts slightly paler, scapulars broadly tipped white; upperwing black, broad white tips on tertials and secondaries, wide white bar across primaries (near bases); tail black, all except central feather pair tipped white, outer web of outer two pairs entirely white (sometimes some black on T5); throat and underparts whitish, flanks



sometimes washed pale grey, occasionally some faint darker vermiculation on breast; iris dark brown; bill black, in non-breeding season often pale base of lower mandible; legs blackish. Differs from *L. excubitor* mainly in smaller size (10–15% smaller), shorter bill with less pronounced hook. Female is very similar to male, but often lores duller (grey feather bases), upperparts less bluish, sometimes more greyish below (breast feathers with grey or brown shafts), legs browner. Juvenile is paler than adult, generally light brownish-grey with fine dark vermiculation above and below, facial mask narrower and browner, cinnamon-

buff tips of greater upperwing-coverts (buffish wingbar), smaller white primary patch than adult, pale base of lower mandible. Races differ mainly in plumage coloration and size: *migrans* is on average slightly paler above than nominate, a shade greyer below, with smaller bill; *excubitorides* is paler above than other races (except S populations of nominate, “*miamicensis*”), white on lower rump and uppertail-coverts, usually has some white in superciliary area (supercilium often fairly prominent); *grinnelli* is dark grey above, with little or no white in superciliary area, smaller white tail tips, grey below; *anthonyi* is darker above than nominate, with less white in scapulars, less white in tail and wing, has pale grey rump and uppertail-coverts; *nearnsi* is similar to previous but smaller, slightly darker above but paler below, rump whiter (not so grey), scapulars mostly white, bill somewhat shorter and with tip less hooked; *mexicanus* is dark above, rump variable (white to pale grey or medium grey), more greyish (less white) below than nominate, bill relatively slender. Voice. Huge variety of calls. Repeated harsh screeching “tscheer-tscheer...”, and sharp “bzeek-bzeek” as territorial calls, latter as 4–12 notes diminishing in intensity; harsh, buzzy “tuubzt” or “tzzweet” notes probably used also in territorial disputes; alarm “aak” (aerial predator), “jaa” (for terrestrial danger), and “keer” and “kzzz” sounds; in defence, e.g. of nest, may give “schgra-a-a”. Begging calls of female and juvenile described as “naaaa-naaa...”, also “tsp” (very young nestlings) and husky repeated “teheek” or “teheep” (older nestlings). Song consists of series of notes of two or three syllables with metallic quality, e.g. “krrr-di” or “jee-uk”, repeated at short intervals; some duetting by partners reported; not known to mimic other species.

Habitat. Breeds in open country with short vegetation, generally below 2000 m elevation. Prefers active pastures with fencerows, mowed roadsides and parks, golf courses, cemeteries, open woodland, old orchards, and agricultural fields. Usually avoids row crops, but has been observed in corn fields in Midwest. In winter, N populations withdraw to areas with infrequent snow cover; in non-breeding season, habitat also includes mowed and idle crop fields with nearby trees or shrubs (for shelter from aerial predators). Breeding and winter territories usually include impaling sites such as thorn trees and barbed-wire fences.

Food and Feeding. Almost 70% insectivorous, more so than *L. excubitor*. Chief among prey items are grasshoppers and crickets (Orthoptera) and beetles (Coleoptera), but diet includes also spiders (Araneae), crayfish (Decapoda), frogs, mice (Muridae) and small birds, also carrion (including roadkills); other small vertebrates, such as lizards and snakes consumed less frequently. Small mammals and birds taken more often in winter, when insects less available. Solitary hunter; pair-members may hunt same area, but without co-operation. Usually sits and waits on exposed perch 1–15 m above ground, or hovers over open fields; often uses fence lines, utility lines and poles as hunting perches, often adopting nearly horizontal posture, with tail cocked at upward angle. Most prey caught on ground, but flying insects captured also in air. Reduced prey base in winter months often results in territory at that season being larger than breeding territory.

Breeding. Breeds earlier than most other passerines. Laying mainly Feb–Jul; late May to Jul in N of range, but in S eggs found as early as mid-Jan in Florida and nesting begins mid-Feb in S Texas and Louisiana; multiple broods common in S. Monogamous. Territorial; occasionally nests in loose groups, e.g. seven pairs found nesting within 1 square mile (259 ha) in E Colorado. Nest built by female, a bulky cup constructed from twigs, bark strips and grass, lined with rootlets, moss, fine grasses, animal fur and feathers, sited from below 1 m to up to 3 m above ground and well hidden in tree fork or on lateral branch beneath canopy of isolated tree or thick shrub; thorny tree such as acacia (*Acacia*) or hawthorn (*Crataegus*) selected where available, preferring trees not rubbed by livestock, and in arid W nests in sagebrush (*Artemisia*) or cactus, e.g. cholla or prickly-pear (*Opuntia*); territory size variable (dependent on availability of nest-sites, prey and foraging perches), from 2.7 ha (Alberta, in Canada) to 25 ha or more, average 6–9 ha. Clutch 3–9 eggs, larger clutches in N latitudes, grey-buff with darker splotches at large end; replacements laid if clutch lost; incubation by female, fed on and away from nest by male, period mainly 15–17 days; chicks brooded by female, fed by both sexes, nestling period 17–20 days; juveniles able to feed themselves from c. 2 weeks, independent from c. 4 weeks, sometimes stay with parents for longer (up to c. 3 months). Nests occasionally parasitized by Brown-headed Cowbird (*Molothrus ater*). Breeding success relatively high, 56%; chief causes of nest failure are predators and severe weather.

Movements. N populations migratory, most wintering S of latitude 40° N; populations in extreme N of range (W Canada) possibly migrate farthest S, to Mexico. Most S populations resident on breeding territories. Migrates individually, but migrating family groups may be encountered in autumn; diurnal low-level migrant, individuals may travel 70–80 km/day, feeding along the way. Migrants leave breeding grounds in N extremes and higher altitudes from mid-Jul, stragglers not until as late as Nov; Christmas Bird Count data suggest that highest concentrations of this species in winter months are found in US states of Texas, Louisiana, Mississippi and Alabama. Spring return begins in Feb; in E Colorado a few arrive late Feb, and arrivals through rest of range continue through late May.

Status and Conservation. Not globally threatened. Rare to locally fairly common. Decreasing trend in E (E of R Mississippi); some W populations appear stable, but not well studied. The species is listed as “threatened” or “endangered” in whole of Canadian range; in USA, as “endangered” in Wisconsin, Indiana, Ohio, Vermont, New York, New Hampshire, Massachusetts, Pennsylvania, New Jersey and Maryland, and as “threatened” in Minnesota, Illinois and Virginia; listed as “Species of Special Concern” in most other states of USA. Of the migratory races, *migrans* is the most endangered. Race *nearnsi*, confined to small island of San Clemente, is listed as “endangered”. Factors affecting population declines have not been positively identified. Although rates of breeding success high, and winter survival (more than 38%) appears sufficient for species’ viability, numbers in E areas continue to fall; Active recovery programmes and captive-breeding programmes have been initiated in Ontario and Idaho, and on San Clemente I. Reduction in use of agricultural and domestic pesticides and the restoration of hedgerows at field and pasture edges would be positive steps in helping to increase numbers. Research priorities include identification of causative factors in population decline; ability to determine sex and races in the field remains difficult, and often impossible.

Bibliography. Anderson (1976), Andrews & Righter (1992), Blumton (1989), Chabot, Bird & Titman (1995), Chabot, Titman & Bird (1995, 2001), Collins (1996), Esely & Bollinger (2003), Grubb & Yosef (1994), Haas

(1987), Harris & Franklin (2000), Johnson *et al.* (1998), Kingery (1998), Lefranc & Worfolk (1997), Lynn *et al.* (2006), Miller (1931), Mundy, Winchell, Burr & Woodruff (1997), Mundy, Winchell & Woodruff (1996, 1997), Pérez & Hobson (2006, 2007), Pruitt (2000), Pyle (1997), Sibley (2000), Slack (1994), Vallianatos *et al.* (2001, 2002), Yosef (1992b, 1992c, 1993c, 1994a, 1994b, 1996, 2001), Yosef & Deyrup (1998), Yosef & Grubb (1993, 1994a, 1994b), Yosef & Lohrer (1995), Yosef & Whitman (1992), Yosef *et al.* (1996).

15. Great Grey Shrike

Lanius excubitor

French: Pie-grièche grise

German: Raubwürger

Spanish: Alcaudón Norteño

Other common names: Grey Shrike; Northern Shrike (*borealis*, *invictus*); North Siberian Shrike (*sibiricus*); Steppe Shrike (*homeyeri*); Altai Shrike (*mollis*)

Taxonomy. *Lanius excubitor* Linnaeus, 1758, Europe = Sweden.

Forms a superspecies with *L. ludovicianus*, *L. meridionalis* and *L. sphenocercus*. Sometimes treated as conspecific with *L. meridionalis*, but the two overlap slightly in range, with little intergradation, in C Asia. Geographical variation complex and not fully understood, and obscured by individual variation and intergradation between races; in Nearctic, *invictus* apparently interbreeds with *borealis* in C Canada (NE Manitoba and N Ontario) and is sometimes synonymized with latter; *sibiricus* and *mollis* intergrade in NW Mongolia. Proposed race *leucopterus* (from upper R Naryn, in Kyrgyzstan) regarded as synonymous with *homeyeri*. Eight subspecies provisionally recognized.

Subspecies and Distribution.

L. e. invictus Grinnell, 1900 – breeds Alaska (except N) and NW & NC Canada (Yukon and Northwest Territories, and extreme N British Columbia E to N Ontario); non-breeding S Canada and most of W & C USA.

L. e. borealis Vieillot, 1808 – breeds NE Canada (N Ontario and N & C Quebec E to Labrador); non-breeding SE Canada and C & E USA.

L. e. excubitor Linnaeus, 1758 – breeds N, C & NE Europe (E from Scandinavia and C France) E to NW Siberia (lower R Ob), S to S Russia (Kazan area); non-breeding S Scandinavia, Britain and W & S France E to Asia Minor, Caucasus and Transcaucasia.

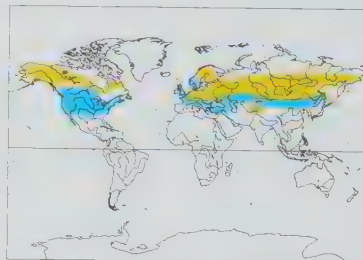
L. e. sibiricus Bogdanov, 1881 – breeds C & E Siberia E to Kolyma Basin, Anadyrland and Chukotsk Peninsula, S to L Baikal, N Mongolia and SE Russia (N Amurland), possibly also N Kurils (Paramushir I); non-breeding SC Siberia, Mongolia, NE China (N Manchuria, perhaps N Hebei) and Ussuriland.

L. e. homeyeri Cabanis, 1873 – breeds SE Europe (E Balkans, Bulgaria, S Romania, Ukraine E to foothills of S Urals) and SW Siberia (E to N foothills of Altai, including Naryn region); non-breeding SW & C Asia.

L. e. mollis Eversmann, 1853 – breeds CS Russia (Altai and Sayan Mts) and NW Mongolia; non-breeding also N China.

L. e. funereus Menzbier, 1894 – Dzhungarian Alatau Mts (E Kazakhstan) and S & E Tien Shan (Kyrgyzstan–NW China).

L. e. bianchii E. J. O. Hartert, 1907 – breeds Sakhalin I and S Kuril Is; non-breeding N Japan (Hokkaido, rarely farther S).



Descriptive notes. 24–25 cm; 48–81 g. A rather large shrike with medium-length tail; white of scapulars, wing and tail conspicuous in flight. Male nominate race has narrow black face-mask (thin dark area above bill barely noticeable) extending back to rear of ear-coverts, thin whitish supercilium (often indistinct or lacking); top of head, nape and upperparts to lower back pale grey with variable bluish tinge, rump and uppertail-coverts often slightly paler, scapulars white; upperwing black, prominent white patch across bases of primaries, often another (narrower) white patch at base of secondaries, flight-feathers and tertials

tipped white; tail black, outer feather pair white (sometimes some black on inner web), adjacent rectrices with progressively decreasing amount of white; throat and underparts white, in fresh plumage occasionally a hint of pink tinge on breast; iris brown or dark brown; bill black; legs blackish. Distinguished from similar *L. meridionalis* (nominate race) mainly by much paler plumage, indistinct or non-existent supercilium, more white in wing, also by slightly longer wings, shorter and less robust bill and shorter legs. Female is very like male but with less white in plumage (white wing patches slightly smaller; whitish tips of wing feathers narrower, scapulars with more grey tones), greyer (not so pure white) underparts sometimes with hint of vermiculation on upper breast. Juvenile is generally more brownish-grey, usually faintly barred dark brown from nape to uppertail-coverts, with facial mask browner, greater coverts pale-tipped, whitish below, grey-brown wash on breast and flanks, narrowly vermiculated brown, bill brownish-grey. Races differ in plumage and in body size: *homeyeri* is paler than nominate, rump and uppertail-coverts whitish, white supercilium more obvious, extensive white in wing, more white in tail (including at base of central feather pair); *sibiricus* is tinged ochre above, lightly vermiculated below; *mollis* is darker than previous, has smaller white wing patch, underparts more buff and more strongly vermiculated; *funereus* is larger than others, in plumage similar to previous but darker, with underparts more brownish-grey and more heavily vermiculated; *bianchii* is small, similar in plumage to *sibiricus* but paler and greyer, less buffy, above, and less vermiculated below; *borealis* is similar to nominate, but rump and uppertail-coverts paler, supercilium more prominent, white in wing always restricted to primaries, greyer underparts extensively vermiculated dark, juvenile much darker and browner all over and more strongly barred below than juvenile nominate; *invictus* is very like last, perhaps slightly paler above, supercilium stronger, rump and uppertail-coverts white, underparts less vermiculated. Voice. Song consists of short, repeated verses, interrupted by longer intervals of silence; usually introduced with “trrr” or “prrr” (sometimes varied to “trrr-tr-trrr”) for alarm, but different alarm, “ääk”, “kwää” or “wäääk”, used in parent–offspring interactions; in territorial conflicts between males “ghirr” recorded. Notes such as “kwiet” and “triet” and also more vocal “chlip”, “tlück” or “tluck”, in courtship behaviour; also in duets by partners, “chli”–“ip” or “triet”–“chlip”, sometimes first note given by one partner and second by other partner, or both notes by just one of the two, followed by two notes by the other.

Habitat. Breeds in subarctic and temperate climates in open country with trees, bushes, fence posts and powerlines; N populations in clearings in taiga or in transition zone from taiga to tundra and forest edge; sometimes also on marshland and peat bogs. Sparse and low vegetation an impor-

tant component, typical perch densities in C & N Europe 5–15 perches/ha. Suitable perches are provided by isolated trees, small groves, bushes, and also pylons, electric wires and fences. Habitats used in non-breeding areas similar to those when breeding, but meadows more important outside breeding season.

Food and Feeding. Highly opportunistic and flexible in use of different food spectra, as well as in hunting tactics. Diet consists mainly of small vertebrates and large arthropods. Voles (Microtinae) appear to be most frequent vertebrate prey, usually in excess of 50% (sometimes as much as 90%) of total biomass taken; small birds, shrews (Soricidae), lizards and frogs also relatively frequent prey. Large insects (seldom more than 15% of total biomass consumed) chiefly beetles (Coleoptera), grasshoppers and crickets (Orthoptera), and wasps and bees (Hymenoptera); various other insects and invertebrates recorded as food, including arachnids, worms (Oligochaeta), snails (Gastropoda) and crayfish (Decapoda). Carrion occasionally recorded; also small fruits. Usually forages and perches alone, or partners feed in close proximity to each other. Uses sit-and-wait technique. Utilizes variety of lookout perches 2–15 m high, including wires, fence lines, tree branches; dives down on to prey on ground. Also, very often hovers in manner of a kestrel (*Falco*). Very frequently impales prey, although some individuals impale more regularly in larders than others. During mating period, males impaled more prey before mating than they did afterwards, the majority of cached prey was on borders of territories and in visible places, and a large part of the food was left uneaten, all of which indicates that during mating period impaling behaviour has a signalling function. During breeding stages, in contrast, impaling was used primarily as a means of storing food: distance from larders to nests decreased, more prey were stored in well-concealed sites, and larger proportion of stored food was consumed.

Breeding. Laying from end Mar to end May, replacement clutches to early Jul; Mar–Jun in C Europe, Apr–May in Alaska and May–Jul in E Canada (Labrador); one brood, very rarely two. Monogamous, but very rarely polygyny also observed. Strictly territorial breeder. Nest built by both sexes, a well-made structure with loose foundation of twigs, grass, rootlets, string, etc., often with high proportion of green plants, lined with rootlets, feathers and hair, placed generally high above ground (mean of 401 nests in C Europe 15.5 m) in fork or on lateral branch of tree, mainly pine (*Pinus*) or poplar (*Populus*), sometimes in dense shrub and therefore much lower (down to 0.2 m above ground), mean 1.8 m above ground in alpine areas of North America; territory size 20–350 ha. Clutch 3–9 eggs (usually 6–7 in Europe, 8 in North America), pale bluish-green, with olive-brown spots concentrated toward broad end; frequent replacements if previous clutch lost; incubation mainly by female, fed on and off nest by male, period 14–19 days, mostly 15–17 days; chicks brooded by female, fed initially mostly by male, later by both sexes more equally, nestling period 14–21 days, generally 15–19 days; young accompanied by parents for c. 3 weeks or more, leave natal territory usually 6–7 weeks (sometimes c. 1 month) after fledging. Nests formerly parasitized by Common Cuckoo (*Cuculus canorus*) in Europe, but no such records since late 1970s. Breeding success varies from place to place and from year to year, and is 40–55% in optimal conditions in C Europe, 3.9–6.3 young fledged per pair, and rarely nine chicks raised from single brood. First breeding in second calendar year.

Movements. Most populations migratory or at least partially so, non-breeding range including S parts of breeding range in addition to more S areas. In Old World, movements only of European populations are relatively well known; most leave breeding areas during Jul–Oct, mainly Sept–Oct, spend c. 4–5 months in non-breeding quarters, and return mainly Mar–Apr. In general, European populations migrate to wintering grounds in regions S of 60° N. Many of those breeding in SW Europe appear largely sedentary compared with populations farther E. Asian populations migrate mainly to areas in SW, C & E Asia, but recorded also as rare vagrants in N & W Europe. In North America, non-breeding range extends from S parts of Canada S in USA to NC California, C New Mexico and N Texas and, in E, S to North Carolina. Some evidence suggesting changes in migratory strategy of some populations during recent decades, e.g. increasing numbers of individuals remaining in S Fennoscandia and Poland in winter.

Status and Conservation. Not assessed. Probably not globally threatened, but until recently treated as conspecific with *L. meridionalis* and separate evaluation now required. Locally common to uncommon. Fennoscandian and Russian stronghold contains at least 330,000 breeding pairs, and future Russian censuses may reveal greater numbers; maximum density of 33 pairs/100km² in traditional farmland. Populations in rest of Europe relatively insignificant (13,000 pairs in C & E Europe, 3400 pairs in W Europe). Generally decreasing trends reported in Europe. Protected in most countries; in some listed as “highly endangered”, in more countries regarded as “vulnerable” or “endangered”. Situation in Asia and in North America not well known, but available data suggest that in both continents this is a decreasing species. Reduction in the practice of intensive agricultural management would probably be the most effective conservation measure for this shrike.

Bibliography. Antczak, Hromada, Grzybek & Tryjanowski (2004), Antczak, Hromada & Tryjanowski (2005a, 2005b, 2005c), Atkinson (1997), Brazil (1991), Chen Fuguan *et al.* (1998), Cramp & Perrins (1993), Dementiev *et al.* (1954b, 1968), England (1971a), Etchéopar & Hüt (1983), Hafler (1993b), Harris & Franklin (2000), Hromada, Kuczynski *et al.* (2003), Hromada, Tryjanowski & Antczak (2002), Karlsson (2002), Kren (2000), Kuczynski *et al.* (2003), Lefranc & Worfolk (1997), Michalcuk (2004), Nikolov *et al.* (2004), Olborska & Kosicki (2004), Probst (2001), Probst *et al.* (2002), Rogacheva (1992), Schön (1979, 1994a, 1994b, 1994c, 1994d, 1994e, 1994f, 1994g, 1994h, 1995a, 1995b, 1998a, 1998b, 2000), Scott *et al.* (1975), Stepanyan (2003), Tucker & Heath (1994), Yosef (1994a).

16. Southern Grey Shrike

Lanius meridionalis

French: Pie-grièche méridionale **German:** Mittelmeer-Raubwürger **Spanish:** Alcaudón Real
Other common names: Indian Grey Shrike (*lahtora*); Steppe Grey Shrike (*pallidirostris*)

Taxonomy. *Lanius meridionalis* Temminck, 1820, Provence, France.

Forms a superspecies with *L. ludovicianus*, *L. excubitor* and *L. sphenocercus*. Sometimes treated as conspecific with *L. excubitor*, but the two overlap slightly in range, with little intergradation, in C Asia. Recent molecular-genetic studies indicate that present species may be closer to *L. ludovicianus*, but this possibility requires further research. Geographical variation complex and partly clinal, races intergrading. Proposed race *jebelmarrae* (described from Jebel Marra, Darfur, in Sudan) synonymized with *leucopygus*, but may warrant recognition; further study required. Eleven subspecies currently recognized.

Subspecies and Distribution.

L. m. meridionalis Temminck, 1820 – Iberian Peninsula and S France.

L. m. koenigi E. J. O. Hartert, 1901 – Canary Is.

L. m. algeriensis Lesson, 1839 – NW Africa along Atlantic and Mediterranean coasts E to N Tunisia and N Libya (N Tripolitania, N Cyrenaica), S to coastal NW Mauritania and N Sahara.

L. m. elegans Swainson, 1832 – N & C Sahara from NE Mauritania, NW Mali, and S Tunisia E to C & S Libya, Egypt (including N & C Sinai Peninsula), NE Sudan (S to Port Sudan) and SW Israel; possibly also NE Niger.

L. m. theresae R. Meinertzhagen, 1953 – S Lebanon and N Israel.

L. m. leucopygus Ehrenberg, 1833 – S Sahara in C & S Mauritania, C Mali, C & S Niger, NE Nigeria (probably also extreme N Cameroon), S Chad and C Sudan (including Darfur).

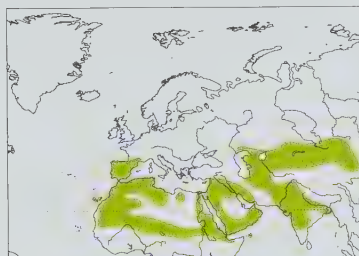
L. m. aucheri Bonaparte, 1853 – CE Sudan (S from Port Sudan), Eritrea, N Ethiopia, NW Somalia, Iraq, S Iran, Syria, SE Israel, SE Sinai Peninsula, W Arabian Peninsula and Oman.

L. m. buryi Lorenz von Liburnau & Hellmayr, 1901 – Yemen.

L. m. uncinatus P. L. Slater & Hartlaub, 1881 – Socotra I.

L. m. pallidirostris Cassin, 1852 – C Asia from NW Caspian Sea (extreme S Russia) and S Kazakhstan E to Mongolia and N China and, in W, S to NE Iran, Afghanistan, N Pakistan and W foothills of Tien Shan.

L. m. lahtora (Sykes, 1832) – Pakistan (except N) and N India (foothills of Himalayas) S to Karnataka, E to C Bangladesh.



white outer web and much white on inner web; throat white, underparts pale pinkish-grey, undertail-coverts white; iris brown or dark brown; bill and legs black. Differs from *L. excubitor* mainly in much darker colour above, pinkish underparts, distinct supercilium, smaller white wing patch, shorter wing (5–10% shorter); from *L. minor* also in relatively longer tail, shorter wing and primary extension, longer and less deep bill. Female is very like male but slightly duller, may have on average less white in plumage. Juvenile is lighter grey above than adult, but has underparts similarly pale buffish-pink, occasionally a hint of very faint dark longitudinal stripes below, facial mask dark brown, lores partly pale. Races differ mainly in plumage colour and pattern and in size: *algeriensis* is similar to nominate, but paler above and greyer below, supercilium poorly indicated, bill thicker; *koenigi* is similar to previous but smaller, with wing and tail shorter, has supercilium clearer and longer, bill on average more strongly hooked; *elegans* is much paler than last, has underparts pure white, more white in scapulars, wing and tail; *leucopygus* is similar to previous but smaller, has rump and uppertail-coverts white, underparts more creamy, not so pure white; *aucheri* is very like *elegans*, but has narrow black band above base of bill, generally less white in wing and tail; *theresae* is similar to previous, but darker grey over much of body; *buryi* also is similar, but upperparts distinctly darker, throat and underparts also somewhat darker; *uncinatus* also is similar, but has less white in scapulars, slightly longer bill; *pallidirostris* has very narrow mask, especially in front of eye, forehead pale, lores dusky, supercilium faint and not readily apparent against pale grey of crown; *lahtora* is similar to *aucheri*, but with black frontal band distinct and relatively wide, more white in wing and tail, larger bill. **VOICE.** Wide variety of calls. Repeated double “kwirick”, “sheen-sheek” or “shihk-shihk” used in territorial disputes (race *pallidirostris*), a metallic “schryck” or rolling “schrick” also recorded; these can be altered to alarm calls, “kcha-kcha...” and “weche-weche...” or more intense “sheck-sheek, sheek, sheek...”, and “djerki-djerki-djerki” and other harsh clicking and buzzing sounds probably have similar function. Repertoire includes several different trilled whistles, e.g. “dri-dri...” or harsher “trrr-trrr...”. For some races (e.g. *aucheri*) clearer whistles are used for alarm or contact, “kwiet”, “tew-dew” or ringing “trip-trip”. Parent-nesting contact calls described as “hui-hui” and begging “gaik-gaik...”, “pchee-ar” and “chee-chee-chee”. Bill-snapping recorded. Song typical of genus, harsh buzzes combined with clear whistles or relatively short warbles, with imitations of other birds included.

Habitat. Fairly open country dotted with thorny bushes in dry and warm, sunny lowlands to 1200 m. Nominative race occupies cereal-growing land with groves, hedgerows, bushes, meadows, vineyards, orchards, pasture and evergreen oak (*Quercus*) forests (“dehesas”); trees and shrubs required for nesting, as hunting perches, for territory delimitation, as food caches and for shelter against predators. Much prey is caught in the herbaceous layer, and in NW Spain this layer accounts for c. 70% of the habitat occupied; this percentage is increased in winter habitat. Other races occur in variety of arid landscapes, including semi-desert and desert, so long as some thorny vegetation is present. Less arboreal than *L. excubitor*.

Food and Feeding. Diet consists of arthropods (mostly large insects) and small vertebrates (reptiles, small mammals and birds). Nominative race prefers crickets (Gryllidae), grasshoppers (Acrididae), mole-crickets (Gryllotalpidae) and dung beetles (Scarabaeidae). Of 4527 prey items identified in 287 pellets from NW Spain, majority were insects (Coleoptera during winter, spring and autumn, and Hymenoptera in summer); other arthropods included arachnids and millipedes (Diplopoda), and vertebrates included lizards, small passerines and small mammals; arthropods 15–20 mm long on average. In terms of energy content, contribution of vertebrates was higher than that of invertebrates in all seasons except autumn (invertebrates 67.3% in autumn, in other seasons vertebrates 60.7–78%); grasshoppers and crickets the main energy source among arthropods in all seasons. Most reptiles captured were lizards and, to lesser extent, skinks (*Chalcides striatus*) and small snakes; small mammals consisted of shrews (mainly *Crocidura russula*), mice (*Apodemus sylvaticus* and *Mus spretus*) and voles (*Microtus arvalis*, *Microtus agrestis* and *Microtus lustratus*). In study in France, 5409 prey items identified in 257 pellets; 63.7% of biomass consisted of insects, of which Coleoptera 26.6%, Lepidoptera 16.2%, Orthoptera 12.9% and Hymenoptera 4.7%; vertebrates formed 21% of total prey biomass. A sit-and-wait hunter. Utilizes variety of lookouts, such as bushes, barbed wire, fences and rocks; dives down to take prey on ground. Hovering seems to be used much less frequently (by nominate race, at least). Frequently impales prey items on thorns or barbed wire. In NW Spain (nominate race), 193 cached prey were mainly orthopterans and lizards, and hawthorn (*Crataegus monogyna*) and blackthorn (*Prunus spinosa*) were preferred as impaling sites; food cached mainly during non-breeding period, and most items were used within 9 days. In Israel, males of race *aucheri* create conspicuous caches of impaled prey; cache size reflects quality of male and his territory, thereby influencing mate selection.

Breeding. Laying from Jan in Israel, from Feb in Spain and N Africa, and mainly Mar–Jul elsewhere, but season Jan–Oct (mainly Mar–Jul) in Pakistan and India, and nestlings in Mar in Somalia; two broods common in some places, and three broods recorded locally (S Israel). Monogamous; occasional records of polygyny in Negev Desert, in Israel (presumably race *aucheri*). Breeds as territorial pairs. Nest built by both sexes, that of nominate race a rather untidy deep cup made from dry material such as twigs, grass, wool and similar, often incorporating green plants such as stoechas lavender (*Lavandula stoechas*), purple viper’s bugloss (*Echium plantagineum*) and others, similar in appearance to nest of Common Blackbird (*Turdus merula*), placed on branch or in fork or outer

twigs of tree or bush, generally a thorny bush or prickly tree (e.g. *Rubus*, *Quercus ilex* or *Quercus coccifera*), usually not high above ground, e.g. range 0.3–2.2 m in S France (Crau) and average height of 65 nests 1.1 m in NW Spain; other races also typically nest low in bush; territory size 10–100 ha. Clutch 2–7 eggs (mostly 4–6), laid one daily, pale blue-green with olive-brown spots; frequent replacements if previous clutch lost; incubation by female, fed on and off nest by male, period 14–18 days, mainly 17–18 days; chicks brooded by female, fed usually by both sexes, nestling period 16–19 days; in Israel and Spain, records of female, in reaction to nest disturbance, coaxing chicks out of nest and to a hiding place in ground nearby; juveniles fed by both parents, if male polygynous fed by female only (utilizing male's food larder), independent c. 34–40 days after fledging. First breeding at 1 year.

Movements. Mostly resident. Race *pallidirostris* a long-distance migrant, but some of its S populations strictly sedentary; regular migrants winter in S & SW parts of breeding range, but can reach E Sudan, Ethiopia, N Somalia and Eritrea, leave breeding grounds in Sept, returning Mar–Apr; vagrants recorded W to Britain and S to Borneo. Some desert races, and also nominate race in France, make regular small movements; nominate mainly resident, but dispersal by young can exceed 200 km.

Status and Conservation. Not assessed. Probably not globally threatened, but until recently treated as conspecific with *L. excubitor* and separate evaluation now required. Locally common to uncommon. Nominative race numbers c. 250,000 pairs in Iberian Peninsula (but apparently decreasing) and c. 1500 pairs in France; estimated population of *koenigi* in Canary Is 1000–1500 pairs; several thousand pairs in Israel, and 5000–10,000 pairs (*aucheri*) in United Arab Emirates. Fairly common in E & SE of range, but no details of numbers. Main threats are agricultural intensification, with increased use of pesticides and herbicides; cessation of sheep grazing may lead to invasion of scrub, leaving habitat unsuitable for this species.

Bibliography. Ali & Ripley (1987), Borrow & Demeey (2001), Brugiére (1996), Clement & Worfolk (1995), Cramp & Perrins (1993), de la Cruz & de Lope (1985), Degen *et al.* (1992), Eck (1990), Harris & Franklin (2000), Henry & Gazave (1998), Hernández (1993a, 1993b, 1993c, 1994a, 1994b, 1995a, 1995b, 1995c, 1995d, 1999a, 1999b, 1999c, 1999d), Hernández & Infante (2003, 2004), Hernández & Salgado (1993), Hernández, Campos *et al.* (2004), Hernández, Purroy & Salgado (1993), Infante (2002, 2004), Infante & Peris (2004), Isenmann & Lefranc (1994), Lefranc (1997, 1999a, 1999b), Lefranc & Worfolk (1997), Lepley, Guillaume *et al.* (2000), Lepley, Thévenot *et al.* (2004), Ma Ming (1993), Nogales *et al.* (1998), Panov (1995, 1996), Rasmussen & Anderton (2005b), Schön (1998a), Shirihai (1996), Telleria *et al.* (1999), Tenovuo & Varrel (1998), Thévenot *et al.* (2003), Vaurie (1955), Ward & Pinshow (1995a, 1995b), Yosef (1992a, 1992d, 1993a, 1993b, 1994a), Yosef & Pinshow (1988a, 1988b, 1989, 2005), Yosef *et al.* (1991).

17. Chinese Grey Shrike

Lanius sphenocercus

French: Pie-grièche géante **German:** Keilschwanzwürger **Spanish:** Alcaudón Chino
Other common names: Chinese Great Grey/Long-tailed Grey/Wedge-tailed/Large Chinese Shrike

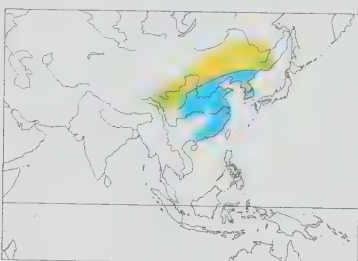
Taxonomy. *Lanius sphenocercus* Cabanis, 1873, “probably Canton”, China.

Forms a superspecies with *L. ludovicianus*, *L. excubitor* and *L. meridionalis*. Nominative race and *giganteus* sometimes thought possibly to represent two separate species on basis of differences in size, plumage and habitat, and alleged overlap in breeding ranges without interbreeding; evidence of sympatric breeding lacking, however, and further research required. Two subspecies currently recognized.

Subspecies and Distribution.

L. s. sphenocercus Cabanis, 1873 – breeds E Mongolia E to SE Russia (Amur region and S Ussuriland), NE & NC China (Nei Mongol, NE Liaoning, probably also Heilongjiang and Jilin, S to Gansu, Shaanxi and Shanxi), N & C Korean Peninsula; non-breeding mainly E & SE China and Korea.

L. s. giganteus Przevalski, 1887 – C China (C & E Qinghai, E Xizang, N & W Sichuan).



Descriptive notes. c. 29–31 cm; 85–100 g. The largest *Lanius* shrike, with strongly graduated tail (graduation 3–4.5 cm). Nominative race has black facial mask from lores back to rear ear-coverts, rather broad white supercilium extending anteriorly over base of bill; crown, nape and upperparts medium grey, scapulars white; upperwing black, flight-feathers and tertials edged and tipped white, large and distinctive white patch across base of primaries and secondaries (very obvious in flight); tail black, three outer feather pairs almost entirely white, next two pairs inwards broadly tipped white; throat and underparts off-white, occasionally

faint pinkish or buffy tinge on breast; iris brown; bill black, greyish base of lower mandible; legs black. Distinguished from similar *L. excubitor* mainly by larger size, longer and more markedly graduated tail, more white in wing and tail. Sexes similar in plumage, female possibly slightly bigger and heavier than male. Juvenile differs from adult in having ochre-tinged upperparts with faint barring, flight-feathers and wing-coverts fringed buff, whitish underparts with ochre tinge on breast, legs pale brownish. Race *giganteus* is larger and darker than nominate, wing significantly longer, crown and upperparts dark grey, no white on forehead and supercilium, less white in wing and tail, greyish (less white) below, juvenile darker than juvenile of nominate and with stronger ochre tinge (especially below). Voice. Not well known; combination of harsh notes and whistles, and generally considered similar to that of *L. excubitor*. Territorial calls described as loud repeated “tri-rii” “tree-leece” or “tsveet-tsveet”, with emphasis often on second, drawn-out note; these calls varied to “tschrii”, “riu”, “rleece” or “chreee”, and sometimes combined with soft warbles to form song. Harsh “check-cherr”, and “keee” or “tschee” as alarm (also during flight). A “churr-churr” has been noted in parent-offspring interactions.

Habitat. Nominative race in Amur region favours broad river valleys, pastures and cultivated areas dotted with bushes and small clumps of trees, and in China known to inhabit also open steppes, semi-deserts and foothills. During non-breeding season in S Korea typically found in or beside rice fields, and the few birds seen in Japan were on cultivated plains, around open woodland or on reclaimed land with grass and shrubs. Nominative race inhabits lowlands from sea-level to c. 200 m in Russia, but in China may breed at up to 1100 m, and in winter found even to 1800 m in NW of range (Nan Shan foothills). Race *giganteus* occurs at or above timber-line, usually in stunted vegetation stands such as rhododendron (*Rhododendron*) scrub; in Xizang a high-elevation bird, nesting at c. 3000–5200 m; descends to below 4000 m in non-breeding season.

Food and Feeding. Opportunistic feeder. Diverse range of prey consisting of arthropods (mainly insects) and small vertebrates, the latter forming significant component of diet (16% of 2813 prey items in detailed study in Amurland). Food spectrum seasonally variable. In summer chiefly in-

sects, combined totals of Coleoptera (carabid beetles comprising nearly half), Orthoptera (exclusively the mole-cricket *Grylotalpa africana*) and Hymenoptera (mainly wasps and ants) accounting for c. 95 % of all invertebrate prey, also some spiders taken; among vertebrates mammals (chiefly rodents) and birds (predominantly passerines) usually hunted, but also amphibians (frogs) and lizards. In winter the percentage of mammals in diet increases. Sit-and-wait foraging technique commonly used. Prefers exposed, relatively high (2–8 m, usually 4–6 m) lookout perches, from which it swoops on to prey. Most prey caught on ground or in low vegetation, sometimes in the air; slow-flying insects seized in flight, others and birds may be chased on the wing for up to 100 m. Often hovers in manner of a Common Kestrel (*Falco tinnunculus*) for 10–30 seconds at c. 5–6 m to 15–20 m, occasionally up to 30 m, above ground. Rarely, gleans items from foliage. During breeding, male and female hunt between 10 m and 400 m (usually 40–70 m) from nest. Wedged or impaled prey regularly kept in larders, and sometimes abandoned unused. During migration and possibly in winter, migrants occupy individual feeding territories of up to 100 ha.

Breeding. Data available only for nominate race in SE Russia. Laying from second half Apr (rarely from beginning of Apr) to early Jun, fledging mainly in Jun; one brood per season. Monogamous; territorial, territories of neighbouring pairs near L Khanka (S Ussuriland) 1–2.5 km apart. Nest an open cup of variable size, made from twigs, rootlets, dried grass stems and leaves, lined with fine grass, feathers, vegetable down, sometimes animal hair and/or man-made materials, placed usually 1.2–5 m above ground in fork of small broadleaf tree or bush; territory relatively small, 2.3–5.8 ha (mean of four pairs 3.9 ha). Clutch 5–9 eggs, mean 6.8 (for 19 nests), laid one daily, creamy or greyish-white, sometimes tinged greenish or bluish, with pale brown to reddish-brown or grey spots often concentrated at large end; replacement clutches not uncommon if previous one lost; incubation by female, fed by male, period 16–19 days, mostly 16–17 days; chicks fed by both sexes, nestling period c. 19–21 days; young dependent on adults for c. 2 months after leaving nest. In one study of 11 nests, 74 eggs were laid, of which 58 hatched (78.4 %) and 45 young fledged (60.8 %).

Movements. Race *giganteus* appears to be resident, undertaking only local and altitudinal movements. Nominative race is a partial migrant; winter quarters, partly overlapping with breeding range, lie mainly in E & SE China (S to Hong Kong and W to c. 105° E) and Korea; limited number of individuals overwinter in SE Russia. Little known about migration routes, but in autumn most appear to fly in S or SW direction; some arrive on non-breeding grounds as early as Jun–Jul, but most of those breeding in Ussuriland (Russia) depart between end Aug and Oct, small numbers moving through Korean Peninsula in Sept–Oct; in E China the species is said to be seen mainly between Aug and Nov (a few spring records) in Beidaihe area, Aug–Mar in Hebei, and from Dec to Mar in Nanjing (Jiangsu). Bulk of breeding population is back on nesting grounds in Mar. Accidental winter visitor to Japan.

Status and Conservation. Not globally threatened. Status considered insufficiently known. Probably uncommon to rare throughout range. Generally occurs at low densities, in SE Russia ranging from 0.11–0.34 pairs/km² in C Amurland to 0.4–1 pair/km² in plains near L Khanka. Population in Russian Ussuriland regarded as stable, despite some evidence from 1980s of local reduction in breeding range (R Bikin basin). In the demilitarized zone in S Korea several breeding pairs (adults and fledglings observed) found in 2002, occupying probably some of the last surviving unspoiled lowland habitats. Suspected that a couple of dozens of individuals overwinter in S Korea. Occurs in Xianghai Reserve, in NE China.

Bibliography. Anon. (2002), Baillic *et al.* (2004), Chen Fuguan *et al.* (1998), Cheng Tsohsin (1987), Dementiev *et al.* (1954b, 1968), Etchecopar & Hüe (1983), Gore & Won Pyong-Oh (1971), Harris & Franklin (2000), Lee Kisup (2002), Lefranc & Worfolk (1997), Lei Fumin *et al.* (2004), Liu Yang & Lei Jinyu (2005), Mikhailov *et al.* (1998), Nazarov (2004), Neehaev (1976), Panov (1973, 1983), Sokolow & Vietinghoff-Scheel (1992), Tomek (2002), Vaurie (1959), Vinter (1986, 1991), Vorobiev (1954), Winter (1987), Yan Chongwei & Xu Weishu (1996).

18. Grey-backed Fiscal

Lanius excubitorius

French: Pie-grièche à dos gris **German:** Graumantelwürger **Spanish:** Alcaudón Dorsigris

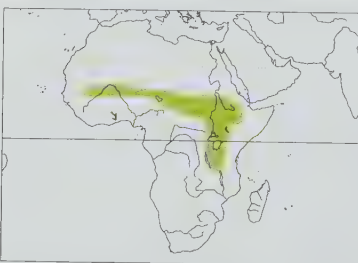
Taxonomy. *Lanius excubitorius* Prévost and Des Murs, 1847, Abyssinia and Nubia = White Nile. Forms a superspecies with *L. cabanisi*, and the two are sometimes united in subgenus *Neolanius*. Original description first used name “*excubitoroides*” but within the same publication authors altered this to “*excubitorius*”, in the mistaken belief that “*excubitoroides*” was preoccupied; as all falls technically within the original description, the emendation stands. Three subspecies recognized.

Subspecies and Distribution.

L. e. excubitorius Prévost & Des Murs, 1847 – Sahel zone of Mauritania and Mali, extreme NE Nigeria, N Cameroon, SW & SE Chad and N Central African Republic E to DR Congo, S (but not SW) Sudan and W Uganda.

L. e. intercedens Neumann, 1905 – C Ethiopia (S & W from L Tana), probably also extreme SE Sudan, S to NE Uganda and W Kenya (W of Elgeyo Escarpment).

L. e. boehmi Reichenow, 1902 – SC Uganda, extreme E DR Congo, E Rwanda, E Burundi, W Tanzania (L Victoria S patchily to L Malawi) and SW Kenya (E shores L Victoria).



Descriptive notes. 25–26 cm (nominate); male 47–63.5 g, female 46–59 g (Kenya). A large, robust shrike with long, graduated tail. Male nominate race has black forehead and lores meeting black facial mask from lores back to ear-coverts (and extending variably on to shoulder and wing), whitish supercilium; crown and nape to back grey, rump and uppertail-coverts whitish; upperwing black, very conspicuous and contrasting white patch towards base of primaries; tail black, feathers narrowly tipped white, all except central feather pair with basal half white; throat and underparts white; undertail white (most of basal half) and black; iris dark brown; bill black; legs blackish. Female is similar to male, but with dark chestnut-brown flanks (often not visible when wing closed). Juvenile has face mask brown from lores to ear-coverts, faint whitish supercilium (not always visible), top of head and upperparts greyish-brown, forehead to mantle and upper back finely barred blackish, rump and uppertail-coverts buff-white, also barred blackish, wings dark brown, white patch on primaries, upperwing-coverts slightly barred and edged buff, tertials variably tipped buff, tail dark brown with some white at base and tipped buff, underparts whitish, faintly barred on breast and flanks, bill brown.

Races differ mainly in size, darkness of upperparts and extent of white in tail: *intercedens* is larger than nominate, with longer tail, less black in tail; *boehmi* is smaller than previous but larger than nominate, has upperparts darker and more dusky grey than others. Voice. Appears to have about six different calls, consisting of harsh notes, noisy chattering, and rasping and shrill, jarring or scream-

ing notes. Two territorial calls (apparently initiated by dominant individual) are the threat call, metallic and monosyllable and sounding like “kyoir-l”, and the display call, which is like a duetting chorus uttered by defenders going for an intruder and sounds like “kyoir-l, kyoi, kyoooh”. Alarm, used also when an aerial predator close, is loud and harsh “krrr-krrr...” or “zzrit-zzzrit...”. Female (during courtship) and begging young give loud repeated “pssh”. Male often gives brief song while feeding mate and fledglings. Juvenile gives first adult-like song 75 days after fledging.

Habitat. Thorn-scrub and open acacia (*Acacia*) savanna; common in bushy and wooded grassland and open woodland, locally also entering gardens, parks, and even cultivated areas if sufficient medium-tall trees present. In study in SW Kenya (L Naivasha), breeding habitat consisted mainly of stands of yellow-barked acacia (*Acacia xanthophloea*) with understorey of perennial shrubs and Naivasha star grass (*Cynodon plectostachyus*); this type of habitat can provide high abundance of insects during dry season. Mainly in lowlands in W of range; in Kenya occurs at 1000–1900 m.

Food and Feeding. Arthropods, mainly large insects such as Lepidoptera (*Cossus* caterpillars), Hymenoptera (ants of genus *Dorylus*) and termites (Isoptera); also small vertebrates, including frogs and, occasionally, birds. Has been recorded as raiding nests of Red-billed Quelea (*Quelea quelea*). Lives in groups of up to c. 20 individuals, each of which forages alone in the group territory; at times, group-members gather at sites where food temporarily abundant, e.g. at ant swarms or at emergences of *Cossus* caterpillars from bases of acacias. Perches 2–4 m above ground on top or side of bush or tree, scanning area around; catches most prey on ground, and returns quickly to perch. Captures some insects in the air. Impales prey, and maintains caches.

Breeding. Season linked with rains and associated abundance of prey (particularly insects), usually follows rains: Feb–Mar in Mauritania and Mali, Apr–May and Aug in Sudan, and Apr and Jun in Ethiopia; in Uganda, Mar–Apr and Nov in N, May–Jul and Oct–Dec in NE and Dec–Feb in C & S; Jan, Jun–Aug and Nov in Tanzania S to EC Kenya, and attempted breeding in all months (mainly May–Nov) in SW Kenya; birds in breeding condition Apr in Cameroon and in all months in NE DR Congo. Gregarious, territorial and co-operative breeder; each group with one breeding pair, other members are helpers (males and females older than 6 months), helper females must leave natal group to attain breeding status, males appear to inherit breeding status. Mated pair separates from group, female solicits with wings drooped while making begging calls, male gives brief song during courtship feeding. Nest built by breeding female, breeding male helps with supplying of material; nest a compact cup of small sticks, twigs, grass stems, bark fibre and rootlets, mainly from acacia species, lined with fine grasses and small feathers, sometimes material from old nests reused for construction, placed 1–12 m up in thorn tree, usually on horizontal branch or in centre of tree; nest can remain empty for up to 2 weeks before egg-laying. Clutch 2–4 eggs, usually 3, variably creamy pink to olive-buff, with brown, red-brown and grey spots mainly at broad end; incubation by female, fed by male and helpers, period 13–15 days; chicks brooded by female, fed by all group-members, breeding pair providing most food, nestling period c. 20 days; young fed by all of group, totally dependent for 2 weeks after fledging, most remain in natal territory and become helpers in subsequent years.

Movements. Most populations probably resident. Regular local movements by some birds likely in W parts of range, where the species inhabits typical Sahel areas; in SE Mauritania and C Mali said to disappear or to be very rare during the rains, which suggests movements. Possibly locally migratory also in Sudan. Although earlier reports of migration to Rift Valley in Kenya considered unlikely, individuals have appeared in unexpected localities (e.g. Mau Narok, at 3000 m).

Status and Conservation. Not globally threatened. Fairly common to locally common; rare in W of range. Conservation status not properly assessed. In E range population probably stable, but surveys are recommended. Most habitats probably not under any immediate threat. Occurs in several protected areas, e.g. Murchison Falls National Park, in Uganda, and are in Serengeti National Park, in Tanzania.

Bibliography. Borrow & Demey (2001), Chapin (1954), Friedmann (1937), Fry *et al.* (2000), Gadow (1883), Hall & Moreau (1970), Harris & Franklin (2000), Lefranc & Worfolk (1997), Lewis & Pomeroy (1989), Moreau (1972), Nikolaus (1987), Olivier (1944), Stevenson & Fanshawe (2002), Zimmerman *et al.* (1996).

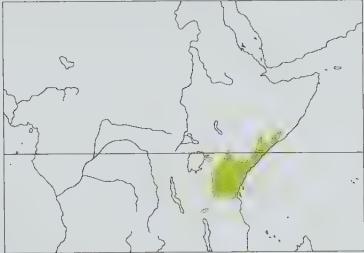
19. Long-tailed Fiscal
Lanius cabanisi

French: Pie-grièche à longue queue **Spanish:** Alcaudón Colilargo
German: Langschwanzwürger

Taxonomy. *Lanius cabanisi* E. J. O. Hartert, 1906, Mombasa, Kenya.

Forms a superspecies with *L. excubitorius*, and the two are sometimes united in subgenus *Neolanius*. Monotypic.

Distribution. S Somalia, S & SE Kenya (from E of L Victoria E to coast; occasional observations N of equator) and NE & S Tanzania (S to Kilosa and Dar es Salaam; outlying population Usanga Flats).



Descriptive notes. 26–30 cm; male 70–80 g, female 69 g. A large and robust shrike with very long, graduated tail and strong, heavy bill. Male has forehead, crown, nape and upper mantle dark blackish-brown, lores, ear-coverts and base of hindneck black (inconspicuous facial mask), mantle and upper back medium grey, becoming pale grey on lower back; rump and uppertail-coverts whitish, latter often with distinct barring at tips; upperwing dark brown, conspicuous white patch on primaries, in fresh plumage slightly tipped whitish on tertials and secondaries; tail dark brown, faint white tips when feathers fresh; throat and underparts white; iris dark brown; bill and legs black. Female is very similar to male, but has dark rufous patch on flanks. Juvenile has brownish-black face mask over lores, eye and ear-coverts, crown to lower back grey-brown, finely barred buff, rump and uppertail-coverts buffy white and heavily dark barred, primaries black with white patch, secondaries and wing-coverts edged buff, tail brownish-black, narrowly tipped buff, underparts whitish, dark barring on breast and upper belly, bill blackish grey-brown. **VOICE.** Very noisy; main calls often in chorus, harsh chattering scolding notes and whistles. Notes combined in repeated phrases given simultaneously by 2–6 members of group in duet and chorusing; chorus appears to be initiated by one bird with “cha-cha-raa”, to which another responds with “chit-er-row, chit-er-row”, both calling together. Commonly heard 3-note phrase combines harsh sounds with whistled endings, “zzreele-tzzrulu-tzzreele”. Other calls include low inhaled “chaak...”, “tzzzz”, cackling “ae-ae” and more musical repeated “kech-wa”; alarm a repeated harsh rasping “kerrr-kerrr-kerrr”; begging call a quavering nasal “naaa-aaaa...”. **Habitat.** Open dry habitats such as almost treeless savannas, in shrubby open woodland and cultivated patches. From sea-level near coast of Kenya to 1600 m at S & E edges of highlands.

Food and Feeding. Insects, mainly beetles (Coleoptera) and Orthoptera; regularly also small vertebrates such as lizards, snakes and young birds; will also eat fruit (*Salvadora persica*), and bread and cheese. Solitary or in small groups. Hunts from perch c. 2 m high, from where it dives to ground to capture most of its prey; some prey taken from foliage, but rarely takes aerial prey. Apparent mutualistic association with Red-billed Buffalo Weavers (*Bubalornis niger*) reported in Kenya (Tsavo), where the shrike benefited from the grasshoppers and other insects flushed at ground level by the foraging weavers, and the latter benefited from the shrike’s vigilance and alarm calls. Almost certainly impales prey and maintains food caches.

Breeding. Breeds May–Jun in Somalia, Jan–May, Aug–Oct and Dec in Kenya, and Jan and Jun in Tanzania. Despite close similarity to co-operatively breeding shrikes in visual and vocal displays, and gregarious gatherings, only single pair recorded at nests; each pair holds separate territory, and species congregates in evening in groups of 4–6 individuals. During displays very noisy and conspicuous, frequently waving long tail in all directions, and raising fanned tail over the back. Nest a large open cup made mainly from grass and rootlets, also small twigs and with spider web around the rim, lined with finer material, concealed on horizontal fork or sloping branch 2–3 m from ground in bush or dense tree. Clutch usually 3 eggs, occasionally 4, olive to creamy, variably blotched and spotted dark brown, yellow-brown and purple-brown, markings mainly around larger end; incubation period 13–14 days, nestling period 16–18 days, no information on roles of sexes.

Movements. Resident; wanderers sometimes appear slightly S of regular breeding range in Tanzania, suggesting some movements.

Status and Conservation. Not globally threatened. Generally common in relatively small range. This species’ habitat is probably not at any immediate risk, but survey recommended. Main threats are poisoning during avicide spraying of Red-billed Quelea (*Quelea quelea*) flocks. Kept in captivity, but any adverse effects of trade in this shrike not evaluated. Occurs in several protected areas, e.g. Nairobi National Park, in Kenya, and Tarangire and Mikumi National Parks, in Tanzania.

Bibliography. Brosset (1989), Friedmann (1937), Fry *et al.* (2000), Gadow (1883), Hall & Moreau (1970), Harris & Franklin (2000), Lefranc & Worfolk (1997), Lewis & Pomeroy (1989), Moreau (1972), Olivier (1944), Zimmerman *et al.* (1996).



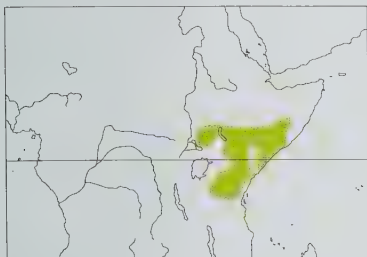
20. Taita Fiscal

Lanius dorsalis

French: Pie-grièche des Teita **German:** Taitawürger **Spanish:** Alcaudón de los Taita
Other common names: Teita Fiscal, Taita Fiscal Shrike

Taxonomy. *Lanius (Fiscus) dorsalis* Cabanis, 1878, Ndi, Teita, Kenya. Morphology, distribution and vocalizations suggest that this species' closest relative is *L. somalicus*. Monotypic.

Distribution. Extreme SE Sudan, S Ethiopia and S Somalia (except extreme S coastal zone) S to NE Uganda (Kidepo Valley S to Moroto), NE & E Kenya (absent SE coastal strip from Malindi S to Tanzanian border) and NE Tanzania (lowlands of Serengeti plains E to Kilimanjaro).



Descriptive notes. 21 cm; 45–55 g. A medium-sized black-and-white shrike with relatively short tail. Male has top and side of head to upper mantle black, and contrasting pale grey lower mantle, back and rump, whitish on uppertail-coverts, scapulars conspicuously white; upwing black, small white patch near base of primaries; tail black, with white edges and tips; throat and underparts pure white; iris dark brown; bill and legs black. Female resembles male, but at least sometimes has small rufous to chestnut streaks on flank, usually concealed by closed wing. Juvenile has blackish-brown facial mask from lores to ear-coverts, is

greyish-brown with fine black barring above, rump buffy with dark bars, wing feathers dark with pale buff edging and tips, tail brownish-black with whitish edges and tips, underparts dull whitish, bill pale grey-brown. Voice. Little known. Song described as repeated phrases with mix of short whistles, harsh buzzy calls, hollow sounds, and ticking and tinkling notes. Also buzzy notes and whistles combined with double sounds e.g. “tztuptzup”, “wokwok”, “kloplop” and “tudid”; also repeated harsh buzzy “bzzree-bzzree” notes and flute-like whistled calls. Alarm a harsh grating “churr”.

Habitat. Inhabits dry open bush, acacia (*Acacia*) woodland and other dry open woodland, from sea-level to at least 1600 m. Avoids highlands, subhumid and humid areas, as well as extremely arid and sparsely vegetated habitats; thus, ecologically segregated from *L. collaris*, *L. cabanisi* and *L. somalicus*.

Food and Feeding. Little known. Feeds mainly on invertebrates, especially grasshoppers (Orthoptera), beetles (Coleoptera), caterpillars and spiders (Araneae); also takes small vertebrates, including rodents, lizards and small snakes, and possibly also nestlings from Red-billed Quelea (*Quelea quelea*) colonies. Hunts from perches 2–6 m above ground, taking most prey on ground; occasionally gleans from vegetation, and takes aerial prey. Probably impales prey items, but confirmation required.

Breeding. Breeds in May in Somalia and in Jan and Jun in Tanzania; season in Kenya Mar–Jun and Dec–Jan, coinciding with rains. Monogamous; solitary nester, territorial. Nest a thick-walled open cup made from grass and twigs, generally placed in thorn bush or tree. Clutch 3–4 eggs, creamy to pale greyish, with brown and grey spots mostly around larger end. No other information.

Movements. Little known. Regarded as resident, but some local movements reported in Kenya, as well as possible post-breeding movement May–Jul in Somalia. Vagrants recorded W as far as Kericho (SW Kenya), where individual found in atypical moist habitat, and S to Dar es Salaam (Tanzania).

Status and Conservation. Not globally threatened. Widespread and common; less common in extreme S of range. Precise limits of distribution uncertain, especially in N. Population estimated at fewer than 100,000 breeding pairs; trends unknown. Conservation status hardly known, but probably not at any immediate risk. Occurs in several protected areas, including Buffalo Springs National Reserve and Shaba Game Reserve, in Kenya, and Serengeti National Park, in Tanzania.

Bibliography. Ash & Miskell (1998), Britton (1980), Brown & Britton (1980), Dowsett & Dowsett-Lemaire (1993), Friedmann (1937), Fry *et al.* (2000), Fuggles-Couchman & Elliot (1946), Hall & Moreau (1970), Harris, T. (1998), Harris, T. & Franklin (2000), Lack (1985), Lefranc & Worfolk (1997), Lewis & Pomeroy (1989), Mackworth-Præd & Grant (1960), Nikolaus (1987), Olivier (1944), Schmidt (1982), Short *et al.* (1990), Stevenson & Fanshawe (2002), Tomlinson (1950), Urban & Brown (1971), Zimmerman *et al.* (1996).

21. Somali Fiscal

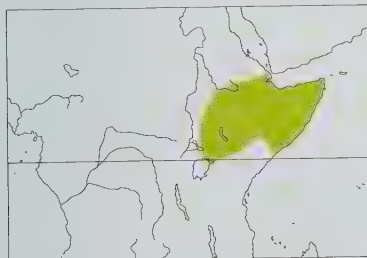
Lanius somalicus

French: Pie-grièche de Somalie **German:** Somaliwürger **Spanish:** Alcaudón Somali

Taxonomy. *Lanius somalicus* Hartlaub & Heuglin, 1859, Bender Gam, Ker-Singeli-Somals country, Red Sea, Somalia.

Morphology, distribution and vocalizations suggest that this species' closest relative is *L. dorsalis*. Monotypic.

Distribution. Extreme SE Sudan, Ethiopia (except N & W), Somalia (except SW) and NW Kenya (L. Turkana basin E to Marsabit).



Descriptive notes. 20–21 cm; 48–58 g. A medium-sized black-and-white shrike with relatively short tail. Male has top and side of head to upper mantle jet-black, lower-mantle and back pale grey, scapulars, rump and uppertail-coverts white; upwing black, large white patch near base of primaries, rather broad white tips on secondaries and tertiaries; tail black, outer two feather pairs almost wholly white, other rectrices except central pair tipped white; throat and underparts white; iris dark brown; bill and legs black. Differs from *L. dorsalis* in being slightly slimmer and in having more white in outer tail, wing, scapulars and rump. Female is very like male,

but axillaries brownish-grey (not black). Juvenile has dark brown facial mask from lores to ear-coverts,

top of head and upperparts greyish-brown with very fine darker vermiculations, rump buffish with dark barring, wings dark brown with broad buff edgings and tips, white primary patch, tail dark brown with white sides and tip, whitish below, breast and flanks vermiculated brown. Voice. Song described as a mix of initial atonal buzzes and rather musical short whistles, e.g. “bur-er-er...lit-it-it” or “tchechetcher-br-r-we-weet”. Calls “thring-thring”; alarm said to be a low churring note.

Habitat. Very arid and sparsely vegetated habitats: found in acacia (*Acacia*) short-grass savanna plains, open bushland (*Acacia-Commiphora*), semi-desert savanna with a few small bushes (*Acacia-Chrysopogon*), and sandy or stony almost pure desert. Where sympatric with *L. dorsalis* (e.g. in Kenya and S Ethiopia) prefers more arid habitats with less bush cover than those occupied by latter species. From sea-level to 2000 m in Ethiopia and Somalia; breeds only between 400 m and 1000 m in Kenya.

Food and Feeding. Feeds mainly on large arthropods such as beetles (Coleoptera), grasshoppers (Orthoptera) and mantises (Mantodea); also on small birds and, probably, other small vertebrates. Perches on exposed branches on top or side of trees and bushes, also utilizing artificial elevated features such as telephone wires. Dives down on to prey on ground. Impales prey and regularly maintains caches. Exoskeletal remains and pellets form characteristic litter under favourite bush.

Breeding. Season protracted, taking place during wettest months of year (when food likely to be more abundant); Nov–Feb and Apr–Jul in Somalia (laying earlier on coast than in interior), nests found in Mar, May–Aug and Nov in Ethiopia, and May–Nov in Kenya. Monogamous. Solitary nester; territorial, particularly aggressive near nest, and known to attack any species up to size of a raven (*Corvus*). Nest an open shallow cup made from thorn twigs, rootlets and silky fibrous materials, external diameter 11.4 cm, height 6.4 cm, internal diameter 6.4 cm, placed up to 2 m above ground (but generally lower) in small bush or in centre of thorn tree. Clutch 4 eggs, less often 3, mostly creamy but sometimes greenish-white, with pale brown spots and ash-grey underlying marks at either end. No other information.

Movements. Resident. Some possible local movements; two individuals found at Djibouti in Mar and, in S, wanderers recorded in Kenya (Baringo, Wamba, Merti and Isolo districts) as far S as N periphery of the highlands and sometimes in atypically moist areas.

Status and Conservation. Not globally threatened. Common in Somalia; uncommon to frequent in Ethiopia; uncommon and local in Kenya. Status in SE Sudan uncertain: rare or under-recorded in this area, and breeding not proved. This species seems to be frequent in much of its range, and is believed not to have declined to any significant extent in recent years. Habitat probably not threatened. Present in Awash National Park, in Ethiopia; present in half of the 24 Important Bird Areas (IBAs) in Somalia, in four out of 70 IBAs in Ethiopia and in only two IBAs in Kenya, although only some of these areas are totally or partially protected.

Bibliography. Archer & Godman (1961), Ash & Miskell (1983, 1998), Britton (1980), Brown & Britton (1980), Fishpool & Evans (2001), Friedmann (1937), Fry *et al.* (2000), Grasseau (2004), Hall & Moreau (1970), Harris & Franklin (2000), Lefranc & Worfolk (1997), Lewis & Pomeroy (1989), Mackworth-Præd & Grant (1960), Nikolaus (1987), Stevenson & Fanshawe (2002), Welch & Welch (1984), Zimmerman *et al.* (1996).

22. Mackinnon's Shrike

Lanius mackinnoni

French: Pie-grièche de Mackinnon **Spanish:** Alcaudón de Mackinnon

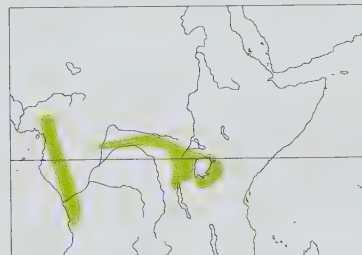
German: Mackinnonwürger

Other common names: Mackinnon's Fiscal/Grey Shrike

Taxonomy. *Lanius mackinnoni* Sharpe, 1891, Kikuyu (= Bugemaia, Kavirondo), Kenya.

Affiliations unclear; may be closely related to *L. collaris*. W populations named as geographical race *zenkerianus* (described from Younde, in S Cameroon), but considered inseparable from birds elsewhere in species' range. Monotypic.

Distribution. SE Nigeria (Obodu Plateau) and SW Cameroon S to S PR Congo and NW Angola (S at least as far as Quiculungo), and N DR Congo E to extreme W Kenya and S to SW Uganda, W Rwanda, Burundi and NW & N Tanzania.



Descriptive notes. 20–21 cm; 35.6–37 g. A fairly large pied shrike with rather long, graduated tail. Male has black facial mask from lores back to ear-coverts, contrasting white lower forehead and conspicuous supercilium; crown to nape and mantle sooty grey, back, rump and uppertail-coverts paler, scapulars contrastingly white; upwing black, tail black with broad white feather tips; white below, underparts variably washed pale buff; iris dark brown; bill and legs black. Female is similar to male, but has distinctive patch of chestnut on flanks (usually concealed). Juvenile has facial mask dark brown, supercilium whitish, top of head

and upperparts greyish-brown with narrow dark barring, whitish scapulars tipped buff, underparts whitish with variable buff wash and vermiculated brownish. Voice. Song a mix of hoarse “chruu” calls and intense and diverse notes like those of a warbler (Sylviidae), including much mimicry. Rest of repertoire consists of harsh sounds and prolonged whistles; alarm call a rough chatter or rattling “ra-a-a...”, “zik-zik...” or “k-k-k-k-k-k-k-k”, but reported also as a protracted whistle.

Habitat. Primarily savanna, and forest edges and clearings, locally also cultivations, secondary growth and open plantations; largely avoids dense forest. From almost sea-level, e.g. in Gabon, to up to 2200 m in mountain areas of Kenya and E DR Congo. Breeding range restricted to tropical rainy climate.

Food and Feeding. Mainly insects, particularly Orthoptera, beetles (Coleoptera), bugs (Hemiptera), winged termites (Isoptera), ants (Formicidae) and the like; small vertebrates taken regularly include geckos (Gekkonidae), frogs and small passerines. Hunts from prominent perch 2–5 m up, infrequently higher; takes prey mainly from ground, less often in air or from foliage. Follows ant swarms. Impales prey items, including small nestlings of other birds; maintains food caches.

Breeding. Breeds Sept–Apr in Cameroon, and elsewhere in W of range (e.g. Gabon) display, copulation and occupied nests observed between Aug and Apr, and fledglings being fed by adults at end of May (Angola); in E range breeds Feb–Aug, centred on long rain (with peaks before and at start of rains); two broods apparently regular. Nest a rather bulky open cup made from coarse dry grass,

On following pages: 23. Common Fiscal (*Lanius collaris*); 24. Newton's Fiscal (*Lanius newtoni*); 25. Uhehe Fiscal (*Lanius marwitszi*); 26. Woodchat Shrike (*Lanius senator*); 27. Masked Shrike (*Lanius nubicus*); 28. Yellow-billed Shrike (*Corvinella corvina*); 29. Magpie Shrike (*Corvinella melanoleuca*); 30. Southern White-crowned Shrike (*Eurocephalus anguitimens*); 31. Northern White-crowned Shrike (*Eurocephalus ruppelli*).

bark shreds and plant stalks, lined with finer fibres, placed 1–3 m above ground in thorny bush or small tree; territory size 1–6 ha, depending on preponderance of bushes. Clutch 2 eggs, sometimes 3, buffish, with yellowish-brown, purple and grey spots and speckles; incubation possibly by both sexes; no information on duration of incubation and nesting periods.

Movements. Resident; juveniles probably undertake local movements.

Status and Conservation. Not globally threatened. Poorly known, with relatively little information on status. Locally not uncommon in W of range; locally common to uncommon in E. Effects of deforestation on this species not known, but possibly beneficial in producing additional secondary growth suitable for this shrike.

Bibliography. Borrow & Demei (2001), Chapin (1954), Dean (2000), Fry *et al.* (2000), Hall & Moreau (1970), Harris & Franklin (2000), Lefranc & Worfolk (1997), Lewis & Pomeroy (1989), Zimmerman *et al.* (1996).

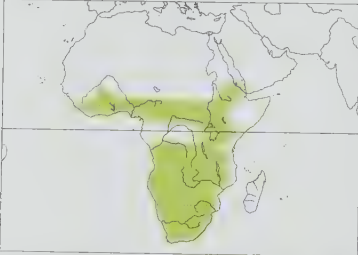
23. Common Fiscal

Lanius collaris

French: Pie-grièche fiscale **German:** Fiskalwürger **Spanish:** Alcaudón Fiscal
Other common names: (Common) Fiscal Shrike, Long-tailed Pied Shrike; Latakoo/South-west African Fiscal (*subcoronatus*)

Taxonomy. *Lanius collaris* Linnaeus, 1766, Cape of Good Hope, South Africa. Forms a superspecies with *L. newtoni* and *L. marwizi*, and all three formerly treated as conspecific. Differences between N races and S races in juvenile plumage, extent of sexual plumage dimorphism, visual displays, and possibly vocalizations suggest that two different species may be involved; further study required, especially involving molecular genetics; possible vocal differences appear minimal and perhaps local. Races intergrade in many areas, making taxonomic and geographical delimitation of forms sometimes uncertain. Race *aridicolus* closely allied to and often merged with *subcoronatus*, but geographically isolated in coastal dunes of Namib region. Other proposed races are *predator* (from near Ingwavuma, in NE KwaZulu-Natal), most often subsumed in nominate but sometimes considered a synonym of *pyrrhostictus*; *vigilans* (from near Kloof, in E Natal), synonymized with nominate; and *dominator* (from Muchinga Range, in SC Zambia), merged with *capelli*. Seven subspecies currently recognized.

Subspecies and Distribution.
L. c. smithii (Fraser, 1843) – S Mauritania (rare), S Mali (rare) and from S Guinea, Sierra Leone and Liberia E to Central African Republic, N PR Congo, SW Sudan and W Uganda.
L. c. humeralis Stanley, 1814 – C Eritrea, C & S Ethiopia, SE Sudan, E Uganda, W Kenya, Tanzania, N Malawi and N Mozambique; probably also NE Zambia.
L. c. capelli (Bocage, 1879) – S Gabon and S PR Congo E to S DR Congo, extreme SW Uganda, Rwanda and Burundi, and S to Angola (except S), Zambia and N Botswana, possibly also extreme SW Tanzania and extreme NE Namibia.
L. c. aridicolus Clancey, 1955 – SW Angola and NW Namibia (dune-fog zone of Namib Desert).
L. c. subcoronatus A. Smith, 1841 – extreme SE Angola, Namibia (excluding coastal NW and extreme S), Botswana, SW Zimbabwe and N South Africa (S to NW Northern Cape and C Free State).
L. c. pyrrhostictus Holub & Pelzeln, 1882 – extreme NE Botswana (around Basuto), S Zimbabwe (S of Harare), NE & E South Africa (Limpopo and Mpumalanga) and SW Mozambique (almost restricted to Gaza province).
L. c. collaris Linnaeus, 1766 – extreme S Namibia, S, C & E South Africa, Swaziland, Lesotho and extreme S Mozambique (Maputo).



Descriptive notes. 21–23 cm; 25–58 g. A medium-large black-and-white shrike with long, thin, graduated tail. Male nominate race has top and side of head to mantle and back black, prominent white scapulars (can be fluffed up or concealed), grey rump and uppertail-coverts; upperwing black, white patch near base of primaries (white scapulars and primary patch prominent in flight); tail black, outermost feather pair almost completely white; underparts greyish-white to grey, often whiter on chin and throat and again from central belly to undertail-coverts, breast to belly faintly vermiculated with pale greyish, underside of

flight-feathers shiny dark slate; iris dark brown; bill and legs black. Female is usually duller than male, often with some rufous on flanks. Juvenile has dark brown facial mask from lores to ear-coverts, dull brownish-grey above, finely to heavily barred buffy, scapulars buffy to brownish-white with blackish margins, wings dark brown, buffy tips on tertials and coverts, buff-white below, vermiculated greyish-brown (bars more widely spaced and less definite on belly and slightly rufous flanks), bill dark with pinkish base. Races differ mainly in intensity of colour on upperparts, presence or absence of white supercilium, freckling on breast, degree of sexual dimorphism and amount of white in tail (subpopulations of nominate exhibit significant differences along an altitudinal gradient in morphological features, skeletal characters and physiology, with largest in cooler and less humid areas): *subcoronatus* is similar to nominate but with narrow white supercilium, whitish uppertail-coverts, female has distinct chestnut flank patch; *aridicolus* is paler and greyer above than previous, more white in tail, underparts purer silky white; *humeralis* has dull black upperparts and dull white underparts, outer tail feathers completely white, chestnut flank patch of female generally well marked, juvenile more rufous and with dense blackish barring; *pyrrhostictus* is similar to previous, but upperparts slightly greyer, underparts tinged grey, female with chestnut patch on flank; *capelli* also is similar to *humeralis*, but extent of white on tail variable. Outer rectrices often black at base, chestnut flank patch of female greatly reduced or absent; *smithii* has glossy black upperparts with bluish gloss, grey rump, underparts clear white, female's rufous flank patch small or lacking, juvenile has rufous-brown upperparts barred dark. **VOICE.** Song, by both sexes throughout year, variable, consists of a full-throated, disjointed medley of short clear whistles, unmusical trills and warbles, and imitations of other birds, interspersed with harsh grating notes, also 3 low buzzing notes followed by 4 double whistles, as “zzzz-zzzz-zzzz tiss-weeo, tiss-weeo, tiss-weeo” (attraction call a variant of this); juvenile starts to produce discordant warbling subsong a few days after leaving nest. Female utters “naaa” call to solicit copulation. Alarm a loud grating “ghreee, ghreee, ghreee”; territorial call, used also as alarm and part of song, a discordant “djaaaa-djaaaa” or “djaaaa-dju”. Nestlings beg with insistent rasping “cheee, cheee” and give screeching alarm calls.

Habitat. Open areas with short grass and scattered shrubs, including woodland and open savanna, often with acacias (*Acacia*), also semi-desert, coastal thickets, bushy margins of marshes, as well as miombo (*Brachystegia*) shrubland with scattered trees. Relatively scarce in arid woodland and alpine grasslands. Has adapted to wide variety of artificial habitats, e.g. common around edges of

plantations, farms, around urban gardens and parks, and along roadsides with telephone lines and fences. Also in recently burnt or overgrazed wooded savanna grassland, forest clearings and well-cleared land. From near sea-level (race *aridicolus*) to up to 3350 m; at least in E Africa, generally more common in highlands than at lower elevations.

Food and Feeding. Wide food spectrum includes mainly invertebrates, fewer vertebrates; occasionally seeds. Invertebrates include, among others, crickets, grasshoppers and locusts (Orthoptera), mantids (Mantodea), beetles (Coleoptera), butterflies and moths (Lepidoptera), damselflies (Zygoptera), termites (Isoptera) and ants (Formicidae), spiders (Araneae), millipedes (Diplopoda) and snails (*Achatina zebra* and *Natalina*). Vertebrate prey recorded include e.g. small frogs and tadpoles, reptiles (snakes, skinks, chameleons and other lizards), small rodents, birds (adults, fledglings and nestlings) and bats, including Cape serotine (*Eptesicus capensis*) and Kuhl's pipistrelle (*Pipistrellus kuhli*). Prey up to 18 cm long recorded. Occasionally takes seeds, and observed to take food scraps from dog bowls. Sit-and-wait predator, hunting from conspicuous perch 1–10 m above ground. Usually seizes prey from ground, but occasionally hawks insects in air, gleans insects from foliage, or hovers above prey on ground; will also plunge-dive to catch tadpoles, and has been reported as scavenging food items. Small prey usually consumed on the ground. Larger items more often carried to perch, where the shrike kills its victim by crushing it in the bill or beating it hard against perch. Large prey sometimes held in one foot torn apart with the bill, or impaled on thorn, wood splinter, flowerhead spike or barbed wire. Impaled items may accumulate in larders (regularly recorded in Ghana and Kenya, less in S of range).

Breeding. Breeds mainly in rainy season when food abundant (especially in relatively arid areas), mostly Feb–Aug in W Africa, Aug–Nov in Angola, Apr–Jul in NE Africa, and in most months in E Africa; in S of range, Aug–Jan in Namibia, May–Dec in Botswana, Apr and Jun–Jan in Zimbabwe; and in South Africa, May and Jul–Dec in Western Cape, Apr and Jul–Jan in Eastern Cape, Jun–Jan in KwaZulu-Natal; often two or three broods. Monogamous; solitary, territorial nester. Nest built by both sexes, a deep, bulky, thick-walled cup made from wide range of materials, including twigs, grass, leafy herbs, flowerheads, bark fibres, moss, spider webs and cocoons, feathers, and artificial material (e.g. string, pieces of paper, rags), lined with rootlets, woolly plant down and fine grass inflorescences, mean external diameter 13 cm, height 9.5 cm, internal diameter 7.5 cm and depth 5 cm; placed mostly 0.6–6 m (exceptionally to 15 m, average 3 m) above ground in small, often thorny tree or shrub, occasionally on man-made structure; nest sometimes used for successive broods. Clutch 1–4 (exceptionally 6) eggs, pale cream to greenish, with brown, grey and dull yellow-olive spots mainly in ring around larger end; incubation by female, occasionally assisted by male, from last or penultimate egg, period 12–16.5 days, normally 14–15 days; sometimes marked size disparity among siblings, chicks brooded by female, fed by both sexes, nestling period usually 17–21 days; fledglings independent c. 5–7 weeks after leaving nest, remain in parental territory for up to c. 7 months. Nests parasitized by Jacobin Cuckoo (*Clamator jacobinus*), Diederik Cuckoo (*Chrysococcyx caprius*) and African Cuckoo (*Cuculus gularis*), possibly also by Red-chested Cuckoo (*Cuculus solitarius*) but evidence inadequate. Eggs sometimes preyed on by common egg-eating snake (*Dasypeltis scabra*); tropical nest fly (*Passeromyia heterochaeta*) causes myiasis in nestlings, which is sometimes fatal.

Movements. Mainly resident and sedentary throughout most of range. No large-scale movements reported, but some degree of local movement may occur. Partial migrant in driest parts of range; in Botswana predominantly a winter visitor. Occasional appearance of *subcoronatus* in E South Africa (near Pretoria and Johannesburg).

Status and Conservation. Not globally threatened. Common to abundant in most of range; locally uncommon, and rare in extreme NW parts. Has become more numerous as a result of urban settlement and development. Common bird in residential suburbs and even city centres in E Africa, with densities up to 5.4 pairs/10 ha. Has spread in S Africa into open areas where overhead lines and wires provide lookout perches; low reporting rates in Transkei and Lesotho, however, indicate a certain degree of sensitivity to different types of land use.

Bibliography. Borrow & Demei (2001), Bruderer (1991), Chapin (1954), Cooper (1971a, 1971b), Dean (2000), Devereux *et al.* (2000a, 2000b), Dowsett & Dowsett-Lemaire (1993), Fry *et al.* (2000), Hall & Moreau (1970), Harris, T. (1998), Harris, T. & Arnott (1988), Harris, T. & Franklin (2000), Herremans (1994), Herrmann (2004), Hockey *et al.* (2005), Holub & Pelzeln (1882), Kopij (1999, 2004a, 2005), Lefranc & Worfolk (1997), Little & Bainbridge (1992), Lowther (2007), Macdonald (1980), Maclean (1993), Markus (1972), Marshall & Cooper (1969), Ottow & Duve (1965), Parker (1997a), Schwan & Hikes (1979), Soobramoney *et al.* (2004a, 2004b, 2005), Tarboton (2001), Taylor (1949), Zack & Ligon (1985a, 1985b).

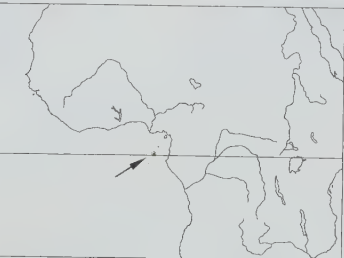
24. Newton's Fiscal

Lanius newtoni

French: Pie-grièche de Sao Tomé **Spanish:** Alcaudón de Santo Tomé
German: Sao-Tomé-Würger
Other common names: São Tomé Fiscal

Taxonomy. *Lanius (Fiscus) Newtoni* Bocage, 1891, São Tomé. Forms a superspecies with *L. collaris* and *L. marwizi*, and all three formerly treated as conspecific. Monotypic.

Distribution. Island of São Tomé, in Gulf of Guinea.



Descriptive notes. 19–21 cm; one female 22.4 g. A medium-sized pied shrike with longish, graduated tail; comparatively small and weak bill with very small hook at tip of upper mandible. Has top and side of head black (glossy at side), upperparts glossy black, scapulars yellowish; upperwing glossy black, tertials distinctly white-tipped, very small white patch on primaries (sometimes lacking); tail black, three outer pairs of rectrices edged white towards tips; throat and underparts white (museum specimens), but on at least some live individuals pale yellow or washed yellowish; iris dark brown; bill black; legs dark brown or black.

Distinguished from very similar *L. collaris* by yellowish underparts (when present), less white in tail, smaller bill, often lack of white primary patch. Sexes apparently similar. Juvenile is poorly known, apparently brown and narrowly barred above, tawny-yellow to orangey with fine vermiculations below, bill horn-brown (not black). **VOICE.** Little information available. Supposed territorial call a loud, rather nasal repeated “juurt-juurt-juurt...” or “tuurt-tuurt...”; or a series of far-carrying well-separated fluted “tiu” notes repeated several times. Presumed alarm a rapidly delivered, harsh, rasping “kerkerkerkerker...” or “kikikikikiki...” and quickly repeated harsh “tzk” or “tsink”.

Habitat. Undisturbed lowland and middle-altitude primary rainforest, mainly under closed canopy, with little or no undergrowth. Most observations have been made in virgin forest below c. 700 m, with some exceptional records from 1060 m. The only true forest-dwelling member of the genus.

Food and Feeding. Little information. Insectivorous, seems to feed on small beetles (Coleoptera) and flying insects. Believed not to prey on small vertebrates (bill too small and weak). Apparently a species of the middle to lower storey, and curiously difficult to see. Most individuals observed were skulking in low bushes, sometimes more in the open; one individual recorded as foraging on boulders in a stream, another as taking small beetles from the ground; one pair observed 5 m below canopy in dense primary forest.

Breeding. Little information. Singing heard in Dec–Jan and Aug; two males in breeding condition in Nov–Dec, and two females showing traces of juvenile plumage in same months. Observation of different pairs and family groups suggests that it is monogamous. No other information.

Movements. Presumably sedentary.

Status and Conservation. CRITICALLY ENDANGERED. Restricted-range species: present in São Tomé EBA. Rare. First discovered in 1888, and 13 specimens collected in 1928; thereafter, not seen again for more than 60 years and was assumed to have become extinct. In 1990, however, a single individual was located in SW part of São Tomé, near the source of R Xufexufe; since mid-1990s has been seen with some regularity, mostly in Xufexufe catchment, but total population thought probably to number fewer than 50 individuals. Reasons for this species' rarity not known but, unlike its congeners, it inhabits forest, much of which on São Tomé has been damaged or destroyed. During Portuguese administration of the island most of the cleared areas were used for growing cocoa and coffee; in more recent years, however, land privatization has resulted in a huge increase in number of small farms, and consequent removal of large numbers of trees. Possible effects of any introduced predators, such as black rat (*Rattus rattus*) and mona monkey (*Cercopithecus mona*), on the shrike's population require investigation.

Bibliography. Anon. (2007m), Atkinson, Dutton *et al.* (1994), Atkinson, Peet & Alexander (1991), Borrow & Demei (2001), Butchart & Stattersfield (2004), Christy & Clarke (1998), Collar & Stuart (1985), Collar *et al.* (1994), Harris & Arnott (1988), Harris & Franklin (2000), Hirschfeld (2007), Jones & Tye (2006), Lefranc & Worfolk (1997), de Naurois (1994), Peet & Atkinson (1994), Sargeant (1994), Stattersfield & Capper (2000).

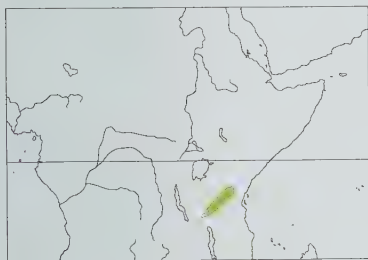
25. Uhehe Fiscal

Lanius marwitszi

French: Pie-grièche de Tanzanie **German:** Reichenowwürger **Spanish:** Alcaudón Tanzano
Other common names: Uhehe Shrike

Taxonomy. *Lanius marwitszi* Reichenow, 1901, Ngomingi, Uhehe (Iringa District), Tanzania. Forms a superspecies with *L. collaris* and *L. newtoni*, and all three formerly treated as conspecific. Inhabits highland areas, thus ecologically segregated from *L. collaris* and apparently not interbreeding with it (and very little intergradation with local race *humeralis* of latter), but intermediates sometimes mentioned; further morphological and genetic study required. Monotypic.

Distribution. Highlands from NE to SC Tanzania (Mpwawpa and Ukagurus S to Njombe, Mt Rungwe and Tukuyu).



Descriptive notes. 20–23 cm. A medium-sized, slim, pied shrike with relatively long and graduated tail. Male has distinct white supercilium covering upper lores and merging into white frontal band above bill; crown and nape to back dull black, prominently white scapulars, dark grey rump and uppertail-coverts; upperside dull black, small white patch near base of primaries; tail black, outer pair of feathers almost entirely white, others except central pair with white spots at tip; throat and underparts off-white, sometimes buffish wash, undertail wholly white; iris dark brown; bill and legs black. Sexes probably similar, female

seems always to lack rufous patch on flank (present in *L. collaris*). Juvenile has traces of whitish supercilium, is dark brownish-grey above, finely to heavily barred buffish, rump slightly lighter in colour, scapulars buffy to brownish-white, wings dark brown, buffy tips on tertials and coverts, underparts buffy white and heavily barred greyish-brown, bill dark with pink base. Voice. Hardly known; apparently rather silent. Supposed to be similar to that of *L. collaris*.

Habitat. Bush and savanna country, grassland, clearings and farms; above 1500 m, to at least 2900 m. Perhaps generally in more natural habitats than those occupied by *L. collaris*.

Food and Feeding. No details. Probably mainly invertebrates.

Breeding. No information.

Movements. No information, but local altitudinal movements appear possible.

Status and Conservation. Not globally threatened. Restricted-range species: present in Tanzania–Malawi Mountains EBA. Very poorly known species. Seems to be locally common. Estimated population fewer than 10,000 breeding pairs. Trends and conservation status not known. Further study on taxonomy and conservation status needed.

Bibliography. Britton (1980), Friedmann & Loveridge (1937), Fry *et al.* (2000), Hall & Moreau (1970), Harris, T. (1998), Harris, T. & Franklin (2000), Lefranc & Worfolk (1997), Mackworth-Præd & Grant (1960), Stevenson & Fanshawe (2002).

26. Woodchat Shrike

Lanius senator

French: Pie-grièche à tête rousse **German:** Rotkopfwürger **Spanish:** Alcaudón Común
Other common names: Woodchat; Eastern Woodchat Shrike (*niloticus*)

Taxonomy. *Lanius Senator* Linnaeus, 1758, “Indiis”; error = Rhine valley, Germany. Geographical variation partly clinal, amount of white at tail base increasing from W to E. Validity of race *rutilans* has been questioned; possibly better merged with nominate. Proposed race *hensii* (from Sicily) synonymized with nominate. Four subspecies generally recognized.

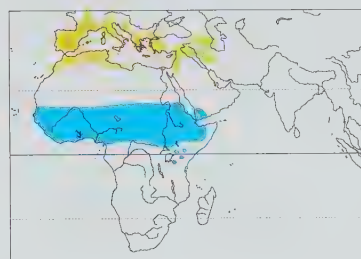
Subspecies and Distribution.

L. s. senator Linnaeus, 1758 – breeds patchily from N Spain and C & S France (mainly Languedoc–Roussillon and Côte d’Azur) E to Sicily and Greece (including Corfu, Crete and most bigger islands in Aegean Sea), coastal Balkans E to S Bulgaria and W Turkey, and also locally and irregularly in Switzerland, SW Germany (upper Rhine Valley, foothills of Swabian Mts, Saarland), SE Poland and SW Slovakia; non-breeding W & C Africa.

L. s. rutilans Temminck, 1839 – breeds Iberian Peninsula (except N Spain) and NW Africa, from Moroccan Atlantic coast E to NW & NE Libya, S to S slopes of Anti-Atlas and Middle and High Atlas; non-breeding W Africa.

L. s. badius Hartlaub, 1854 – breeds islands in W Mediterranean (Balearics, Capraia, Corsica, Sardinia); non-breeding W Africa.

L. s. niloticus (Bonaparte, 1853) – breeds Cyprus, S & E Turkey, Levant and N Iraq (Kurdistan) E to Iran (Zagros Mts; possibly also SE to Baluchistan and in Elburz Mts); non-breeding E Africa and SW Arabia.



Descriptive notes. 18–19 cm; 21–59 g. A medium-sized, rather bulky-looking shrike with distinctive plumage pattern. Male nominate race has black forehead and facial mask to ear-coverts and rear neck side, short whitish supercilium (often inconspicuous); crown to upper mantle rufous, scapulars white, lower mantle and back black, rump and uppertail-coverts white; upperside dark brown, broad white patch near base of primaries; tail black, all except central feather pair tipped white, outermost pair white with some black basally on inner web (occasionally wholly white); throat and underparts white, in fresh plumage

a creamy-buff wash on underparts; iris brown or dark brown; bill black; legs blackish. Female is duller than male, white patch over bill extends back to eye. Juvenile has lores mixed brown and whitish, ear-coverts brownish, forehead to back rufous-buff (becoming greyish) with dark brown and white barring, scapulars whitish, rump pale rufous-buff with dark barring, wing patch buff, wing-coverts edged light buffish, outer rectrices buff-white, underparts whitish with grey-brown crescent markings, bill dark grey, flesh-grey lower mandible. Race *rutilans* is smaller than nominate; *badius* differs distinctly from nominate in having narrower black forehead, only vestigial white area on base of primaries (often hidden); *niloticus* has white of rump extending well on to tail base, white primary patch distinctly broader than in nominate. Voice. Contact calls described as “kwikwik” or “pitquür”, and alarm as “geg”, “tschek” or harsher “kreck”, often in long series; in conflicts between males a long and strong “drirdr” uttered, of similar function is a soft “grüg”; in aggression very quickly repeated “tr-tr-tr-tr-trtrtr...” sounds. Song a continuous warble with mixture of harsh notes and sparsely interspersed imitations of other birds’ songs, and once a European tree-frog (*Hyla arborea*) imitated; in contrast to congeners, song believed to have also some territorial function; female also sings, sometimes in synchrony with male song to form duets.

Habitat. Generally in semi-open areas with bushes and well-spaced trees, such as open woodland, old orchards, olive (*Olea*) groves, gardens, and parks or hedgerows with large thorny bushes; in SE extending to edge of steppe and desert. Open pine (*Pinus*) forest preferred in Greece. In many areas occurs commonly in cultivated country with trees; in N of range a typical bird of old traditional orchards, particularly when sheep or cattle present. Three habitat elements necessary: shrub-like or arboreal cover, open ground offering rich supply of large insects, and perches with commanding view of area. Normally below 1000 m, but in N Israel (Mt Hermon) breeding proved at 1650 m, and in Spain and NW Africa favours holm oak (*Quercus ilex*) and cork oak (*Quercus suber*) to at least 2000 m, although only to 1500 m in Pyrenees. In African winter quarters, found in dry acacia (*Acacia*) savanna, but structure of these light woodlands often resembles that of traditional orchards inhabited in breeding area.

Food and Feeding. Almost exclusively insectivorous, with preference mostly for larger insects such as beetles (of families Carabidae and Scarabaeidae), Orthoptera and caterpillars, also spiders (Araneae); average body length of prey 15.7 mm. Small vertebrates such as lizards, small mammals and birds only occasionally caught. Total of 518 prey items from Georgia consisted of 69 invertebrate species: of these, 159 items from adults (May–Jun) comprised 44.6% beetles, 32.7% Orthoptera, 17.6% Hymenoptera (of which 10.7% ants), 1.9% arachnids and 1.3% snails; 359 prey items from nestlings in same area and at same time comprised 52.9% Orthoptera, 18.4% Hymenoptera (18.1% ants), 17.3% beetles, 8.1% snails, 2% arachnids and 1.1% Hemiptera. Perches on exposed lookout, from which it drops or glides down on to ground prey or makes sallying flights after aerial insects. Impaling of prey recorded only seldom.

Breeding. Laying early May to end Jun in C Europe, earlier, from Apr, in N Africa and from Mar in Israel; two broods usually in S (N Africa and Israel), but exceptional in Europe. Monogamous. Solitary and territorial; nests sometimes more clustered, but tendency to form groups less pronounced than in *L. minor*. Nest built by both sexes, a compact open cup made from twigs and roots and other plant material (including green), lined with rootlets, hair, wool, moss, lichen and spider web, placed mostly on lateral branch of tree, often fruit tree or oak, pine or poplar (*Populus*), 1–20 m above ground but mainly low (mean 4–5 m in C Europe), and in Mediterranean region often low down in dense bush; looks very much like nest of *L. minor* but is stronger, not so loosely built, and generally closer to ground; average territory size 8 ha in SW Germany, 1.5 ha in Georgia. Clutch 4–8 eggs, mean 4.9 in C Europe, 7-egg clutches much more frequent (34%) in Armenia (race *niloticus*) than in W Europe (1–5%), pale green to olive-green, sandy or greyish-yellow, more rarely reddish-yellow or brown, with brown to pale olive speckles concentrated in circle at broad end; replacements (smaller than first clutches) frequent to mid-Jul; incubation by female, fed on nest by male, period 14–16 days; chicks brooded by female, fed by both sexes, nestling period normally 15–18 days, but from 12 days onwards chicks sometimes jump from nest if disturbed; juveniles fed by parents for up to c. 6 weeks after fledging. Breeding success relatively low: of 553 eggs monitored in 112 nests in C Europe, 68.9% hatched, 53.8% reached 7–9 days, and estimated 42% produced fledged young.

Movements. Migratory, wintering in vast belt of sub-Saharan Africa N of equator, and in small numbers in S Arabia. Races have different winter quarters: nominate found from S Mauritania E to Darfur region of Sudan, S to NE DR Congo and Uganda; *niloticus* occurs from Sudan E to Eritrea and SW Arabia; *badius* appears to be confined mainly to S part of W Africa, and *rutilans* probably likewise. Leaves European breeding grounds mostly second half Aug or beginning Sept, adults before juveniles, movement probably on broad front in S to SW direction; arrives in non-breeding quarters Aug–Oct, mainly Sept. Departure from winter quarters protracted, Feb–May; passage of nominate race through Mediterranean area late Mar to early Jun, with main arrival on N breeding grounds around beginning May; E race *niloticus* appears in Israel between end Jan and mid-Feb, much earlier than nominate (which represents c. 10% of country’s total numbers). Some W populations may make loop migration, as recorded more frequently and in larger numbers in E Mediterranean in spring than in autumn. Annual vagrant NW to Britain and Ireland, especially May–Jun; rare in Norway and Sweden.

Status and Conservation. Not globally threatened. Locally common; rare in N parts of range. Majority of European population inhabits Mediterranean region, where Iberian Peninsula may hold over 600,000 breeding pairs, representing more than 70% of total European population. Decreasing trends reported in most of Europe, and now very local or extinct in N & C Europe (Germany,

Poland, Czech Republic, Slovakia, Hungary, Austria, etc.), where last breeding confirmed in 1980s–1990s or where insignificant remnant populations remain. Range contraction towards SW & SE combined with decline in numbers in most European countries evidently part of longer-term trend apparent since middle of 19th century and especially 1970–1980; numbers also decreased during that time in strongholds of France and Spain; in 19th century breeding occurred in old parks in centre of Paris, and in middle of 20th century still bred in cemeteries in Slovakian towns and villages. Protected in most countries; in some listed as “highly endangered”, in others regarded as “vulnerable” or “endangered”. Loss and degradation of habitat through agricultural intensification, afforestation, and large fires are main threats. Traditional management of pastoral woodland, old orchards and Mediterranean scrub, reduced use of insecticides and the prevention of hunting are among the required conservation measures.

Bibliography. Andrews (1995), Baumgart (1995), Becker & Nottbohm (1976), Bernard & Fremillon (1984), Bersuder & Koenig (1995), Bezzel *et al.* (2005), Bonaccorsi & Isenmann (1994), Castan (1960), Chappuis (1970), Clancey (1948), Clement (1995), Cramp & Perrins (1993), Dementiev *et al.* (1954b, 1968), Dvorak *et al.* (1993), Ferguson-Lees (1965), Flint & Stewart (1992), Hafler (1993b), Harris & Franklin (2000), Hernández (1993a, 1993b, 1993d, 1994b), Herroelen (1987), Hirschfeld (1995), Inbar (1995), Isenmann & Fradet (1995), Jennings (1981), Kauscák & Snajdar (1977), Kowalski (1993), Kren (2000), Lefranc (1993), Lefranc & Worfolk (1997), Lefranc *et al.* (1989), Moskát & Fuisz (2002), Panov (1983), Patrikeev (2004), Petrov & Gusev (1967), Richardson, C. (1990), Ristow (1971), Roselaar (1995), Schaub (1996a, 1996b), Schreurs (1936), Scott *et al.* (1975), Shirihai (1996), Stauber & Ullrich (1970), Stepanyan (2003), Thévenot *et al.* (2003), Tucker & Heath (1994), Ullrich (1971, 1987a, 1987b, 1993), Vaurie (1955, 1959), Yeatman-Berthelot (1995), Zimmerman *et al.* (1996), Zink (1975).

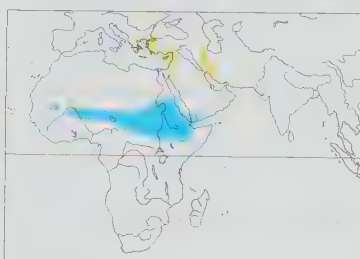
27. Masked Shrike

Lanius nubicus

French: Pie-grièche masquée **German:** Maskenwürger **Spanish:** Alcaudón Nubico
Other common names: Nubian Shrike

Taxonomy. *Lanius nubicus* M. H. C. Lichtenstein, 1823, Nubia. Affiliations uncertain, possibly related to some Palearctic brown shrikes and some African fiscal shrikes. Monotypic.

Distribution. Breeds from Balkan Peninsula and Asia Minor S to Levant, including Cyprus, also in N Iraq and W Iran (Zagros Mts); range limits uncertain, possibly includes S Turkmenistan and NW Afghanistan. Non-breeding in sub-Saharan Africa and SW Arabia.



Descriptive notes. 17–18.5 cm; 14.5–30 g (usually c. 20–23 g). Distinctive smallish, rather slim shrike with small bill and proportionately very long and narrow tail. Male has white on forehead and extending behind eye as prominent white supercilium; crown, ear-coverts and nape to upperparts, upperwing and tail glossy black; scapulars white, large white patch at base of primaries, outer two pairs of rectrices almost wholly white; throat, neck sides and underparts white, contrasting orange on breast and flanks; iris brown or dark brown; bill black, palate light pink; legs black or dark brown. Female is similar to male but duller,

dark colour on head dark grey to brownish-black or dull black, orange colour below less intense, bill rather dark brown or plumbeous black. Juvenile is grey-brown above and off-white below, heavily vermiculated all over, with large white primary patch, lacks contrasting head pattern of adults, thus facial mask brown, lower forehead and supercilium whitish; first-winter similar to female but lacks rufous below, bill and legs greyer. Voice. Similar to that of congeners. Calls include short repeated harsh “tsr” or “tztz”, “krret” and “shek” combined with clearer whistles; alarm rattling sounds such as “krrrr” or “krrrt”, sometimes extended to disyllabic “krrrr-krrrr”; repeated hoarse “khir” note and low “rad” also recorded. Begging calls of juveniles range from “scirp-scirp...” to a more churring “skerr-skerr...”. Song rather soft and short compared with those of congeners, and without mimicry, but full of warbles and chatters, somewhat reminiscent of song elements of *Hippoboscidae* warblers. Bill-snapping recorded.

Habitat. Favours natural open woodland with bushes and glades, and fond of big isolated trees. Nests in variety of light deciduous (predominantly), coniferous and mixed forests; also in maquis and maquis-like vegetation. Usually absent from open areas or those near human habitation, but occurs locally in cultivated land dotted with old trees, citrus and olive (*Olea*) groves, orchards, small fields with tall hedges and many trees, vineyards, gardens, and poplar (*Populus*) plantations. Usually in more densely vegetated habitat than other shrikes breeding within same range. Lowland and hilly country, mostly below 1000 m; on some well-exposed mountain slopes can be found at up to 1500 m (Mt Hermon, in N Israel), 1800 m (Zagros Mts, in W Iran), and even to 2000 m (Aladag, in E Turkey). During migration and on African non-breeding grounds, again prefers areas with rather high tree cover; typical habitat in NE Africa is hot acacia (*Acacia*) country, but found also in riverine woodland, Sahel thorn-scrub near streams, and sometimes in open, relatively tall introduced eucalypt (*Eucalyptus*) plantations. Recorded also in gardens and in holiday resorts well provided with trees, especially on passage.

Food and Feeding. Main prey insects; other arthropods and small vertebrates also taken. Among insects, it prefers Orthoptera species, including crickets (Gryllidae) and especially bush-crickets (Tettigoniidae) and grasshoppers (Acrididae), and also beetles (Coleoptera); other insects recorded as prey include dragonflies (Odonata), moths (Lepidoptera, including caterpillars) and ants (Formicidae). During Jun–Jul, consumes large numbers of the bush-cricket *Poecilimon thoracicus* in S Bulgaria. Small vertebrates such as lizards and small passerines (including nestlings) taken occasionally; exhausted migrant birds, e.g. Lesser Whitethroat (*Sylvia curruca*) and even a Little Swift (*Apus affinis*), occasionally caught while on passage. Sit-and-wait foraging technique commonly employed, using less exposed lookouts than those preferred by other shrikes; hunting perches mostly branches of trees or bushes, usually 3–8 m (range 1–15 m) above ground. Dives to ground to capture prey; sometimes catches flying insects, pursuing them in manner of a flycatcher (Muscicapidae), less frequently gleans items from foliage; may hover briefly before taking prey from ground or foliage. Can be quite confiding, taking prey at a human observer’s feet or even closely following a gardener and taking flushed insects. Regularly impales prey.

Breeding. Laying early Apr to mid-Jun, with peak in most areas during first half May, replacement clutches Jun–Jul; starts c. 1 month later in mountainous areas than in those near sea-level (Cyprus, Turkey); two broods probably normal in at least part of range. Monogamous. Solitary, territorial breeder; sometimes loose concentrations locally in favourable habitats, and sometimes pairs quite close together, e.g. two nests 40 m apart in open downy oak (*Quercus pubescens*) forest in S Bulgaria. Nest built by both sexes, sometimes male more active than female; a relatively small open

cup (mean dry weight of 12 nests 20.4 g) very carefully constructed from rootlets, twigs, plant down, plant stems and moss, lined with wool, hair or man-made materials, decorated externally with lichen (more or less camouflaged), placed usually 0.95–12 m above ground (mean 6.5 m for 29 nests in S Bulgaria) against trunk in fork or on lateral branch of tree, sometimes in dense (often thorny) bush; territory appears to be small, under 1 ha to 5 ha. Clutch 3–7 eggs (rarely 8), mostly 4–6; variable, creamy to pale buff or yellowish (rarely white or greenish-grey), brown blotches in ring towards broad end and large pale and dark grey underlying; replacement clutches frequent; incubation by female, period 14–16 days; chicks fed by both parents, often shaded by female during hottest part of day, nestling period 18–20 days; fledglings dependent on adults and fed for at least 3–4 weeks after leaving nest. Breeds in first year.

Movements. Migratory. Most spend non-breeding season in sub-Saharan Africa (particularly in NE part of continent) S to S parts of Sudan and Ethiopia (rarely, S to Kenya and L Edward, near equator) and W to E Mali; winter range extends E to extreme SW Arabian Peninsula, and a few occasionally overwinter in Persian Gulf area. Passage mainly through E Mediterranean at both seasons; much more common in spring (Mar–Apr) than in autumn in e.g. Egypt, Jordan and Israel, suggesting loop migration (or difference in conspicuousness because of overflying in autumn). Autumn migration can start as early as Jun, but this mainly local post-breeding dispersal prior to main departure; leaves Balkan countries second half Aug, continuing until Sept; main migration recorded Aug–Sept, when common in Iraq, Israel, Arabia and Egypt; reaches winter quarters Aug–Nov (peak Sept–Oct). Leaves wintering grounds usually from Feb onwards, with passage through Arabian Peninsula Feb–May (peak Apr) and Egypt Mar–Apr; most birds back in breeding territories in Apr, but arrival very protracted and not reaching extreme NW of breeding range (S Bulgaria and S Macedonia) until beginning of May (exceptional record from end Feb in SW Bulgaria). On migration tends to congregate (perhaps more so than other migrating shrikes), and concentrations can occur; in Israel more than 100 occasionally recorded on peak days at favoured staging sites (five or more individuals on one bush). Defends very small (less than 0.5 ha) temporary (a few hours or days) territories at migration stopovers; in general, these held for shorter duration on spring migration than in autumn.

Status and Conservation. Not globally threatened. Uncommon and local, provisionally evaluated as declining in Europe, but to large extent insufficiently known. Densities of up to 6 pairs/1.9 ha recorded in riverine poplar plantation, Turkey, holding up to 90,000 breeding pairs, possibly has majority of world population. About 3000–4000 pairs thought to occur in some of the Balkan countries, the bulk in Bulgaria and Greece; reassessed estimation for Cyprus gives population of 4000–10,000 breeding pairs. Few data for Middle East; population in Israel in 1970s and 1980s estimated at a few thousand pairs. Possible slight increase suspected in Bulgaria (where species may have been overlooked for long time) and Macedonia. Declining in Greece and Turkey; widespread decline in Israel in 1950s and 1960s apparently due to pesticides. In non-breeding range status unknown; formerly not uncommon in Somalia, now rare. Protected in most countries, in some listed as “rare”. In Europe main probable cause of declining trends is degradation of favoured diverse habitats; during migration suffers from shooting in Turkey, Middle East and Africa. Locally subject to persecution on breeding grounds in Greece and Syria, as considered a bird of ill omen. Has recently started to occupy plantations, which have replaced natural woodland, and this adaptation may be of long-term conservation benefit to this species.

Bibliography. Baillie *et al.* (2004), Burfield & van Bommel (2004), Cramp & Perrins (1993), Curry-Lindahl (1975), Hagemeijer & Blair (1997), Handrinos & Akriotis (1997), Harris & Franklin (2000), Inbar (1995), Kumerloev (1961), Lefranc & Worfolk (1997), Makatsch (1950, 1976), Matvejev (1976), Morgan & Shirihai (1997), Moskát & Fuisz (2002), Nankinov (2001), Nikolov (2006), Panov (1983), Paz (1987), Scott *et al.* (1975), Shirihai (1996), Snow & Perrins (1998), Svensson *et al.* (1999), Tucker & Heath (1994), Ullrich (2002), Vatev *et al.* (1980), Vaurie (1959), Velevski (2001), Yosef (1998), Yosef & Tryjanowski (2002).

Genus CORVINELLA Lesson, 1831

28. Yellow-billed Shrike

Corvinella corvina

French: Corvinelle à bec jaune **German:** Gelbschnabelwürger **Spanish:** Alcaudón Piquigualdo
Other common names: (Western) Long-tailed Shrike(!)

Taxonomy. *Lanius corvinus* Shaw, 1809, no locality = Senegal.

Treated as congeneric with *C. melanoleuca* on basis mainly of similarities in morphology (e.g. long tail), vocal communication patterns, and social behaviour (co-operative breeding, gregariousness). Races intergrade, and intermediate individuals exist. Race *caliginosa* sometimes merged with *affinis*. Proposed race *chapini* (from Kavirondo, in Kenya) synonymized with *affinis*. Four subspecies recognized.

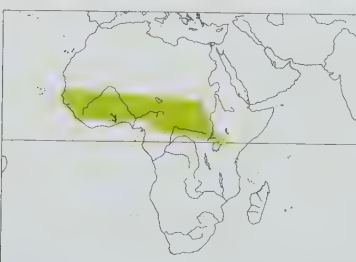
Subspecies and Distribution.

C. c. corvina (Shaw, 1809) – extreme S Mauritania, Senegal and Gambia S to Guinea-Bissau and N Guinea, E to Burkina Faso, SW Niger and NW Nigeria.

C. c. togoensis Neumann, 1900 – S part of range from W Guinea and Sierra Leone E to C & E Nigeria, N Cameroon, Central African Republic, S Chad and W & S Sudan.

C. c. caliginosa Friedmann & Bowen, 1933 – S Bahr el Ghazal (SW Sudan).

C. c. affinis Hartlaub, 1857 – S Sudan, NE DR Congo, N Uganda and W Kenya.



Descriptive notes. 30–32 cm; 58–80 g. Large shrike with very long, graduated (graduation c. 6–8.5 cm) tail and distinctive yellow bill. Male nominate race has dark brown facial mask over lores, eye and ear-coverts, broad pale buff supercilium; upperparts fawn-brown, broadly streaked black, scapulars light buff with black subterminal bar; upperwing blackish-brown, very conspicuous orange-buff patch c. 5.5 cm long at base of primaries (striking in flight), secondaries, tertiaries and greater wing-coverts with buff edges and tips; central tail dark brown with buffy tips, other rectrices become progressively paler buffy brown towards outer

tail; washed pale buffish below, narrowly streaked and barred blackish (mainly on lower throat and chest), rufous to cinnamon patch on flanks (usually concealed by closed wing); iris dark brown; bill yellow to deep yellow; legs dark green. Female is very like male, but flank patch maroon in

colour. Juvenile is similar to adult, but upperparts and underside notably barred, primary patch duller, sexes distinguishable at 11–12 weeks by colour on flanks. Races differ mainly in tone of upperparts and degree of streaking: *togoensis* is very like nominate but more heavily streaked above; *affinis* is distinctly more greyish-brown than nominate, with orange-buff primary patch smaller; *caliginosa* is very like previous, but slightly greyer and slightly more streaked. VOICE. Calls with noisy chatters, often uttered in series and simultaneously by mates (duets), or by several group-members; sometimes mimics other birds. Calls generally similar to those of *C. melanoleuca* but less sonorous; described also as reminiscent of Common Starling (*Sturnus vulgaris*). Combination of whistles, buzzes, and rasping “kzzzzkzzzz” sounds and a loud repeated “scis-scis”, “schiss-schiss” or “zrrretzrrret”; in flight “squee” notes given, sometimes terminating in chattering noise starting with “dreee-too”, “breeeu” or “ksseuu”. Most whistles quite loud, audible at up to 200 m. In breeding season repeated rapid “twee-dl-ooo” and “tlueet-tlueet” during displays; also a phrase transliterated as “may we, may we wait, may we...” or similar versions. Alarm “twe-kik...wee-tik-kik” or rasping “kzzzz-kzzzz-kzzzz”. Female beg from mate or helpers with harsh repeated notes.

Habitat. Mostly acacia (*Acacia*) savanna, but also well-wooded parks, open woodland and gardens. Breeds in dry steppe climate of Sahel; less arid areas inhabited in soudanian zone; woodland stands, e.g. *Pterocarpus lucens* in Mali, also occupied. In W Kenya, occurs at 500–1000 m in arid or semi-arid country; also at up to 2200 m in areas with more than 1000 mm rainfall.

Food and Feeding. Wide variety of insects, preferring mostly larger species such as grasshoppers and crickets (Orthoptera) and beetles (Coleoptera), but also large ants (Formicidae), termites (Isoptera), green mantids (Mantidae); spiders (Araneae), slugs, worms and caterpillars also caught. Small vertebrates such as frogs, lizards and, rarely, fledglings of passerines such as waxbills (*Uraeginthus*) occasionally eaten. Most prey caught on ground by swooping from perch or pouncing after low, short flight over a feeding area. During adverse weather, forages also on ground and by turning over litter, even pulling worms from earth in manner typical of Common Blackbird (*Turdus merula*).

Breeding. Season varies geographically; during Sahel rains from end Jun to Aug in Senegal, Jul–Oct farther S in Gambia, in most months in Ghana and Nigeria, in Jan–Feb and Apr in Kenya; locally two or three broods. Monogamous. Co-operative territorial breeder, 18 breeding groups studied in Ghana had average of 12 members (range 6–25); only one breeding pair per group, all other members are helpers (mostly progeny of breeding pair) and these defend territory, warn against predators and feed incubating or brooding female, as well as nestlings and fledglings. Nest built by breeding pair, helped by some group-members, work taking 1–4 weeks to complete, a large open cup loosely constructed from twigs, grass and sometimes leaves, lined with finer grass stems and rootlets, placed 1.5–10 m above ground (60% of nests at 3–6 m) in tree or bush and generally well concealed in foliage; in Ghana 20 tree species used (115 nests), the most frequent *Fagara zanthoxyloides* and *Bambusa vulgaris* (23% each); territory 10.5–27 ha. Clutch 2–6 eggs, usually 3–4, creamy to reddish or greenish with grey and yellowish-brown spots; replacement clutches frequent; incubation by breeding female, fed on nest by male and helpers, period 15–18 days; chicks brooded by female, fed by male and helpers (which deliver food to female), nestling period 18–20 days; young leave nest when still unable to fly, are fed by all group-members, become independent c. 45–50 days after hatching. Nests parasitized rarely (one of 160 nests) by African Cuckoo (*Cuculus gularis*) in Ghana. Breeding success relatively low, 25% in Ghana; 57% of 366 eggs hatched, most clutches lost during rainstorms and high winds, and only 44% of 159 nestlings fledged. Age of first breeding not known, but no young hatched during a six-year study had yet begun to breed.

Movements. Resident and partial migrant. All movements are on local scale, involving modest shift of range S in dry season. In S Mauritania reportedly migratory, and flocks of up to 150–200 individuals observed. S populations appear to be less migratory; a population studied for several years at Legon, in Ghana, was strictly resident, and this appears to be the case for all those inhabiting the Accra plains.

Status and Conservation. Not globally threatened. Locally common. Has a large range, with estimated global extent of occurrence of 3,500,000 km², and total population size believed to be large. Global trends not quantified, but populations appear to be stable. Reduction in use of agricultural pesticides and the conservation of semi-open habitats with dispersed traditional farming would probably be the most effective conservation measure to guarantee this species’ future.

Bibliography. Baillie *et al.* (2004), Borrow & Deme (2001), Brown & Britton (1980), Chapin (1954), Fry *et al.* (2000), Grimes (1975, 1979a, 1979b, 1980, 2006), Hall & Moreau (1970), Harris & Franklin (2000), Lefranc (1993), Lefranc & Worfolk (1997), Morel & Morel (1990), Nikolaus (1987), Skoracki & Sikora (2003), Zimmernan *et al.* (1996).

29. Magpie Shrike

Corvinella melanoleuca

French: Corvinelle noir et blanc **German:** Elsterwürger **Spanish:** Alcaudón Pío
Other common names: (Eastern) Long-tailed Shrike(!)

Taxonomy. *Lanius melanoleucus* Jardine, 1831, Orange River, South Africa. Sometimes placed in a monotypic genus, *Orolestes*, because of distinctive plumage coloration and pattern. Treated as congeneric with *C. corvina* on basis mainly of similarities in morphology (e.g. long tail), vocal communication patterns, and social behaviour (co-operative breeding, gregariousness). Race *angolensis* sometimes synonymized with nominate, as more rarely is *expressa*. Four subspecies recognized.

Subspecies and Distribution.

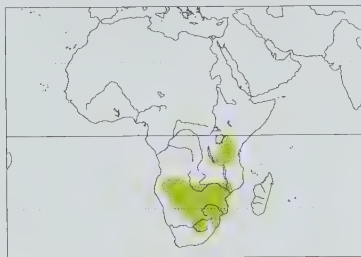
C. m. aequatorialis (Reichenow, 1887) – SW Kenya (E Masai Mara Game Park) and Tanzania (from SE L Victoria E to S slopes of Mt Kilimanjaro, S to SE L Tanganyika and SW to N L Malawi).

C. m. angolensis (Meise, 1958) – SW Angola and NE Namibia (NE of Namib Desert).

C. m. melanoleuca (Jardine, 1831) – S Zambia, Zimbabwe (except SE), Botswana (except large parts of Kalahari) and N South Africa.

C. m. expressa (Clancey, 1961) – SE Malawi, SE Zimbabwe and NW & C Mozambique S to NE South Africa (Kruger NP and NE KwaZulu-Natal) and E Swaziland.

Descriptive notes. 34.5–50 cm, including tail (male 22.5–35 cm, female 21.5–34 cm); male 55–97 g, female 71–96 g (*melanoleuca*). A large black-and-white shrike with an exceptionally long, strongly graduated tail. Male nominate race has head and mantle glossy black, extensively white scapulars and sometimes primaries and some greater upperwing-coverts white-tipped, large white patch near base of primaries (very prominent in flight); tail black; chin and throat to chest black with dark brownish gloss, belly and flanks black and less glossy, undertail-coverts black; iris brown; bill and legs black. Female is similar to male, but with large white patch on flanks, possibly even more extensive when breeding. Immature has black areas of adult replaced by dark brown without gloss, graduated tail up to same length as adult’s but dark brownish-black with buff tips (fledgling’s tail shorter), feather tips on mantle rufous-brown, scapulars whitish and tipped buff, rump buffy grey, wing-coverts and remiges with buff tips, underparts dark brown with whitish feather tips (giving barred impres-



sion), variable amount of buffy white on flanks. Races differ mainly in size: *aequatorialis* has much shorter tail (up to 26 cm), also deeper black on chin to breast, smaller white tips on secondaries and tertials; *angolensis* has shorter tail, supposedly not exceeding 28 cm; *expressa* is smaller, has shorter wing, remiges with larger white tips, rump greyish (rather than whitish). VOICE. Noisy, with large variety of sounds reflecting complex social organization. Territorial calls various loud, repeated whistles e.g. “teeloo-teeloo”, first note higher than following one, resembling “needle boom needle boom” or “come here come here”; breeding pair calls in duet, “teeloo” by male and higher-pitched “tleeu” by female. Scolding “chack” or “tchzzrrr” alarm used for ground predators, more intense and prolonged as nest-site approached; alarm call for aerial predator shorter. Begging call of breeding female repeated “tzeew”, becoming louder and more frequent as group-member approaches nest; begging call of young similar.

Habitat. Mainly savanna woodlands and open park-like savanna with scattered acacia (*Acacia*) growth and short-grazed grass or bare-ground patches; also broadleaf woodland and mopane (*Colophospermum*) habitat. At SW limit in Botswana most common in moist areas, river valleys and vleis, always with acacia trees, but also in semi-desert habitat. Found locally in town parks (South Africa) and suburbs (Zimbabwe). Mostly in lowlands; at N limit in Kenya found at up to 1800 m.

Food and Feeding. Feeds mainly on arthropods. Observed prey items ants (Formicidae), termites (Isoptera), grasshoppers (Orthoptera), mantises (Mantodea), millipedes (Diplopoda) and large grubs; also lizards, mice, fresh and rotting meat and fruit. Stomach contents consisted mainly of grasshoppers and beetles (Coleoptera). Once observed to catch and partly eat a Bronze Mannikin (*Lonchura cucullata*), but in general birds seem a very rare food source. Nestling diet insects, lizards and rodents. Scans for prey from top and outer branches of small trees and bushes, also from artificial perches such as telephone wires and fences. Usually catches prey by dropping down on to it from perch, or by grasping or plunging on item after a low flight of sometimes more than 20 m; prey occasionally caught in air. Other catching techniques are hopping around on ground to disturb prey, and gleaning items from leaves and branches. Usually forages solitarily, but group-members often attracted to food source of foraging individual; feeds gregariously on ground on ants and termites when these emerge in large numbers.

Breeding. Season largely coincides with rainy season, in S (nominate race) from Aug to Mar (Oct–Mar in Zambia, mainly Oct–Nov in Zimbabwe and N South Africa, Nov–Feb in Botswana) and Jan–Apr in E Africa (*aequatorialis*); two broods probably common. Probably monogamous. Gregarious and regularly co-operative territorial breeder, group size varying from two (breeding pair only) to eleven during breeding season (in austral winter up to 19); social organization little known, probably one breeding pair within a group, seemingly breeding female dominant; in one study group home range estimated at 23 ha and 32 ha in one area and average of 22 ha in another, in a second study 70 ha. Nest built by breeding pair, but one study suggests probably one or more helpers also involved; a compact cup made from twigs, fibres, rootlets and grass, also artificial material if available, lined with finer material but with ragged exterior, placed 1.5–12 m (average c. 4 m) above ground in thorny tree, especially acacia; breeding territory of c. 3 ha around nest. Clutch 1–6 eggs, usually 3–5, buff to yellow with brown and grey spots; replacement clutches frequent; incubation by breeding female only, fed by male and apparently also by certain other members of group, period 16–20 days; hatching usually asynchronous, chicks brooded by female, fed by parents and by at least one helper (probably more), young of first brood known to feed nestlings of second brood, nestling period 19–24 days; young start to forage for themselves in second week after fledging, but fed by adults at decreasing rate for up to 8 weeks after leaving nest. Breeding success variable: in one study a pair made seven breeding attempts, of which two successful; success per pair (at least one nestling leaving nest during breeding season) 85%, at least 2:1 fledglings per pair; fledging success per nest (at least one nestling leaving nest) 47%, fledging success per egg 31%; some nest failures caused by strong winds and possibly by human disturbance, also suspected nest predation by crows (Corvidae), monkeys and raptors.

Movements. Mainly resident. In dry season regular movements suspected near borders of range in N Namibia and C Zambia; rare (non-)breeding visitor in S Malawi. Moves temporarily into areas cleared by fires. Possible movements by individuals leaving group towards start of breeding season.

Status and Conservation. Not globally threatened. Uncommon to locally very common. Disappears or decreases in areas severely modified by man. Indications of decline in some areas, e.g. SW Kenya (only few pairs remaining in E Masai Mara Game Park). Seems generally not to adapt well to man-made habitats, but in Zimbabwe several groups have for long bred in suburbs of Bulawayo.

Bibliography. Baillie *et al.* (2004), Clancey (1964), Dean (2000), Dowsett *et al.* (2008), Fry *et al.* (2000), Grimes (1976, 2002), Hall & Moreau (1970), Harris & Arnott (1988), Harris & Franklin (2000), Hockey *et al.* (2005), Kopij (2005), Lefranc & Worfolk (1997), Lepage (2008), Lewis & Pomeroy (1989), du Plessis *et al.* (1995), Zimmermann *et al.* (1996).

Genus EUROCEPHALUS A. Smith, 1836

30. Southern White-crowned Shrike

Eurocephalus anguitimens

French: Eurocéphale à couronne blanche **Spanish:** Alcaudón Coroniblanco
German: Weißscheitelwürger
Other common names: (Smith’s) White-crowned Shrike

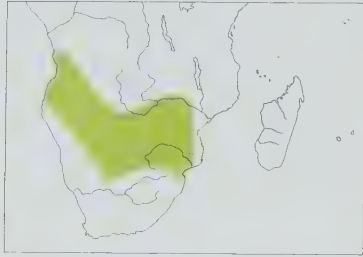
Taxonomy. *Eurocephalus anguitimens* A. Smith, 1836, “between Latakoo and the Tropic” = northern South Africa.

Genus formerly included with the helmet-shrikes (Prionopidae), which were at the time treated as a subfamily of Malaconotidae; recent studies, however, suggest that it belongs with Laniidae. Forms a superspecies with *E. ruppelli*. Two subspecies recognized.

Subspecies and Distribution.

E. a. anguitimens A. Smith, 1836 – SW & S Angola and N & NE Namibia E to Botswana (except SW), extreme S Zambia, C plateau of Zimbabwe, and N South Africa (W Limpopo Province).

E. a. niveus Clancey, 1965 – SE Zimbabwe and adjacent SW Mozambique S to NE South Africa (E Limpopo S to extreme N KwaZulu-Natal) and NE Swaziland.



Descriptive notes. 24 cm; 51–70 g. A large stocky shrike with relatively short tail. N nominate race has forehead, crown and nape white, black line from lores passing just through and below eye and linking with large sooty black patch over ear-coverts, rear side of throat and side of nape, often sooty brown on ear-coverts and sides of neck; upperparts, including scapulars, ashy brown; upperwing dark brown, all flight-feathers narrowly fringed and tipped pale, wing-coverts slightly less dark than remiges; tail dark brown, feathers very narrowly tipped and fringed pale when fresh; chin and throat to central belly off-white, tinged buff on upper

breast, both lower belly and lower flanks and vent ashy brown, undertail-coverts grey-brown; iris dark brown; bill black; legs dark brown. Sexes similar. Juvenile is similar to adult, but with greyer crown mottled and faintly barred, wing feathers edged and tipped buffish, underparts washed ashy brown, bill paler, legs greyish. Race *niveus* is very like nominate, but paler on mantle and scapulars. Voice. Repertoire diverse and complex. Calls generally loud, with some harsh and strident squeaks and squawks, some with nasal quality. Territorial calls probably started by dominant male with “kaekaew” (sounding like a toy trumpet), to which others respond in chorus with diversity of calls including stuttering and bleating “k-k-k-kaev”, “skwee-kwee-kwee”, “kaeeer”, and “chuk” or “chut” calls. Threat call a low “krrr”; alarm noisy, one bird uttering loud nasal “kaeeer” to which others instantly respond with repeated “keekekeke...” in chorus. Contact a bleating “kaee” and repeated “k-kaeeke...”. A stuttering “kida-kida-kida...” seems to be used in welcoming display or when approaching fledglings with food; other calls apparently when preferred food is found are “tchetchetche...”; begging call of young loud wheezy “skaa-skaa-skaa...”.

Habitat. Open woodland and open parkland. Requires rather tall deciduous thorny trees and sparse ground layer. Often found near large rivers, and in drier regions in W of range commonest in riverine bush, but appears also in semi-desert thorn savanna. Prefers dry low-lying areas; in NE South Africa absent from highveld, but widespread in bushveld and lowland regions. Sometimes found in village gardens.

Food and Feeding. Arthropods, mainly insects. Seems to favour large prey such as locusts and grasshoppers (Orthoptera), Lepidoptera (caterpillars), Hymenoptera (black bees), termites (Isoptera) and beetles (Coleoptera); feeds also on millipedes (Diplopoda) and small fruits. Scans surroundings from perch 3–6 m above ground; most prey taken on ground. Gleans items from trunks, branches and foliage; sometimes hangs upside-down to investigate likely sites; also flutters among foliage to flush prey. Aerial hawking commonly practised. Occurs singly, in pairs and in small groups; moves through woodland systematically. Size of territory of one observed group during austral winter was c. 200 ha.

Breeding. Laying from Sept to Feb, mostly Oct–Dec; appears to be single-brooded. Monogamous. Co-operative and territorial, single breeding pair occasionally assisted by helpers; degree of co-operative breeding seems to vary, sometimes solitary pair, sometimes 4–5 helpers; breeding male observed to ignore helper which solicited copulation, but occurrence of clutches twice normal size (likely result of two females laying in same nest) suggests potential extra-pair copulations and/or intra-group brood parasitism. Nest built by both pair-members, sometimes aided by one or two helpers, work taking 3–4 weeks; a very tidy, strong, perpendicular-sided cup up to c. 12.5 cm across and c. 7.5 cm high, made from fine yellow grass stems, hair and feathers occasionally used for lining, the exterior plastered with an even covering of cobweb (giving nest a smooth silvery-grey finish that matches lichen-covered branch), placed normally at height 4–6 m on lateral branch of acacia (*Acacia*), occasionally in deciduous tree (e.g. *Brachystegia*); nest may be renovated and reused. Clutch 2–6 eggs, usually 3–4, occasional larger clutches (e.g. 10 eggs) probably product of two females, whitish, with grey and brown spots and blotches mainly at larger end; incubation by breeding female, sometimes (for short stints) by helpers, period c. 20 days; nestling period reported as 18–20 days; fledglings fed by all group-members.

Movements. Local seasonal movements reported. In years of drought appears to be nomadic, with irregular irruptions.

Status and Conservation. Not globally threatened. Fairly common and quite widespread in suitable habitats; rather localised in some regions. Population seems to be stable, and habitat not under any immediate threat. Kept in captivity.

Bibliography. Dean (2000), Hall & Moreau (1970), Harris, T. (1998), Harris, T. & Arnott (1988), Harris, T. & Franklin (2000), Hockey *et al.* (2005), Lefranc & Worfolk (1997), Parker (1997b), Vicent (1949).

31. Northern White-crowned Shrike

Eurocephalus ruppelli

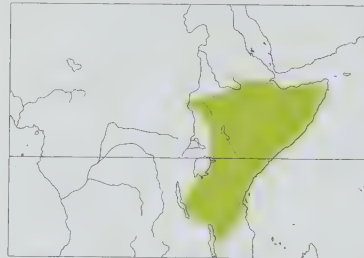
French: Eurocéphale de Rüppell **German:** Rüppellwürger **Spanish:** Alcaudón Culiblanco
Other common names: White-rumped Shrike

Taxonomy. *Eurocephalus ruppelli* [sic] Bonaparte, 1853, White Nile, Shoa, Ethiopia. Genus formerly included with the helmet-shrikes (Prionopidae), which were at the time treated as a subfamily of Malaconotidae; recent studies, however, suggest that it belongs with Laniidae. Forms a superspecies with *E. anguifimans*. Race *erlangeri* sometimes considered insufficiently differentiated, and species sometimes treated as monotypic. Additional proposed races are *deckeni* (described from Afgoi, in S Somalia), which is subsumed in *erlangeri*, and *fischeri* (Ndjiri, W of Kilimanjaro, in N Tanzania) and *boehmi* (Langenburg, NE of L Malawi, in S Tanzania), both synonymized with nominate. Two subspecies currently recognized.

Subspecies and Distribution.

E. r. ruppelli Bonaparte, 1853 – extreme SE Sudan, W part of S Ethiopia, Kenya (except NE) and N & C Tanzania.

E. r. erlangeri Zedlitz, 1913 – C & SE Ethiopia, NE Kenya and extreme NW, C & S Somalia.



Descriptive notes. 19–23 cm; 42–58 g. A large stocky shrike with relatively short tail. Nominant race has forehead, crown and nape white, dull black facial mask from bill base and lores through eye to ear-coverts and side of neck; upperparts brown, darker on lower back, white rump and uppertail-coverts; upperwing and tail dark brown; chin to undertail-coverts white, dull brown on flanks and underwing-coverts; iris dark brown; bill black; legs dark grey or brown. Sexes very similar. Juvenile is darker than adult, dark brown forehead to nape, blackish area below eye, wing-coverts and back feathers with pale edges and tips, white throat, grey-brown

breast with faint barring (forming narrow band), white belly, bill paler than adult's; immature similar to juvenile but head paler, with crown white. Race *erlangeri* is somewhat larger than nominate. Voice. Little information available. Has complex repertoire with noisy, harsh nasal quality, very similar to voice of *E. anguifimans* but accelerated. Calls normally short, rather high-pitched, sometimes a single squawk or squeak, or 2–3 chattering, repeated sharp “kek-kek”, “kak-kak” or “chee-cheee” notes; also longer phrases made up of fast series of notes, e.g. “chrrk”, “wirk-wirk”, “yeark-yeark”, “wuk-wuk”, or “yerk-yerk-yerk-yerk”; also a bleating “weeyer wók” call. Juveniles give sharp “skeet”.

Habitat. Dry thornbush areas and open woodland. Typical species of acacia (*Acacia*) or *Commiphora* woodlands. In Somalia occurs on the plateau, in open acacia-aloe (*Acacia-Aloe*) country near old tribal encampments or in high mimosa trees bordering dry watercourses. In Kenya found at up to 2200 m, but commonly below 1400 m, avoiding most of the rather humid areas. Near human habitations enters gardens, parklands and similar habitats.

Food and Feeding. Mainly insectivorous, but little information available. Beetles (Coleoptera), grasshoppers (Orthoptera) and butterflies (Lepidoptera) most commonly taken; removes and discards butterfly wings. Berries also recorded. Scans from from perch 3–7 m up; most prey taken on ground, where the shrike also hops after insects. Frequently takes insects in air, and gleans items from foliage. May forage in small groups.

Breeding. Very few data. Season Mar–May and Oct in Ethiopia, Aug–Dec in Sudan, Mar–Jun in Somalia, Jan–Apr/May and Nov in Kenya, and Jun–Dec in Tanzania. Monogamous. Co-operative breeding suspected; although pairs known to breed alone, a report of three individuals perched a few centimetres from another that was incubating. Juveniles apparently have dependency period of at least 3 months. No other information.

Movements. Little information available; possibly some local seasonal movements in Sudan.

Status and Conservation. Not globally threatened. Common in most of range. Has been poisoned during spraying of Red-billed Quelea (*Quelea quelea*) colonies. Occurs in several protected areas, including Awash National Park, in Ethiopia, and Buffalo Springs National Reserve and Shaba Game Reserve, in Kenya.

Bibliography. Friedmann (1937), Hall & Moreau (1970), Harris & Arnott (1988), Harris & Franklin (2000), Lefranc & Worfolk (1997), Lewis & Pomerey (1989), Moreau & Moreau (1939), Nikolaus (1987), Zimmerman *et al.* (1996).

REFERENCES

REFERENCES OF SCIENTIFIC DESCRIPTIONS

Abdulali (1977). *J. Bombay Nat. Hist. Soc.* **73**: 395 [*Oriolus xanthornus reubeni*].

Alcasid & Gonzales (1968). *Bull. Brit. Orn. Club* **88**(7): 129 [*Arachnothera clarae luzonensis*].

Alexander (1899). *Bull. Brit. Orn. Club* **8**(9): 54 [*Cinnyris shelleyi*].

Alexander (1903). *Bull. Brit. Orn. Club* **13**(4): 38 [*Cyanomitra oritis poensis*, *Cinnyris ursulae*].

Amadon (1953). *Bull. Amer. Mus. Nat. Hist.* **100**: 427 [*Cyanomitra cyanolaema octaviae*], 436 [*Oriolus nigripennis alleni*].

Anthony (1889). *Proc. Calif. Acad. Sci.* **Ser. 2, no. 2**: 77 [*Sitta pygmaea leuconucha*].

Babault (1920). *Mission Babault dans les Provinces Centrales de l'Inde 1914*: 293, plate 5 [*Dicaeum erythrorhynchos ceylonense*].

Baird, S.F. (1854). *Proc. Acad. Nat. Sci. Philadelphia* **7**: 118 [*Psaltriparus minimus plumbeus*].

Baird, S.F. (1864). *Rev. Amer. Birds Mus. Smithsonian Inst.* **1**: 85 [*Auriparus*].

Bangs (1922). *Bull. Mus. Comp. Zool. Harvard* **65**: 83 [*Oriolus xanthonotus persuasus*].

Bangs & Peters, J.L. (1927). *Occas. Pap. Boston Soc. Nat. Hist.* **5**: 240 [*Anthreptes malacensis mjobergi*].

Bangs & Peters, J.L. (1928). *Bull. Mus. Comp. Zool. Harvard* **68**: 358 [*Lanius bucephalus sicarius*].

Bannerman (1911). *Bull. Brit. Orn. Club* **29**(2): 23 [*Anthreptes seimundi kruensis*].

Bannerman (1921). *Bull. Brit. Orn. Club* **41**(9): 135 [*Cyanomitra obscura guineensis*], 137 [*Deleornis fraseri cameroonensis*].

Bannerman (1922). *Bull. Brit. Orn. Club* **43**(1): 7 [*Cinnyris superbus ashantiensis*], 8 [*Cyanomitra oritis bansoensis*].

Bannerman (1924). *Bull. Brit. Orn. Club* **44**(3): 41 [*Zosterops vaughani*].

Bannerman (1935). *Bull. Brit. Orn. Club* **55**(7): 131 [*Anthoscopus flavifrons waldronae*].

Bannerman (1939). *Bull. Brit. Orn. Club* **59**(3): 41 [*Anthoscopus parvulus aureus*].

Bartels, M. (1914). *Orn. Monatsber.* **22**(7/8): 125 [*Dicaeum agile finschi*].

Bartle & Sagar (1987). *Notornis* **34**(4): 297 [*Anthornis melanura oneho*].

Bates (1926). *Bull. Brit. Orn. Club* **46**(7): 107 [*Anthreptes seimundi minor*].

Bates (1930). *Bull. Brit. Orn. Club* **51**(3): 52 [*Cyanomitra obscura cephaelis*], 53 [*Cyanomitra cyanolaema magnirostrata*].

Bates (1935). *Bull. Brit. Orn. Club* **55**(6): 120 [*Cinnyris habessinica kimeari*].

Beavan (1867). *Ibis Ser. 2, no. 3*: 326 [*Oriolus chinensis andamanensis*].

Bechstein (1811). *Kurze Uebersicht aller bekannten Vögel* **2**: 196 [*Phylidonyris niger*].

Beehler, Prawiradilaga, de Fretes & Kemp (2007). *Auk* **124**(3): 1002 and frontispiece [*Melipotes carolae*].

Begbie (1834). *Malayan Peninsula*: 518 [*Dicaeum cruentatum ignitum*].

van Bemmell (1939). *Treubia* **17**: 125 [*Zosterops atriceps dehaani*].

Benson (1942). *Bull. Brit. Orn. Club* **63**(1): 16 [*Anthodiaeta collaris djamdjamensis*].

Benson (1946). *Bull. Brit. Orn. Club* **67**(2): 26 [*Oriolus chlorocephalus amani*].

Benson (1948). *Bull. Brit. Orn. Club* **69**(2): 19 [*Cinnyris ludovicensis whytei*].

Benson (1955). *Bull. Brit. Orn. Club* **75**(8): 106 [*Cinnyris oustaleti rhodessae*].

Benson (1969). *Bull. Brit. Orn. Club* **89**(1): 25 [*Zosterops maderaspatanus menaiensis*].

Berezowski & Bianchi (1891). *Ptitsi Gansuiskogo puteshestviya Potamina*: 119 [*Sitta przewalskii*].

Berlepsch (1888). *Auk* **5**: 450 [*Certhia americana albeszens*].

Bernstein (1864). *J. Orn.* **12**(6): 405 [*Melilestes megarhynchus vagans*].

Bianchi (1903). In: Sharpe, *Hand-list Gen. Spec. Birds Nom.* **Av. 4**: 360 [*Certhia hodgsoni khamensis*].

Blanford (1873). *Ibis Ser. 3, no. 3*: 86 [*Cinnyris asiaticus brevirostris*], 87 [*Sitta neumayer rupicola*].

Blasius, A.W.H. (1885). *Zeitschr. ges. Orn.* **2**: 289, plate 12 [*Cinnyris jugularis platani*].

Blasius, A.W.H. (1886). *Braunschweig. Anz.* **1886**(52): 457 [*Dicaeum nehrkorni*].

Blasius, A.W.H. (1888). *Braunschweig. Anz.* **1888**(9): 86 [*Zosterops nehrkorni*]; **1888**(37): 335 [*Prionochilus plateni*].

Blasius, A.W.H. (1890). *Braunschweig. Anz.* **1890**(87): 877 [*Arachnothera clarae*].

Blundell & Lovat (1899). *Bull. Brit. Orn. Club* **10**(2): 19 [*Oriolus monacha meneliki*].

Blyth (1842). *J. Asiatic Soc. Bengal* **11**: 459 [*Sitta cinnamoventris*].

Blyth (1843). *J. Asiatic Soc. Bengal* **12**: 938 [*Sitta formosa*], 975 [*Aethopyga nipalensis horsfieldi*], 980 [*Hypogramma hypogrammicum nuchale*], 983 [*Dicaeum ignipectus*], 1009 [*Dicaeum chrysorrheum chrysochlore*], 1010 [*Dicaeum melanoxanthum*].

Blyth (1845). *J. Asiatic Soc. Bengal* **13** (1844): 943 [*Aegithalos iouschistos*]; **14**: 557 [*Cinnyris jugularis flammavillaris*], 563 [*Zosterops palpebrosus nicobaricus*], 580 [*Certhia discolor*], 581 [*Certhia nipalensis*].

Blyth (1846). *J. Asiatic Soc. Bengal* **15**: 46 [*Oriolus chinensis macrourus*], 48 [*Oriolus tenuirostris*], 302 [*Lanius schach caniceps*], 304 [*Lanius arenarius*].

Blyth (1855). *J. Asiatic Soc. Bengal* **24**: 478 [*Arachnothera magna aurata*].

Blyth (1867). *Ibis Ser. 2, no. 3*: 34 [*Zosterops palpebrosus siamensis*].

Bocage (1868). *J. Sci. Math. Phys. e Nat., Acad. Real Sci. Lisboa Ser. 1, no. 2*: 41 [*Cinnyris ludovicensis*].

Bocage (1878). *J. Sci. Math. Phys. e Nat., Acad. Real Sci. Lisboa Ser. 1, no. 6*: 189 [*Salpornis spilonotus salvadori*], 208 [*Anthreptes anchietae*], 213 [*Lanius souzae*], 254 [*Cinnyris oustaleti*].

Bocage (1879). *J. Sci. Math. Phys. e Nat., Acad. Real Sci. Lisboa Ser. 1, no. 7(26): 93 [*Lanius collaris capelli*].*

Bocage (1887). *J. Sci. Math. Phys. e Nat., Acad. Real Sci. Lisboa Ser. 1, no. 11*: 250 [*Anabathmis newtonii*].

Bocage (1889). *J. Sci. Math. Phys. e Nat., Acad. Real Sci. Lisboa Ser. 2, no. 1*: 143 [*Dreptes thomensis*].

Bocage (1891). *J. Sci. Math. Phys. e Nat., Acad. Real Sci. Lisboa Ser. 2, no. 2(6): 79 [*Lanius newtoni*].*

Bocage (1892). *J. Sci. Math. Phys. e Nat., Acad. Real Sci. Lisboa Ser. 2, no. 2*: 252 [*Nectarinia kilimensis gadowi*].

Bocage (1893). *J. Sci. Math. Phys. e Nat., Acad. Real Sci. Lisboa Ser. 2, no. 3*: 18 [*Zosterops griseovireszens*].

Bogdanov (1881). *Zapiski Imp. Akad. Nauk. St. Pétersbourg* **39** (Suppl. 1): 101 [*Lanius excubitor sibiricus*].

Bonaparte (1838). *Geograph. Comp. List Birds Europe North Amer.*: 11 [*Certhia americana*].

Bonaparte (1850). *Compt. Rend. Acad. Sci. Paris* **31**: 478 [*Psaltriparus*, *Psaltriparus minimus personatus*].

Bonaparte (1850). *Consp. Gen. Avium* **1**: 225 [*Tichodroma muraria nepalensis*], 227 [*Sitta europaea roseitia*], 346 [*Oriolus flavocinctus muelleri*, *Oriolus melanotis*, *Oriolus forsteni*], 347 [*Oriolus xanthornus*

ceylonensis], 348 [*Oriolus chinensis broderipii*], 390 [*Melitograis gilolensis*], 392 [*Myzomela obscura fumata*], 398 [*Zosterops chloris*, *Zosterops citrinella*, *Zosterops meyeri*, *Zosterops montanus*], 399 [*Zosterops senegalensis*].

Bonaparte (1853). *Rev. Mag. Zool. Ser. 2, no. 5*: 294 [*Lanius meridionalis aucheri*], 439 [*Lanius senator niloticus*], 440 [*Eurocephalus ruppelli*].

Bonaparte (1854). *Compt. Rend. Acad. Sci. Paris* **38**: 59 [*Apalopteron*], 62 [*Cephalopyrus*], 264 [*Cissomela*], 264 [*Myzomela rubratra major*].

Bonaparte (1856). *Compt. Rend. Acad. Sci. Paris* **42**: 765 [*Cinnyris osea*].

Bond (1931). *Proc. Acad. Nat. Sci. Philadelphia* **83**: 389 [*Sitta pusilla insularis*].

Bourns & Worcester (1894). *Minnesota Acad. Nat. Sci. Occ. Pap.* **1**(1): 16 [*Oriolus steerii cinereogenys*], 17 [*Aethopyga bella arolasi*, *Aethopyga bella bonita*], 18 [*Aethopyga bella minuta*, *Dicaeum trigonostigma pallidus*, *Dicaeum trigonostigma sibuyanicum*], 19 [*Dicaeum trigonostigma assimile*, *Dicaeum trigonostigma intermedium*], 20 [*Dicaeum agile aeruginosum*, *Dicaeum bicolor*], 21 [*Zosterops everetti siquijorensis*].

Brandt, H.W. (1938). *Auk* **55**: 269 [*Sitta carolinensis oberholseri*].

Brehm, C.L. (1820). *Beitr. Vogelkd.* **1**: 570 [*Certhia brachyactyla*].

Brehm, C.L. (1831). *Handb. Naturg. Vög. Deutschl.*: 208 [*Certhia familiaris macrodactyla*], 211 [*Certhia brachyactyla megarhynchos*].

Brehm, C.L. (1854). *J. Orn.* **2**(2): 145 [*Lanius ludovicianus mexicanus*].

Brewster (1891). *Auk* **8**: 149 [*Sitta carolinensis lagunae*].

Brisson (1760). *Ornithologia Syn. Meth. Sist. Avium* **1**: 34, 2: plate 43, fig. 2 [*Promerops*].

Brooks, W.E. (1871). *J. Asiatic Soc. Bengal* **41** (1872): 74 [*Certhia hodgsoni*].

Brooks, W.E. (1871). *Proc. Asiatic Soc. Bengal* **7**: 209 [*Sitta cashmirensis*].

Brooks, W.E. (1874). *J. Asiatic Soc. Bengal* **42** (1873): 256 [*Certhia hodgsoni mandellii*].

Burleigh (1935). *Proc. Biol. Soc. Washington* **48**: 62 [*Certhia americana nigrescens*].

Burton, E. (1836). *Proc. Zool. Soc. London* **1835**(3), no. 34: 153 [*Cephalopyrus flammiceps*].

Büttikofer (1890). *Notes Mus. Leyden* **12**: 202 [*Zosterops senegalensis demeryi*].

Büttikofer (1891). *Notes Mus. Leyden* **13**: 213 [*Philemon buceroides neglectus*].

Büttikofer (1892). *Notes Mus. Leyden* **14**: 199 [*Dicaeum sanguinolentum wilhelminae*].

Büttikofer (1893). *Notes Mus. Leyden* **15**: 179 [*Cinnyris jugularis teysmanni*], 180 [*Dicaeum maugei splendidum*].

Büttikofer (1894). In: Weber, *Zool. Ergeb. Reise Nederl. Ost-Ind.* **3**: 301, plate 18, fig. 4 [*Dicaeum amae*].

Buturlin (1906). *Ibis Ser. 8, no. 6*: 416 [*Lanius collurio kobylini*].

Buturlin (1907). *Mitt. Kaukas. Mus.* **3**: 70 [*Sitta neumayer zarudnyi*].

Buturlin (1907). *Orn. Monatsber.* **15**(1): 8 [*Certhia familiaris caucasica*].

Buturlin (1907). *Psov i Ruzh. Okhota* **6**: 87 [*Sitta europaea arctica*].

Buturlin (1911). *Nascha Okhota* **8**: 51 [*Sitta europaea formosana*].

Buturlin (1916). *Trudy Imp. Petrograd. Obsh. Estest.* **44**: 158 (In English 170) [*Sitta europaea sakhalinensis*], 160 (In English 171) [*Sitta europaea hondoensis*], 165 (In English 173) [*Sitta tephronota iranica*].

Cabanis (1851). In: Cabanis & Heine, *Mus. Hein.* **1**: 89 [*Anthoscopus*], 100 [*Anthodiaeta*], 103 [*Aethopyga, Anthobaphes, Chalcoparia*], 104 [*Leptocoma*], 118 [*Lichmera*], 119 [*Lichenostomus, Lichenostomus cratitius occidentalis*].

Cabanis (1872). *J. Orn.* **20**(5): 392 [*Oriolus chinensis formosus*].

Cabanis (1873). *J. Orn.* **21**(1): 75 [*Lanius excubitor homeyeri*], 76 [*Lanius sphenocercus*].

Cabanis (1878). *J. Orn.* **26**(1): 101 [*Dicaeum cruentatum sumatranum*]; **26**(2): 205 [*Lanius dorsalis*].

Cabanis (1880). *Orn. Centrabl.* **5**(18): 143 [*Chalcomitra amethystina deminata*].

Campbell, A.G. (1906). *Emu* **5**: 140 [*Phylidonyris pyrrhopterus halmaturinus*], 142 [*Acanthorhynchus tenuirostris halmaturinus*].

Campbell, A.J. (1899). *Victorian Naturalist* **16**(1): 3 [*Lichenostomus penicillatus carteri*].

Campbell, A.J. (1910). *Emu* **10**: 168 [*Lichenostomus plumulus planasi*].

Campbell, A.J. & White, S.A. (1910). *Emu* **10**: 196 [*Zosterops lateralis chlorocephalus*].

Cassin (1852). *Proc. Acad. Nat. Sci. Philadelphia* **5**: 244 [*Lanius meridionalis pallidirostris*].

Cassin (1855). *Proc. Acad. Nat. Sci. Philadelphia* **7**: 325 [*Anthoscopus flavifrons, Pholidornis rushiae*].

Cassin (1856). *Proc. Acad. Nat. Sci. Philadelphia* **8**: 254 [*Sitta carolinensis aculeata*].

Chapin (1932). *Amer. Mus. Novit.* **570**: 15 [*Zosterops senegalensis kasaiensis*], 16 [*Cinnyris rockefelleri*].

Chapin (1949). *Bull. Brit. Orn. Club* **69**(9): 83 [*Anthodiaeta collaris somereni*].

Chapin (1950). *Auk* **67**: 241 [*Lanius souzae burigi*].

Chapin (1958). *Rev. Zool. Bot. Afr.* **57**: 23 [*Anthoscopus flavifrons ruthae*].

Chasen (1935). *Bull. Raffles Mus. Singapore* **9**: 95 [*Chalcoparia singalensis pallida*, *Prionochilus maculatus natunensis*], 96 [*Dicaeum everetti bungurensis*], 97 [*Aethopyga siparaja natunae*]; **10**: 43 [*Hypogramma hypogrammicum natunense*].

Chasen (1941). *Treubia* **18** (Suppl.): 105 [*Zosterops atricapilla viridicatus*].

Chasen & Kloss (1926). *Ibis Ser. 12, no. 2*: 294 [*Oriolus chinensis sipora*], 295 [*Oriolus xanthonotus mentawi*].

Chasen & Kloss (1927). *Bull. Brit. Orn. Club* **48**(2): 47 [*Chlorocharis emiliae moultoni*].

Chasen & Kloss (1929). *J. Orn.* **77** (Suppl. 2): 121 [*Dicaeum trigonostigma dayakanum*].

Cheng Tsohsin, Ting Wenning & Wang Tzeyu (1964). *Acta Zootaxonomica Sinica* **1**(1): 1 [*Sitta solangiae chienfengensis*].

Clancey (1955). *Bull. Brit. Orn. Club* **75**(3): 32 [*Lanius collaris aridicolus*].

Clancey (1961). *Bull. Brit. Orn. Club* **81**(3): 54 [*Corvinella melanoleuca expressa*].

Clancey (1962). *Durban Mus. Novit.* **6**(13): 159 [*Zosterops pallidus caniviridis*]; **6**(15): 188 [*Cinnyris afer saliens*].

Clancey (1965). *Arnoldia* **1**(23): 2 [*Eurocephalus anguitimens niveus*].

Clancey (1970). *Durban Mus. Novit.* **8**(17): 341 [*Lanius souzae tacitus*]; **9**(1): 10 [*Cinnyris fuscus inclusus*]; **9**(3): 25 [*Cinnyris manoenis amicorum*].

Clancey (1975). *Durban Mus*. Novit. **10**(14): 208 [*Salpornis spilonotus xylodromus*].

Clancey (1986). *Durban Mus*. Novit. **14**(2): 24 [*Chalcornis hunteri siccata*].

Clark, A.H. (1907). *Proc. US Natl. Mus.* 32: 475 [*Aegithalos caudatus magnus*].

Cuvier (1816). *Règne Animal* 1: 410 [Dicaeum], 411 [Cinnyris].

D'Albertain & Salvadori (1879). *Ann. Mus. Civ. Storia Nat. Genova Ser. 1, no. 14*(5): 74 [*Dicaeum geelvinkianum rubrigularis*], 75 [*Dicaeum geelvinkianum albob punctatum*].

Daudin (1800). *Traité Élément. Compl. d'Orn.* 2: 246, plate 16 [*Anthochaera paradoxa*].

De Vis (1890). *Ann. Rep. Brit. New Guinea* **1888/1889**. App.: 60 [*Melidectes belfordii*, *Zosterops griseotinctus pallidipes*].

De Vis (1892). *Ann. Rep. Brit. New Guinea* **1890/1891**. App.: 95 [*Paramythia*, *Paramythia montium*].

De Vis (1894). *Ann. Rep. Brit. New Guinea* **1893/1894**. App.: 103 [*Ptiloprora*, *Ptiloprora guisei*].

De Vis (1897). *Ibis* **Ser. 7, no. 3**: 251 [*Macgregoria*, *Macgregoria pulchra*], 383 [*Melidectes fuscus*, *Lichenostomus obscurus*].

De Vis (1898). *Ann. Rep. Brit. New Guinea* **1896/1897**. App.: 86 [*Ptiloprora perstriata*, *Rhamphocharis crassirostris piperata*], 87 [*Melanocharis versteri maculiceps*].

Deignan (1938). *Proc. Biol. Soc. Washington* **51**: 97 [*Dicaeum ignipectus dolichorhynchum*].

Deignan (1938). *Smithsonian Misc. Coll.* **97**(9): 1 [*Sitta magna ligae*].

Deignan (1943). *Proc. Biol. Soc. Washington* **56**: 30 [*Hypogramma hypogrammicum mariae*].

Deignan (1943). *Zoologica* **28**: 202 [*Zosterops everetti wetmorei*].

Deignan (1948). *J. Washington Acad. Sci.* **38**: 22 [*Aethopyga saturata galenae*, *Aethopyga saturata petersi*], 23 [*Aethopyga saturata ochra*].

Deignan (1955). *Proc. Biol. Soc. Washington* **68**: 147 [*Chalcoparia singalensis internota*].

Deignan (1956). *Proc. Biol. Soc. Washington* **69**: 210 [*Arachnothera modesta caena*, *Arachnothera magna musarum*], 211 [*Arachnothera magna pagodarum*].

Deignan (1957). *Proc. Biol. Soc. Washington* **70**: 44 [*Arachnothera chrysogenys harrissoni*].

Delacour (1926). *Bull. Brit. Orn. Club* **47**(1): 21 [*Aethopyga nipalensis ezrai*], 22 [*Hypogramma hypogrammicum lisetae*], 47(3): 70 [*Lanius collurioides nigricapillus*].

Delacour (1927). *Bull. Brit. Orn. Club* **47**(9): 168 [*Oriolus traillii robinsoni*].

Delacour (1932). *Oiseau et RFO (Nouv. Sér.)* 2: 431 [*Arachnothera longirostra pallida*].

Delacour (1944). *Zoologica* **29**: 32 [*Nectarinia johnstoni mykensis*].

Delacour (1946). *Zoologica* **31**: 4 [*Dicaeum agile atjehense*].

Delacour (1948). *J. Washington Acad. Sci.* **38**: 184 [*Aethopyga saturata cambodiana*].

Delacour (1951). *Oiseau et RFO (Nouv. Sér.)* 21: 112 [*Certhia manipurens laotiana*].

Delacour & Greenway (1939). *Bull. Brit. Orn. Club* **59**(9): 133 [*Aethopyga nipalensis blanci*, *Sitta solangiae fortior*].

Delacour & Jabouille (1924). *Bull. Brit. Orn. Club* **45**(2): 34 [*Aethopyga siparaja mangini*].

Delacour & Jabouille (1928). *Bull. Brit. Orn. Club* **48**(9): 134 [*Aethopyga siparaja insularis*], 135 [*Leptocoma sperata emmae*, *Dicaeum ignipectus cambodianum*].

Delacour & Jabouille (1930). *Oiseau et RFO* **11**(7): 395 [*Sitta solangiae*].

Diamond (1967). *Amer. Mus. Novit.* **2284**: 8 [*Myzomela eques karimuiensis*], 12 [*Meliphaga mimikae bastille*].

Diamond (1969). *Amer. Mus. Novit.* **2362**: 46 [*Ptiloprora mayri acrophila*], 55 [*Melidectes rufoerissalis thomasi*].

Diamond (1985). *Emu* **85**(2): 82 [*Melipotes fumigatus kumawa*].

Domaniewski (1922). *Disc. Biol. Arch. Soc. Parsvensiens* **1**(10): 4 [*Certhia familiaris daurica*].

Drapiez (1828). In: Audouin & Bory de Saint-Vincent, *Diet. Class. Hist. Nat. (Paris)* **13**: 523 [*Lanius tigrinus*].

Dresser (1892). *Bull. Brit. Orn. Club* **14**(1): 15 [*Aegithalos caudatus macedonensis*].

Dubois, A.J.C. (1902). *Syn. Avium* 1: 711 [*Zosterops conspiciatulus saypani*].

Dubois, A.J.C. (1911). *Rev. Franç. Orn.* 2: 18 [*Zosterops senegalensis reichenowi*].

Ehrenberg (1833). *Symb. Phys. Icones Descr. Avium* 1: fol. e [p. 13] [*Lanius meridionalis leucopygus*].

van den Elzen & König (1983). *Bonn. Zool. Beitr.* **34**: 164 [*Zosterops senegalensis gerhardi*].

Erlanger (1901). *Orn. Monatsber.* **9**(12): 182 [*Zosterops abyssinicus jubaensis*].

Eversmann (1853). *Bull. Soc. Imp. Nat. Moscou* **26**(4): 498 [*Lanius excubitor mollis*].

Eyton (1839). *Proc. Zool. Soc. London* **1839**(7), no. 78: 105 [*Arachnothera flavigaster*, *Arachnothera modesta*, *Prionochilus percussus ignicapilla*].

Falla (1948). *Records Auckland Mus.* 3: 337 [*Anthornis melanura obscura*].

Fedushin (1927). *J. Orn.* **75**(3): 493 [*Lanius minor turanicus*].

Finsch (1870). *Abh. Naturwiss. Ver. Bremen* 2: 364 [*Lichmera argenteauris*].

Finsch (1870). *Trans. Zool. Soc. London* **7**(4): 230 [*Cinnyris mariquensis osiris*].

Finsch (1876). *Proc. Zool. Soc. London* **1875**(4): 642 [*Melanocharis versteri*], 643 [*Zosterops cinereus ponapensis*].

Finsch (1886). *Zeitschr. ges. Orn.* 3: 21 [*Myzomela pammelaena ramsayi*].

Finsch (1898). *Notes Mus. Leyden* **20**: 129 [*Speothoerops hypoleucus*], 130 [*Lichmera notabilis*].

Finsch (1900). *Notes Mus. Leyden* **22**: 70 [*Melanocharis arfakiana*].

Finsch (1901). *Das Tierreich* **15**: 23 [*Zosterops wallacei*], 31 [*Zosterops nigrorum innominatus*].

Finsch (1907). *J. Orn.* **55**(2): 302 [*Zosterops chloris maxi*].

Finsch & Hartlaub (1867). *Beir. Fauna Centralpolynesien*, *Orn.*: 62, plate 5, fig. 3 [*Foulehaio carunculatus procerior*].

Fischer, G.A. (1884). In: Fischer & Reichenow, *J. Orn.* **32**(1): 56 [*Drepanorhynchus reichenowi*].

Fischer, G.A. & Reichenow (1884). *J. Orn.* **32**(1): 55 [*Zosterops polioastrus euryerictus*], 56 [*Drepanorhynchus*, *Cinnyris venustus falkensteinii*], 181 [*Cinnyris pulchellus melanogaster*].

Forbes, H.O. (1883). *Proc. Zool. Soc. London* **1883**(2): 116 [*Myzomela wakoloensis*].

Forbes, W.A. (1879). *Proc. Zool. Soc. London* **1879**(2): 260 [*Myzomela caledonica*], 263 [*Myzomela erythrocephala infuscata*], 265, plate 25, fig. 2 [*Myzomela selateri*], 266 [*Myzomela nigrita pluto*].

Franklin (1831). *Proc. Zool. Soc. London* **1830/1831**(1), no. 10: 118 [*Oriolus xanthornus maderaspatanus*], 125 [*Salpornis spilonotus*].

Fraser (1843). *Proc. Zool. Soc. London* **1843**(11), no. 121: 16 [*Lanius collaris smithii*].

Friedmann (1952). *J. Washington Acad. Sci.* **42**: 32 [*Promerops gurneyi ardens*].

Friedmann & Bowen (1933). *Proc. Biol. Soc. Washington* **46**: 122 [*Corvinella corvina caliginosa*].

Gervais (1833). *Mag. Zool.* 3 (Classe 2): plate 19 [*Chalcornis adelberti*].

Gilliard (1960). *Amer. Mus. Novit.* **2001**: 2 [*Melidectes whitemanensis*].

Gilliard & LeCroy (1968). *Amer. Mus. Novit.* **2343**: 33 [*Melidectes belfordii schradereus*].

Gmelin, J.F. (1788). *Syst. Nat.* 1(1): 308 [*Lanius minor*], 464 [*Prothemadera novaeseelandiae*], 465 [*Philemon moluccensis*], 471 [*Cinnyris sovimmaga*], 472 [*Foulehaio carunculatus*, *Myzomela cardinalis*], 474 [*Leptocoma sperata brasiliiana*].

Gmelin, J.F. (1789). *Syst. Nat.* 1(2): 824 [*Oriolus monacha*], 944 [*Zosterops flavifrons*], 964 [*Chalcoparia singalensis*], 981 [*Zosterops borbonicus*, *Zosterops borbonicus mauritanus*], 1003 [*Pardalotus striatus*].

Godwin-Austen (1874). *Proc. Zool. Soc. London* **1874**(1): 44 [*Sitta nagaensis*].

Gould (1835). *Birds Europe*, Part 12 (later bound in vol. 3): plate 236 and text [*Sitta europaea asiatica*].

Gould (1837). *Proc. Zool. Soc. London* **1836**(4), no. 44: 75 [*Zosterops albugularis*], 76 [*Zosterops tenuirostris*].

Gould (1837). *Synop. Birds Australia*, Part 1: plate 13, fig. 1 and text [*Philemon citreogularis*], plate 15, fig. 1 and text [*Lichenostomus penicillatus*], plate 17, fig. 2 and text [*Melithreptus gularis*], plate 17, fig. 3 and text [*Melithreptus gularis*]; 2: plate 26, fig. 3 and text [*Lichenostomus fuscus*], plate 27 and text [*Acanthorhynchus*], plate 27, fig. 1 and text [*Acanthorhynchus superciliosus*], plate 27, fig. 3 and text [*Acanthorhynchus tenuirostris dubius*].

Gould (1838). *Birds Austr. and Adj. Islands*, Part 2: plate 8 and text [*Sugomel nigrum*].

Gould (1838). *Synop. Birds Australia*, Part 4: plate 62 and text [*Pardalotus quadragintus*, *Pardalotus rubricatus*, *Pardalotus striatus melanocephalus*], plate 69 and text [*Acanthagenys*, *Acanthagenys rufogularis*], plate 70 and text [*Plectorhyncha*, *Plectorhyncha lanceolata*], plate 71 and text [*Grantiella picta*], plate 72, fig. 1 and text [*Lichenostomus ornatus*]; Part 4, App.: 5 [*Anthochaera lunulata*], 6 [*Lichmera indistincta ocularis*].

Gould (1840). *Proc. Zool. Soc. London* **1839**(7), no. 82: 143 [*Manorina flavigula*, *Pardalotus striatus uropygialis*], 144 [*Lichenostomus flavescens*, *Manorina flavigula lutea*, *Myzomela erythrocephala*, *Philemon argenticeps*].

Gould (1841). *Birds Austr.*, Part 2 (later bound in vol. 4): plate 40 and text [*Lichenostomus plumulus*].

Gould (1841). *Proc. Zool. Soc. London* **1840**(8), no. 94: 159 [*Manorina flavigula obscura*], 160 [*Lichenostomus virensens sonorus*, *Lichenostomus cratiatus*, *Purnella albifrons*], 165 [*Zosterops lateralis chloronotus*], **1840**(8), no. 95: 169 [*Entomyzon cyanotis albipennis*], 170 [*Cissomela pectoralis*].

Gould (1843). *Birds Austr.*, Part 11 (later bound in vol. 4): plate 83 and text [*Zosterops luteus*].

Gould (1843). *Proc. Zool. Soc. London* **1842**(10), no. 117: 136 [*Lichenostomus versicolor*, *Lichenostomus unicolor*, *Lichenostomus flavus*, *Myzomela obscura*], 137 [*Ramsayornis fasciatus*, *Conopophila rufogularis*, *Conopophila albugularis*]; **1843**(11), no. 126/127: 104 [*Cinnyris jugularis flavigaster*].

Gould (1846). *Proc. Zool. Soc. London* **1846**(14), no. 163: 83 [*Phylidonyris novaehollandiae longirostris*].

Gould (1848). *Birds Austr.*, Part 30 (later bound in vol. 4): plate 73 and text [*Melithreptus lunatus chloropsis*], plate 74 and text [*Melithreptus albugularis*].

Gould (1848). *Introduction Birds Austr.* (= Part 36 *Birds Austr.*, later bound in vol. 1): 57 (liii) [*Oriolus sagittatus affinis*], 64 (lviii) [*Philemon citreogularis sordidus*].

Gould (1850). *Birds Asia*, Part 1 (later bound in vol. 2): plate 46 and text [*Sitta leucopsis*].

Gould (1850). *Proc. Zool. Soc. London* **1849**(17), no. 196: 111 [*Speothoerops vieillotii flaviventris*].

Gould (1851). *Birds Austr.*, Suppl., Part 1: plate 42 and text [*Xanthotis flaviventer filiger*].

Gould (1854). *Proc. Zool. Soc. London* **1851**(19), no. 236: 285 [*Lichenostomus fasciularis*].

Gould (1855). *Birds Asia*, Part 7 (later bound in vol. 2): plate 65 and text [*Aegithalos concinnus*].

Gould (1855). *Proc. Zool. Soc. London* **1855**(23), no. 294: 166 [*Zosterops lateralis tephroleptus*].

Gould (1866). *Proc. Zool. Soc. London* **1866**(2): 217 [*Meliphaga gracilis*].

Gould (1867). *Ann. Mag. Nat. Hist.* **Ser. 3, no. 20**: 269 [*Meliphaga notata*].

Gould (1867). *Birds Austr.*, Suppl., Part 4: plate 39 and text [*Lichenostomus melanops cassidix*].

Gould (1869). *Birds Austr.*, Suppl., Part 5: plate 43 and text [*Trichodere cockerelli*].

Gould (1872). *Ann. Mag. Nat. Hist.* **Ser. 4, no. 10**: 114 [*Dicaeum retrocinctum*].

Gould (1875). *Ann. Mag. Nat. Hist.* **Ser. 4, no. 16**: 287 [*Melithreptus gularis laetior*].

Grant, C.H.B. (1908). *Bull. Brit. Orn. Club* **21**(8): 93 [*Cinnyris neergaardi*].

Grant, C.H.B. & Mackworth-Praed (1943). *Bull. Brit. Orn. Club* **63**(4): 63 [*Cyanomitra bannermani*].

Gray, G.R. (1840). *List Gen. Birds*, 1st edition: 15 [*Anthornis*, *Prothemadera*].

Gray, G.R. (1846). *Gen. Birds*, Part 30 (later bound in vol. 1): 119, plate 38 [*Myzomela chermesina*], 125, plate 39 [*Philemon inornatus*].

Gray, G.R. (1847). *Proc. Zool. Soc. London* **1847**(15), no. 168: 7 [*Salpornis*].

Gray, G.R. (1858). *Proc. Zool. Soc. London* **1858**(26), no. 357: 173 [*Dicaeum hirundinaceum ignicollis*, *Myzomela nigrita*], 174 [*Melilestes megarrhynchus*, *Philemon plumigenis*, *Ramsayornis modestus*], 175 [*Zosterops griseotinctus*].

Gray, G.R. (1859). *Proc. Zool. Soc. London* **1859**(2): 160 [*Lichmera incana poliotis*], 161 [*Zosterops xanthochroa*, *Zosterops lateralis griseonota*].

Gray, G.R. (1860). *Cat. Birds Trop. Isl. Pac. Ocean* (1859): 15 [*Zosterops lateralis melanops*].

Gray, G.R. (1861). *Proc. Zool. Soc. London* **1860**(3): 348 [*Leptocoma sericea aspasoides*, *Leptocoma sericea auriceps*], 349 [*Dicaeum erythrothorax schistaceiceps*, *Myzomela obscura simplex*], 350 [*Zosterops atriceps*], 351 [*Oriolus phaeochromus*].

Gray, G.R. (1862). *Ann. Mag. Nat. Hist.* **Ser. 3, no. 10**: 444 [*Speirops melanocephalus*].

Gray, G.R. (1862). *Proc. Zool. Soc. London* **1861**(3): 428 [*Lichenostomus versicolor sonoroideus*], 429 [*Xanthotis polygrammus*].

Gray, G.R. (1870). *Ann. Mag. Nat. Hist.* **Ser. 4, no. 5**: 327 [*Meliarchus selateri*], 331 [*Lichmera incana flavotincta*].

Greenway (1966). *Amer. Mus. Novit.* **2258**: 22 [*Meliphaga montana margaretae*].

Grinnell (1900). *Pacific Coast Avifauna* 1: 54 [*Lanius excubitor invictus*].

Grinnell (1918). *Condor* 20: 88 [*Sitta carolinensis tenuissima*].

Grinnell (1926). *Univ. Calif. Publ. Zool.* **21**: 405 [*Sitta carolinensis alexandrae*].

Grinnell (1931). *Condor* 33: 168 [*Auriparus flaviceps acaciarius*].

Grinnell & Swarth (1926). *Univ. Calif. Publ. Zool.* **30**(5): 169 [*Psaltiriparus minimus melanurus*].

Griscom (1935). *Ibis* **Ser. 13, no. 5**: 552 [*Certhia americana pernigra*].

Grote (1922). *Orn. Monatsber.* **30**(4): 86 [*Cinnyris medioeris usambaricus*].

Grote (1924). *Orn. Monatsber.* **32**(3): 68 [*Anthoscopus parvulus senegalensis*].

Grote (1932). *Ibis* **Ser. 13, no. 2**: 350 [*Cyanomitra veraxii zanzibarica*].

Guérin-Ménéville (1843). *Rev. Zool.* 6: 162 [*Zosterops abyssinicus*].

Gunning (1909). *Ann. Transvaal Mus.* 1: 173 [*Anthreptes reichenowi*].

Günther (1865). *Ibis* **Ser. 2, no. 1**: 95 [*Aegithalos caudatus tephronotus*].

Haagner (1909). *Ann. Transvaal Mus.* 1: 233 [*Anthoscopus caroli roberis*].

Hablizl (1783). *Neue Nord. Beytr.* 4: 49 [*Aegithalos caudatus alpinus*].

Hachisuka (1926). *Bull. Brit. Orn. Club* **47**(2): 55 [*Dicaeum pygmaeum palawanorum*].

Hachisuka (1930). *Contrib. Birds Philippines* 2: 203 [*Sitta oenochlamys apo*].

Hachisuka (1941). *Bull. Bio-Geogr. Soc. Japan* 11: 6 [*Aethopyga primigenia*].

Harrison (1957). *Sarawak Mus. J.* 7: 520 [*Chlorocharis emiliae trinitae*].

Hartert, E.J.O. (1895). *Novit. Zool.* **2**(2): 64 [*Dicaeum bicolor inexpectatum*].

Hartert, E.J.O. (1896). *Novit. Zool.* **3**(1): 15 [*Xanthotis flaviventer visii*], 70 [*Lophozosterops squameiceps*]; **3**(3): 237 [*Oedistoma iliolophus fergussoni*], 238 [*Philemon bucceroides sububerous*], 239 [*Oedistoma pygmaeum meeki*]; **3**(4): 531 [*Lichenostomus subfrenatus salvadorii*], 567 [*Lophozosterops*], 568 [*Lophozosterops dohertyi*], 581 [*Cinnyris buettikoferi*].

Hartert, E.J.O. (1897). *Bull. Brit. Orn. Club* **7**(1): 5 [*Rukia ruki*].

Hartert, E.J.O. (1897). *Novit. Zool.* **4**(1): 138 [*Certhia familiaris japonica*], 171 [*Lophozosterops dohertyi subcristatus*], 172, plate 3 [*Heleia crassirostris*, *Lophozosterops supercilialis*]; **4**(2): 264 [*Dicaeum maugei neglectum*]; **4**(3): 520 [*Zosterops palpebrosus unicus*].

Hartert, E.J.O. (1898). *Bull. Brit. Orn. Club* **8**(3): 20 [*Myzomela albigula*], 21 [*Myzomela albigula pallidior*].

Hartert, E.J.O. (1898). *Novit. Zool.* **5**(4): 527 [*Myzomela nigrita louisianensis*], 528 [*Zosterops meeki*].

Hartert, E.J.O. (1899). *Novit. Zool.* **6**(3): 425 [*Zosterops lateralis vegetus*].

Hartert, E.J.O. (1900). *Novit. Zool.* **7**(1): 2 [*Zosterops semperi owstoni*]; **7**(2): 238 [*Zosterops montanus obstinatus*].

Hartert, E.J.O. (1901). *Novit. Zool.* **8**(1): 51 [*Arachnothera longirostra prillwitzii*], 52 [*Dicaeum concolor sollicitans*]; **8**(3): 309 [*Lanius meridionalis koenigi*].

Hartert, E.J.O. (1902). *Novit. Zool.* **9**(2): 209 [*Anthreptes malacensis wiglesworthi*]; **9**(3): 573 [*Sitta frontalis saturator*].

Hartert, E.J.O. (1903). *Bull. Brit. Orn. Club* **14**(1): 13 [*Hypocryptadius*, *Hypocryptadius cinnamomeus*, *Lophozosterops goodfellowi*, *Zosterops montanus whiteheadi*], 14 [*Zosterops montanus vulcani*].

Hartert, E.J.O. (1903). *Novit. Zool.* **10**(1): 28 [*Dicaeum celebicum kuehni*], 29 [*Cinnyris jugularis infrenatus*, *Zosterops chloris flavissimus*], 56 [*Myzomela chloroptera batjanensis*, *Myzomela obscura mortyana*].

Hartert, E.J.O. (1904). *Bull. Brit. Orn. Club* **14**(5): 50 [*Certhia brachydactyla dorotheae*]; **14**(6): 61 [*Zosterops luteirostris*]; **14**(8): 79 [*Dicaeum ignipectus apo*], 80 [*Dicaeum ignipectus bonga*]; **15**(1): 8 [*Dicaeum nigroline*].

Hartert, E.J.O. (1904). *Novit. Zool.* **11**(1): 214 [*Cinnyris solaris exquisitus*], 218 [*Oriolus flavocinctus migrator*], 219 [*Oriolus melanotis finschi*].

Hartert, E.J.O. (1905). *Bull. Brit. Orn. Club* **15**(5): 45 [*Zosterops japonicus alani*]; **15**(8): 74 [*Anthoscopus caroli ansorgei*], 75 [*Anthoscopus caroli sharpei*], 161 [*Sitta frontalis palawana*].

Hartert, E.J.O. (1905). *Vögel Pal. Fauna* **1**(3) (1910): 320 [*Certhia familiaris corsa*], 321 [*Certhia familiaris bianchi*, *Certhia familiaris tianshanica*], 333 [*Sitta europaea levantina*].

Hartert, E.J.O. (1906). *Bull. Brit. Orn. Club* **16**(7): 82 [*Zosterops kühni*].

Hartert, E.J.O. (1906). *Novit. Zool.* **13**(2): 404 [*Lanius cabanisi*].
Hartert, E.J.O. (1907). *Vögel Pal. Fauna* **1**(4) (1910): 424 [*Lanius excubitor bianchii*].
Hartert, E.J.O. (1908). *Bull. Brit. Orn. Club* **21**(9): 105 [*Myzomela eichhorni atrata*], 106 [*Zosterops veltallavella*].
Hartert, E.J.O. (1910). *Bull. Brit. Orn. Club* **27**(1): 12 [*Cinnyris jugularis buruensis*].
Hartert, E.J.O. (1914). *Bull. Brit. Orn. Club* **35**(3): 34 [*Sitta azurea expectata*].
Hartert, E.J.O. (1917). *Bull. Brit. Orn. Club* **38**(1): 7 [*Dicaeum siparaja tonkinensis*].
Hartert, E.J.O. (1918). *Bull. Brit. Orn. Club* **38**(8): 74 [*Dicaeum trigonostigma megastoma*], 75 [*Dicaeum trigonostigma flavicinctus*].
Hartert, E.J.O. (1920). *Novit. Zool.* **27**(2): 428 [*Cinnyris sovimanga apolis*].
Hartert, E.J.O. (1922). *Bull. Brit. Orn. Club* **42**(3): 49 [*Cinnyris loveridgei*].
Hartert, E.J.O. (1923). *Vögel Pal. Fauna, Nachtrag* **1**: 33 [*Zosterops japonicus hainanus*].
Hartert, E.J.O. (1926). *Novit. Zool.* **33**(1): 48 [*Zosterops griseotinctus eichhorni*].
Hartert, E.J.O. (1928). *Novit. Zool.* **34**(3): 204 [*Prosthodera novaeseelandiae chathamensis*].
Hartert, E.J.O. (1929). *Amer. Mus. Novit.* **364**: 8 [*Guadalcarnaria, Guadalcarnaria inexpectata*], 9 [*Dicaeum aeneum beckii*], 10 [*Zosterops rendovae oblitus*], 11 [*Zosterops murphyi*], 12 [*Zosterops splendidus*].
Hartert, E.J.O. (1930). *Novit. Zool.* **36**(1): 45 [*Melilestes megarhynchus stresemanni*], 47 [*Meliphaga montana germanorum*], 49 [*Ptiloprora mayri, Ptiloprora perstriata praedicta, Xanthotis polygrammus kuehni*].
Hartlaub (1844). *Rev. Zool.* **7**: 216 [*Psaltiriparus minimus melanotis*].
Hartlaub (1848). *Rev. Zool.* **11**: 109 [*Speirops lugubris*].
Hartlaub (1854). *J. Orn.* **2**(2): 100 [*Lanius senator badius*].
Hartlaub (1857). *Syst. Orn. Westafri.*: 50 [*Anabathmis reichenbachii, Anabathmis hartlaubi*], 52 [*Anthodiaeta collaris subcollaris*], 54 [*Pholidornis*], 71 [*Speirops leucophoeus*], 104 [*Corvinella corvina affinis*], 266 [*Oriolus crassirostris*], 270 [*Cinnyris erythrocerus*].
Hartlaub (1860). *J. Orn.* **8**(2): 90 [*Cinnyris coquerellii*].
Hartlaub (1861). *J. Orn.* **8**(5) (1860): 340 [*Cinnyris dussumieri*]; **9**(1): 13 [*Anthreptes gabonicus*].
Hartlaub (1862). *Ibis Ser.* **1, no. 4**: 341 [*Cinnyris cupreus chalcus*].
Hartlaub (1865). *J. Orn.* **13**(1): 8 [*Zosterops pallidus sundevalli*], 15 [*Zosterops palpebrosus melanurus*], 26 [*Heleia, Heleia muelleri*].
Hartlaub (1866). *Proc. Zool. Soc. London* **1866**(2): 327 [*Zosterops ficedulins*].
Hartlaub (1868). In: Hartlaub & Finsch, *Proc. Zool. Soc. London* **1868**(1): 6, plate 3 [*Zosterops finschii*], 117 [*Zosterops semperi*].
Hartlaub (1880). *J. Orn.* **28**(2): 213 [*Anthreptes orientalis*].
Hartlaub (1882). *Orn. Centralbl.* **7**: 91 [*Anthoscopus musculus, Lanius gubernator*].
Hartlaub (1884). *Proc. Zool. Soc. London* **1884**(3): 415 [*Salpornis spilonomus emini*].
Hartlaub & Finsch (1872). *Proc. Zool. Soc. London* **1872**(1): 95 [*Zosterops hypoleis, Zosterops oleagineus*].
Hartlaub & Heuglin (1859). In: Heuglin, *Ibis Ser.* **1, no. 1**: 342 [*Lanius somalicus*].
Hartmann (1866). *J. Orn.* **14**(3): 205 [*Chalcomitra senegalensis acit*].
Hellmayr (1912). *Novit. Zool.* **19**(2): 210 [*Dicaeum sanguinolentum hanieli*].
Hemprich & Ehrenberg (1828). In: Ehrenberg, *Symb. Phys. Icones Descr. Avium* **1**: fol. a [p. 3], plate 4 [*Cinnyris habessinicus*].
Hemprich & Ehrenberg (1833). In: Ehrenberg, *Symb. Phys. Icones Descr. Avium* **1** (1828): fol. e, footnote [p. 13] [*Lanius isabellinus*].
Hermann (1783). *Tab. Affin. Anim.*: 223 [*Dicaeum australe*].
Hermann (1804). *Obs.* **Vol.**: 136 [*Leptocoma zeylonica flaviventris*], 214 [*Aegithalos, Aegithalos caudatus europaeus*].
Heuglin (1861). *Ibis Ser.* **1, no. 3**: 357 [*Zosterops polioastrus*].
Heuglin (1864). *J. Orn.* **12**(4): 260 [*Anthoscopus parvulus*].
Heuglin (1873). *Orn. Nordost-Afr.* **2**(2) (Nachträge & Berichtigungen 5): 70 [*Cinnyris venustus fazoqlensis*].
Hodgson (1836). *India Rev.* **1**(7): 272 [*Arachnothera magna*], 273 [*Aethopyga nipalensis, Aethopyga saturata, Aethopyga ignicauda*].
Hodgson (1837). *India Rev.* **1**(10): 446 [*Lanius schach tricolor*].
Holdsworth (1872). *Proc. Zool. Soc. London* **1872**(2): 459, plate 20, fig. 2 [*Zosterops ceylonensis*].
Holub & Pelzeln (1882). *Beitr. Orn. Südafrikas*: 97, plate 2 [*Lanius collaris pyrrhisticus*].
Hombrom & Jacquinet (1841). *Ann. Sci. Nat. Zool. Ser.* **2, no. 16**(20): 314 [*Gymnomyza samoensis, Philemon subcorniculatus*].
Hoogerwerf (1967). *Bull. Brit. Orn. Club* **87**(1): 7 [*Chalcoparia singalensis bantenensis*].
Horsfield (1821). *Trans. Linn. Soc. London* **13**: 144 [*Lanius schach benter*], 152 [*Oriolus xanthonotus*], 156 [*Lophozosterops javanicus*], 166 [*Arachnothera affinis*], 168 [*Aethopyga eximia*], 170 [*Zosterops flavus*].
Horsfield (1840). *Proc. Zool. Soc. London* **1839**(7), no. 82: 167 [*Aethopyga siparaja labalecula*].
Hume (1870). *Ibis Ser.* **2, no. 6**: 436 [*Cinnyris asiaticus intermedius*].
Hume (1873). *Stray Feathers* **1**(5): 404 [*Cinnyris jugularis andamanicus*], 412 [*Aethopyga siparaja nicobarica*]; **1**(6): 482 [*Dicaeum concolor virescens*].
Hume (1874). *Stray Feathers* **2**(6): 473, footnote [*Aethopyga siparaja cara*], 513 [*Leptopoeice sophiae stoliczkae*], 521 [*Remiz coronatus stoliczkae*].
Hume (1875). *Stray Feathers* **3**(4): 298 [*Dicaeum agile modestum*].
Hume (1878). *Stray Feathers* **6**(1–6), App. 1: 519 [*Zosterops palpebrosus auriventer*].
Hume (1881). *Stray Feathers* **10**(1–3): 151 [*Certhia manipurensis*].
Hume (1888). *Stray Feathers* **11**(1–4): 254 [*Aegithalos concinnus manipurensis*].
Illiger (1811). *Prodromus Syst. Mammalium Avium*: 210 [*Nectarinia, Tichodroma*].
Indrawan, Rasmussen & Sunarto (2008). *Wilson J. Orn.* **120**(1): 3 [*Zosterops somadikarta*].
Ingram (1906). *Bull. Brit. Orn. Club* **16**(9): 116 [*Lichenostomus virescens forresti*].
Ingram (1913). *Zoologist (London) Ser.* **4, no. 17**: 137 [*Aegithalos caudatus taiti*].
Irwin (1963). *Bull. Brit. Orn. Club* **83**(1): 2 [*Anthoscopus caroli rankinei*].
Jackson, F.J. (1904). *Bull. Brit. Orn. Club* **14**(9): 94 [*Cyanomitra alinae*].
Jardine (1831). *Edinburgh J. Nat. and Geogr. Sci.* **3**: 209 [*Corvinella melanoleuca*].
Jardine (1842). *Ann. Mag. Nat. Hist. Ser.* **1, no. 10**: 187, plate 13 [*Chalcomitra rubescens stangerii*], 188, plate 14 [*Cinnyris chloropygius*].
Jardine (1843). *Nat. Lib. Orn. (Nectarini)* **13**, 1st edition: 244 [*Chalcomitra adelberti eboensis*], 253 [*Cyanomitra obscura*], 263 [*Leptocoma calcostetha*].
Jardine & Fraser (1851). In: Jardine, *Contr. Orn.* **1851**: 153 [*Anthodiaeta collaris hypodila*], 154 [*Cyanomitra cyanolaema, Anthreptes rectirostris tephrolaemus*].
Jardine & Fraser (1852). In: Jardine, *Contr. Orn.* **1852**: 59 [*Cinnyris johannae fasciatus*].
Jardine & Selby (1835). *Illustr. Orn.* **3**(10): plate 144 and text [*Sitta himalayensis*].
Jardine & Selby (1843). *Illustr. Orn. (New Ser.)* **1**(8): plate 52 and text [*Deleornis fraseri*].
Jarocki (1819). *Spis Ptaków w Gab. Zool. Król. Warszawy*: 21 [*Remiz*].
Jensen (1983). *Ibis* **125**(4): 447, plate 1 [*Cinnyris rufipennis*].
Jerdon (1840). *Madras J. Lit. Sci.* **11**: 227 [*Dicaeum concolor*].
Johansen, H.C. (1952). *J. Orn.* **92**(3/4) (1944): 199 [*Lanius collurio pallidifrons*].
Johansen, H.E. (1907). *Orn. Jahrb.* **18**: 201 [*Remiz macronyx spasschnikovi*].
Jourdain (1910). *Bull. Brit. Orn. Club* **27**(3): 39 [*Aegithalos caudatus italiae*].
Jouy (1894). *Proc. US Natl. Mus.* **16**: 776 [*Psaltiriparus minimus iulus*].
Junge (1939). *Nova Guinea Rés. Exp. Sci. Néerl. (Nouv. Sér.)* **3**: 59 [*Melidectes fuscus occidentalis*], 82 [*Macgregoria pulchra carolinae*].
Junge (1952). *Zool. Meded. Leiden* **31**(22): 249 [*Dicaeum geelvinkianum obscurifrons*].
Kennedy, Gonzales & Miranda (1997). *Auk* **114**(1): 3 and frontispiece [*Aethopyga linaraborae*], 7 and frontispiece [*Aethopyga boltoni tibolii*].
King, P.P. (1826). *Narr. Surv. Intertrop. West. Coasts Australia* **2**: 419 [*Oriolus flavocinctus*].
Kinneare (1920). *Bull. Brit. Orn. Club* **40**(7): 142 [*Sitta nagaensis griseiventris*].
Kinneare (1924). *Bull. Brit. Orn. Club* **44**(6): 69 [*Myzomela obscura aruensis*].
Kinneare (1929). *Bull. Brit. Orn. Club* **49**(9): 109 [*Certhia himalayana ripponi*].
Kinneare (1936). *Bull. Brit. Orn. Club* **56**(4): 71 [*Sitta cinnamomensis tonkinensis*].
Kinneare & Whistler (1930). *Bull. Brit. Orn. Club* **51**(2): 27 [*Sitta cinnamomensis almorae*].
Kittlitz (1830). *Mém. Acad. Imp. Sci. St. Pétersbourg Ser.* **2, no. 1**(3): 235, plate 13 [*Apalopteron familiare*].
Kittlitz (1832). *Kupfer Naturgesch. Vögel*, Part 1: 6, plate 8, fig. 2 [*Zosterops cinereus*].
Kittlitz (1833). *Kupfer Naturgesch. Vögel*, Part 2: 15, plate 19, fig. 1 [*Zosterops conspiciatus*].
Kittlitz (1835). *Mém. Acad. Imp. Sci. St. Pétersbourg* **2**: 2, plate 2 [*Dicaeum pygmaeum*].
Kloss (1918). *Ibis Ser.* **10, no. 6**: 218 [*Chalcoparia singalensis koratensis*].
Kloss (1921). *J. Fed. Malay States Mus.* **10**: 209 [*Chalcoparia singalensis borneana, Chalcoparia singalensis sumatrana*].
Kloss (1930). *Bull. Brit. Orn. Club* **50**(7): 70 [*Chalcoparia singalensis assamensis*].
Koelz (1950). *Amer. Mus. Novit.* **1452**: 7 [*Lanius tephronotus lahulensis*], 9 [*Sitta neumayer plumbea*].
Kummerlöwe & Niethammer (1934). *J. Orn.* **82**(4): 546 [*Certhia brachydactyla stresemanni*].
Kuroda, Nagamichi (1920). *Tori* **2**: 230 (In English 231) [*Dicaeum concolor uchidai*].
Kuroda, Nagamichi (1923). *Auk* **40**: 313 [*Aegithalos caudatus kiusiuiensis*].
Kuroda, Nagamichi (1923). *Bull. Brit. Orn. Club* **43**(6): 120 [*Zosterops japonicus daitoensis*].
Kuroda, Nagamichi (1925). *Tori* **4**: 3 [*Oriolus xanthornus tanakae*].
Kuroda, Nagamichi (1927). *Tori* **5**: 257 [*Oriolus chinensis yamamurae*].
La Touche (1899). *Ibis Ser.* **7, no. 5**: 404 [*Sitta nagaensis montium*].
La Touche (1921). *Bull. Brit. Orn. Club* **42**: 32 [*Arachnothera longirostra sordida*].
Latham (1790). *Index Orn.* **1**: 262 [*Sitta carolinensis*], 263 [*Sitta pusilla*], 276 [*Philemon corniculatus*], 288 [*Cinnyris asiaticus*], 296 [*Lichmera incana, Phylidonyris novaehollandiae*], 298 [*Cyanomitra verticalis*], 299 [*Arachnothera longirostra, Dicaeum erythrorhynchos*]; **2**: 553 [*Phylidonyris novaehollandiae canescens*].
Latham (1801). *Suppl. Gen. Synop. Birds* **2**: 35 [*Cinnyris coccinigastrus*].
Latham (1801). *Suppl. Index Orn.*: 20 [*Lanius cristatus superciliosus*], 26 [*Oriolus sagittatus*], 28 [*Manorina melanocephala*], 29 [*Entomozon cyanotis*], 33 [*Anthochaera chrysopatera*], 34 [*Philemon corniculatus monachus*], 36 [*Acanthorhynchus tenuirostris, Gliciphila melanops*], 37 [*Myzomela sanguinolenta*], 38 [*Phylidonyris pyrrhopterus*], 40 [*Lichenostomus melanops*], 42 [*Manorina melanophrys*], 44 [*Lichenostomus leucotis*], 54 [*Lichenostomus chrysops*], 55 [*Zosterops lateralis*].
Lawrence (1851). *Ann. Lync. Nat. Hist.* **5**: 112 [*Auriparus flaviceps ornatus*].
Lawson (1969). *Bull. Brit. Orn. Club* **89**(1): 16 [*Oriolus larvatus additus*].
Layard, E.L. (1875). *Proc. Zool. Soc. London* **1875**(1): 28 [*Xanthotis provocator*], 29 [*Zosterops explorator*]; **1875**(2): 150 [*Gymnomyza viridis*].
Layard, E.L. (1878). *Ann. Mag. Nat. Hist. Ser.* **5, no. 1**: 375 [*Zosterops minutus, Zosterops inornatus*].
Layard, E.L. & Layard, E.L.C. (1878). *Ibis Ser.* **4, no. 2**: 258 [*Myzomela cardinalis lifuensis*].
Lesson (1827). In: Levrault, *Dict. Sci. Nat.* **50**: 15 [*Cinnyris jugularis ornatus*], 18 [*Cinnyris jugularis clementiae*], 21 [*Leptocoma sericea*], 22 [*Toxorhynchus novaeguineae*], 30 [*Myzomela rubratra*].
Lesson (1828). *Man. d'Orn. Descr. Espèces d'Oiseaux* **2**: 67 [*Xanthotis flaviventer*].
Lesson (1830). In: Duperrey, *Voy. 'Coquille' Zool.* **1**(2), Livr. **15**: 673 [*Melanocharis nigra*].
Lesson (1830). *Traité d'Orn.*, Livr. **4**: 298 [*Phylidonyris*], 303 [*Dicaeum maugei*], 306 [*Certhionyx variegatus*], 316 [*Sitta azurea, Sitta castanea*].
Lesson (1831). In: Bélanger, *Voy. Ind. Orient. Zool.*, Part **4**: 250 [*Lanius collurioides*].
Lesson (1831). *Traité d'Orn.*, Livr. **5**: 372 [*Corvella*], 6: 401 [*Philemon diemenensis*].
Lesson (1833). *Illustr. Zool.*, Livr. **8**: plate 23 [*Anthreptes longuemare*].
Lesson (1839). *Rev. Zool.* **2**: 134 [*Lanius meridionalis algeriensis*], 167 [*Melithreptes affinis*].
Lesson (1847). *Descr. Mamm. et Ois. Rés. Découv.*: 271 [*Chalcomitra fuliginosa aurea*].
Lesson & Garnot (1827). *Bull. Sci. Nat. Géol. Férussac* **11**: 386 [*Myzomela eques*].
Lesson & Garnot (1828). In: Duperrey, *Voy. 'Coquille' Zool. Atlas*, Livr. **7**: plate 30, figs. 1–2 [*Dicaeum erythrothorax*].
Levin (1808). *Birds New Holland*: 4, plate 5 [*Meliphaga*].
Li Guiyaun (1995). *Acta Zootaxonomica Sinica* **20**(3): 373 (In English 376) [*Certhia tianquanensis*].
Lichtenstein, M.H.C. (1823). *Verz. Doubl. Zool. Mus. Berlin*: 15 [*Anthodiaeta metallica*], 20 [*Oriolus larvatus*], 47 [*Lanius mubicus*].
Linnaeus (1758). *Syst. Nat.*, 10th edition, **1**: 93 [*Lanius, Lanius cristatus*], 94 [*Lanius collurio, Lanius excubitor, Lanius schach, Lanius senator*], 107 [*Oriolus oriolus*], 108 [*Oriolus xanthornus*], 115 [*Sitta, Sitta europaea*], 117 [*Promerops cafer*], 118 [*Certhia, Certhia familiaris*], 119 [*Dicaeum cruentatum*], 189 [*Remiz pendulus*], 190 [*Aegithalos caudatus*].
Linnaeus (1766). *Syst. Nat.*, 12th edition, **1**: 134 [*Lanius ludovicianus*], 135 [*Lanius cristatus lucionensis, Lanius collaris*], 160 [*Oriolus, Oriolus chinensis*], 177 [*Sitta canadensis*], 184 [*Tichodroma muraria*], 185 [*Cinnyris jugularis, Zosterops olivaceus*], 186 [*Leptocoma sperata, Chalcomitra senegalensis, Chalcomitra senegalensis gutturalis, Cinnyris chalybeus, Cinnyris afer*], 187 [*Cinnyris pulchellus, Nectarinia famosa*], 188 [*Leptocoma zeylonica, Cinnyris lotenisi, Anthobaphes violacea*], 334 [*Zosterops maderaspatanus*].
Lister (1889). *Proc. Zool. Soc. London* **1888**(4): 518, plate 27 [*Zosterops natalis*].
Longmore & Boles (1983). *Emu* **83**(2): 59 [*Lichenostomus hindwoodi*].
Lönnberg (1925). *Sarawak Mus. J.* **3**: 1 [*Dicaeum concolor borneanum*].
Lorenz von Lieburnau & Hellmayr (1901). *Orn. Monatsber.* **9**(2): 31 [*Zosterops abyssinicus arabs*]; **9**(3): 39 [*Lanius meridionalis buryi*].
Macdonald (1958). *Bull. Brit. Orn. Club* **78**(1): 9 [*Cinnyris prigoginei*].
Madarász (1900). *Orn. Monatsber.* **8**(1): 3 [*Pycnopygius ixoides proximus*].
Madarász (1901). *Termés. Fizetek* **24**(1/2): 76 [*Oriolus szalai*].
Madarász (1911). *Ann. Hist.-Nat. Mus. Nat. Hungarici* **9**: 422, plate 16, fig. 1 [*Zosterops palpebrosus egregius*].
Manuel & Gilliard (1953). *Auk* **70**: 90 [*Dicaeum anthonyi kampalii*].
van Marle (1940). *Limosa* **13**: 69 [*Lophozosterops squamiceps stresemanni*].
Mathews (1911). *Bull. Brit. Orn. Club* **27**(9): 100 [*Myzomela obscura harterti*].
Mathews (1911). *Novit. Zool.* **18**(1): 19 [*Grantiella*].
Mathews (1912). *Austral Avian Rec.* **1**(2): 48 [*Pardalotus striatus melvillensis*], 50 [*Lichmera indistincta melvillensis, Lichenostomus flavescens melvillensis, Lichenostomus virescens cooperi*], 51 [*Manorina flavigula melvillensis*]; **1**(4): 96 [*Pardalotus punctatus militaris*], 99 [*Lichenostomus chrysops samueli, Lichenostomus leucotis thomasi, Lichenostomus plumulus graingeri*], 101 [*Philemon argenticeps kempi, Anthochaera chrysopatera halmaturina*], 102 [*Philemon buceroides gordonii, Philemon buceroides yorki*]; **1**(5): 115 [*Ramsayornis*].
Mathews (1912). *Novit. Zool.* **18**(3): 385 [*Zosterops lateralis cornwalli*], 388 [*Pardalotus striatus substriatus*], 394 [*Melithreptes brevisiridis pallidiceps*], 397 [*Acanthorhynchus tenuirostris cairnsensis*], 403 [*Meliphaga gracilis imitatrix, Meliphaga notata mixta*], 404 [*Meliphaga lewinii mab*], 406 [*Lichenostomus chrysops barroni*], 408 [*Lichenostomus melanops meltoni*], 411 [*Lichenostomus fuscus subgermanus*], 412 [*Lichenostomus flavus addendus*], 413 [*Lichenostomus penicillatus calceoli*], 417 [*Manorina melanocephala leachi*], 418 [*Manorina flavigula wayensis*], 419 [*Anthochaera carunculata woodwardi*], 420 [*Anthochaera chrysopatera tasmanica*], 435 [*Oriolus flavocinctus kingi*], 436 [*Sphecotheres vieilloti ashbyi*].
Mathews (1913). *Austral Avian Rec.* **2**(1): 10 [*Pardalotus rubricatus yorki*].
Mathews (1914). *Austral Avian Rec.* **2**(5): 111 [*Purnella*].
Mathews (1914). *South Austr. Orn.* **1**(2): 12 [*Glycichaera fallax claudi*].
Mathews (1922). *Austral Avian Rec.* **5**(1): 7 [*Sugomel*].
Mathews (1923). *Austral Avian Rec.* **5**(2/3): 38 [*Anthochaera carunculata clelandi, Phylidonyris novaehollandiae campbelli*].
Mathews (1925). *Birds Austr.* **12**(2): 76 [*Anthochaera paradoxa kingi*].
Mathews (1926). *Bull. Brit. Orn. Club* **46**(4): 60 [*Lichmera lombokia*].

Mathews (1929). *Bull. Brit. Orn. Club* **50**(1): 11 [Glycfohia].

Mathews (1938). *Bull. Brit. Orn. Club* **58**(3): 44 [Aegithalos caudatus rosaceus].

Mayr (1931). *Amer. Mus. Novit.* **486**: 27 [Myzomela cardinalis sanfordi]; **504**: 25 [Myzomela malaitae], 26 [Zosterops stresemanni].

Mayr (1931). *Bull. Brit. Orn. Club* **51**(4): 59 [Ptiloprora plumbea granti].

Mayr (1931). *Mitt. Zool. Mus. Berlin* **17**(5): 658 [Timeliopsis fulvigula fuscicapilla], 660 [Melidectes torquatus polyphonus], 661 [Melidectes ochromelus lucifer], 664 [Xanthotis polygrammus lophotis], 665 [Xanthotis polygrammus septentrionalis], 666 [Ptiloprora guisei umbrosa, Pycnopygius ixoides unicus], 669 [Melanocharis longicauda captata, Melanocharis longicauda orientalis], 670 [Melanocharis striativentris axillaris, Melanocharis striativentris chrysocome], 671 [Zosterops novaeguineae oreophilus], 715 [Rhamphocharis crassirostris viridescens].

Mayr (1932). *Amer. Mus. Novit.* **516**: 3 [Gymnomyza viridis brunneirostris], 15 [Glycfohia notabilis superciliaris], 16 [Stresemannia bougainvillei], 28 [Myzomela eichhorni ganongae].

Mayr (1933). *Orn. Monatsber.* **41**(2): 53 [Zosterops minor gregarius].

Mayr (1936). *Amer. Mus. Novit.* **869**: 5 [Leptocoma sericea vicina], 6 [Dicaeum geelvinkianum violaceum], 7 [Melidectes torquatus nuchalis].

Mayr (1936). *Bull. Brit. Orn. Club* **57**(2): 42 [Melidectes belfordi kinneari].

Mayr (1937). *Amer. Mus. Novit.* **912**: 2 [Zosterops flavifrons efatensis], 3 [Myzomela cardinalis tenuis], 4 [Myzomela cardinalis tucoipae].

Mayr (1938). *Bull. Raffles Mus. Singapore* **14**: 42 [Prionochilus maculatus oblitus].

Mayr (1938). *Field Mus. Nat. Hist. (Zool. Ser.)* **20**: 468 [Lichmera alboauricularis olivacea].

Mayr (1940). *Ibis Ser.* **14**, no. 4: 705 [Aegithalos bomvaloti obscuratus].

Mayr (1944). *Bull. Amer. Mus. Nat. Hist.* **83**: 167 [Dicaeum agile tinctum].

Mayr (1945). In: Delacour & Mayr, *Zoologica* **30**(3): 116 [Zosterops montanus pectoralis].

Mayr (1946). *Zoologica* **31**: 8 [Dicaeum hypoleucum pontifex].

Mayr (1955). *Amer. Mus. Novit.* **1707**: 43 [Myzomela cruentata cantans], 45 [Zosterops hypoxanthus ultimus].

Mayr & Gilliard (1951). *Amer. Mus. Novit.* **1524**: 13 [Melidectes princeps], 14 [Zosterops novaeguineae wahgiensis].

Mayr & Gilliard (1954). *Bull. Amer. Mus. Nat. Hist.* **103**: 372 [Paramythia montium brevicauda].

Mayr & Meyer de Schauensee (1939). *Proc. Acad. Nat. Sci. Philadelphia* **91**: 142 [Meliphaga flaviviridis crockettorum].

Mayr & Rand (1935). *Amer. Mus. Novit.* **814**: 12 [Myzomela rosenbergii longirostris], 13 [Oedistoma iliophilus flavum], 15 [Xanthotis polygrammus candidior, Philemon citreogularis papuensis], 16 [Zosterops fuscicapilla crookshanki, Zosterops novaeguineae wurui].

Mayr & Rand (1936). *Mitt. Zool. Mus. Berlin* **21**(2): 247 [Melidectes belfordi brassi].

McClelland (1839). *Proc. Zool. Soc. London* **1839**(7), no. 82: 167 1: 322 [Aethopyga saturata assamensis].

McCoey (1866). *Australasian Post* **1**(39): 1221 [Pardalotus punctatus xanthopyge].

McGregor (1904). *Proc. Biol. Soc. Washington* **17**: 165 [Zosterops nigrorum richmondi].

McGregor (1905). *Bull. Bureau Govt. Labs. Manila* **25**: 30 [Aethopyga bella rubrinota].

McGregor (1907). *Philippine J. Sci.* **2**(5) (Sect. A): 330 [Aethopyga pulcherrima decorosa], 343 [Zosterops meyeri batanisi], 348 [Zosterops nigrorum meyeri].

McGregor (1908). *Philippine J. Sci.* **3**(4) (Sect. A): 283 [Zosterops everetti bohollensis].

McGregor (1914). *Philippine J. Sci.* **9**(6) (Sect. D): 531 [Dicaeum anthonyi].

McGregor (1927). *Philippine J. Sci.* **32**(4): 520 [Prionochilus olivaceus parsonsi].

Mearns (1898). *Auk* **15**: 261 [Lanius ludovicianus anthonyi].

Mearns (1902). *Proc. US Natl. Mus.* **24**: 923 [Sitta carolinensis nelsoni].

Mearns (1905). *Proc. Biol. Soc. Washington* **18**: 4 [Aethopyga boltoni], 6 [Anthreptes malacensis gagayensis], 86 [Lanius schach suluensis], 87 [Dicaeum pygmaeum davao].

Mearns (1907). *Philippine J. Sci.* **2**(5) (Sect. A): 360 [Zosterops montanus halconensis].

Mearns (1909). *Proc. US Natl. Mus.* **36**: 443 [Lophozosterops goodfellowi malindangensis], 444 [Cinnyris jugularis woodi].

Mearns (1910). *Smithsonian Misc. Coll.* **56**(14): 4 [Cyanomitra olivacea changamwensis], 5 [Anthodiaeta collaris elachior].

Mearns (1915). *Proc. US Natl. Mus.* **48**: 389 [Anthodiaeta collaris garguensis].

Mees (1953). *Zool. Meded. Leiden* **33**: 26 [Zosterops novaeguineae aruensis], 64 [Oculocincta].

Mees (1954). *Ardea* **42**(3/4): 356 [Chlorocharis emiliae fusciceps].

Mees (1955). *Zool. Meded. Leiden* **33**: 300 [Zosterops kulambangrae paradoxus]; **34**: 153 [Zosterops novaeguineae magnirostris].

Mees (1964). *Zool. Meded. Leiden* **40**(15): 128 [Dicaeum pectorale ignotum].

Mees (1964). *Zool. Verhand. Leiden* **66**: 23 [Cinnyris jugularis robustirostris].

Mees (1965). *Ardea* **53**: 43 [Leptocoma sericea caeruleogula], 46 [Leptocoma sericea veronica], 50 [Leptocoma sericea aircicapilla].

Mees (1966). *Zool. Meded. Leiden* **41**: 255 [Anthreptes malacensis extremus].

Mees (1969). *Zool. Verhand. Leiden* **102**: 100 [Zosterops lateralis tropicus], 195 [Lophozosterops goodfellowi gracilis].

Meinertzhagen, R. (1926). *Bull. Brit. Orn. Club* **46**(6): 83 [Salpornis spilonotus rajputanae].

Meinertzhagen, R. (1953). *Bull. Brit. Orn. Club* **73**(6): 72 [Lanius meridionalis theresae].

Meise (1929). *J. Orn.* **77**(3): 443 [Myzomela chloroptera eva].

Meise (1929). *Orn. Monatsber.* **37**(3): 84 [Myzomela pammelaena ernstmayri, Myzomela pammelaena hades].

Meise (1950). *Orn. Ber.* **2**: 118 [Stresemannia].

Meise (1952). *J. Orn.* **93**(3/4): 365 [Zosterops chloris mentoris].

Meise (1958). *Abh. Verh. Naturw. Ver. Hamburg (N. F.)* **2** (1957): 77 [Corvinella melanoleuca angolensis], 80 [Zosterops senegalensis heinrichi].

Menzbier (1885). *Ibis Ser.* **5**, no. 3: 353 [Leptopocile sophiae major].

Menzbier (1894). *Ibis Ser.* **6**, no. 6: 379 [Lanius excubitor fumereus].

Menzbier (1903). *Bull. Brit. Orn. Club* **13**(5): 49 [Aegithalos caudatus tauricus].

Mertens (1923). *Senckenbergiana* **5**: 228 [Lanius schach stresemanni], 229 [Melidectes torquatus cahni].

Meyer, A.B. (1874). *Sitzungsber. K. Akad. Wiss. Wien. Math.-naturwiss. Cl.* **70**(1): 110 [Melidectes leucostephes], 111 [Melidectes ochromelas], 112 [Xanthotis polygrammus poikilosternus], 113 [Philemon buceroides jobiensis], 115 [Zosterops minor], 116 [Zosterops mysorensis], 120 [Dicaeum geelvinkianum], 123 [Leptocoma sericea majorensis], 124 [Leptocoma sericea mysorensis, Leptocoma sericea sangirensis]; **70**(2): 202 [Myzomela cruentata], 203 [Myzomela obscura rubrobrunnea].

Meyer, A.B. (1875). *Sitzungsber. Naturwiss. Ges. Isis Dresden* **1875**(1–6): 75 [Oreocharis arfaki].

Meyer, A.B. (1884). *Abh. Naturwiss. Gesell. Isis Dresden* **1884**(1): 38 [Dicaeum maugei salvadorii], 41 [Philemon kisserensis].

Meyer, A.B. (1884). *Zeitschr. ges. Orn.* **1**: 207, plate 7 [Leptocoma sperata henkei], 216 [Philemon buceroides aruensis].

Meyer, A.B. (1886). *Zeitschr. ges. Orn.* **3**: 22, plate 4, fig. 1 [Melipotes fumigatus], 22, plate 4, fig. 2 [Melidectes torquatus emili].

Meyer, A.B. (1894). *J. Orn.* **42**(1): 92 [Meliphaga orientalis].

Meyer, A.B. (1904). *Notes Mus. Leyden* **24**: 234 [Zosterops consobrinorum].

Meyer, A.B. & Wilesworth (1894). *Abh. Ber. Mus. Dresden* **5**(4): 2 [Myza celebensis].

Meyer, A.B. & Wilesworth (1894). *J. Orn.* **42**(1): 115 [Zosterops salvadorii], **42**(3): 244 [Leptocoma sericea talautensis], 247 [Oriolus chinensis melanisticus].

Meyer, A.B. & Wilesworth (1895). *Abh. Ber. Mus. Dresden* **5**(8): 11 [Myza, Myza sarasinorum]; **5**(9): 5 [Dicaeum celebicum talautense], 6 [Zosterops everetti babel].

Meyer, A.B. & Wilesworth (1896). *Abh. Ber. Mus. Dresden* **6**(1): 11 [Myza celebensis meridionalis], 12 [Zosterops anomalus], 16 [Oriolus chinensis boneratenensis], **6**(2): 17 [Zosterops atrifrons subatrifrons].

Meyer, A.B. & Wilesworth (1898). *Birds Celebes* **2**: 591 [Oriolus chinensis sangirensis].

Meyer de Schauensee (1932). *Proc. Acad. Nat. Sci. Philadelphia* **84**: 198 [Zosterops senegalensis quanae].

Meyer de Schauensee (1940). *Proc. Acad. Nat. Sci. Philadelphia* **92**: 39 [Prionochilus percussus regulus].

Meyer de Schauensee (1946). *Proc. Acad. Nat. Sci. Philadelphia* **98**: 79 [Aethopyga siparaja transiensis].

Meyer de Schauensee & Ripley (1940). *Proc. Acad. Nat. Sci. Philadelphia* **91**: 410 [Dicaeum cruentatum niasense].

Michahelles (1830). *Isis (Oken)* **23**(8): col. 814 [Sitta neumayer].

Miller, G.S. (1895). *Auk* **12**: 186 [Certhia americana alticola].

Miller, W. deW. & Griscom (1925). *Amer. Mus. Novit.* **183**: 6 [Certhia americana extima].

Milligan (1903). *Emu* **2**(3): 161 [Melithreptus brevirostris leucogenys].

Milligan (1904). *Emu* **3**(4): 226 [Lichenostomus leucotis novaenoriae].

Millne-Edwards, A. & Oustalet (1885). *Compt. Rend. Acad. Sci. Paris* **101**: 220 [Cinnyris humbloti], 221 [Zosterops mauroniensis].

Momiya (1922). *Birds Micron.* **2** [Rukia], 17 [Myzomela rubratra kurodai], 19 [Myzomela rubratra kobayashii], 22 [Zosterops semperi takatsukasai].

Momiya (1931). *Kaidori* **2**(8): 20 [Sitta europaea takatsukasai].

Moore, F. (1854). In: Horsfield & Moore, *Cat. Birds Mus. East India Co.* **1**: 374 [Aegithalos leucogenys].

Moore, F. (1855). *Proc. Zool. Soc. London* **1854**(22), no. 268: 140 [Aegithalos glaucogularis, Aegithalos niveogularis].

Müller, S. (1843). In: Temminck, *Verhand. Natuurlijke Gesch. Nederl. Overzeesche Beziit.* **1** (Land- en Volkenkde.): 153 [Philemon buceroides novaeguineae], 162 [Lichmera limbata, Dicaeum pectorale, Dicaeum celebicum], 172, plate 10, figs. 1–2 [Myzomela boiei], 172, plate 10, figs. 3–4 [Myzomela vulnerata], 173 [Anthreptes simplex, Hypogramma hypogrammicum, Cinnyris jugularis frenatus, Aethopyga temminckii], 174 [Dicaeum agile obsoletum].

Müller, S. & Schlegel (1845). In: Temminck, *Verhand. Natuurlijke Gesch. Nederl. Overzeesche Beziit.* *Zool.* **1** (Aves): 68, plate 11, fig. 1 [Arachnothera robusta], 68, plate 11, fig. 2 [Arachnothera robusta armata].

Murphy (1929). *Amer. Mus. Novit.* **365**: 3 [Zosterops rendowae hamlini], 5 [Zosterops metacalfi exiguus], 7 [Zosterops kulambangrae tetipariensis], 10 [Zosterops rennellensis].

Murphy & Mathews (1929). *Amer. Mus. Novit.* **356**: 3 [Zosterops flavifrons perplexus, Zosterops flavifrons brevicauda], 5 [Zosterops flavifrons gaviensis, Zosterops flavifrons majusculus], 10 [Zosterops lateralis valensis], 11 [Zosterops samoensis], 13 [Woodfordia lacertosa].

Nelson & Palmer (1894). *Auk* **11**: 45 [Sitta carolinensis mexicana].

Neumann (1899). *Orn. Monatsber.* **7**(2): 23 [Zosterops senegalensis jacksoni], 24 [Nectarinia tacaze jacksoni].

Neumann (1900). *J. Orn.* **48**(3): 263 [Corvinella corvina togoensis], 297 [Cyanomitra olivacea neglecta].

Neumann (1902). *Orn. Monatsber.* **10**(1): 10 [Zosterops poliopterus kaffensis].

Neumann (1903). *Orn. Monatsber.* **11**(12): 185 [Cinnyris chloropygius bineschensis].

Neumann (1904). *Orn. Monatsber.* **12**(2): 29 [Cinnyris habessinicus hellmayri], **12**(10): 162 [Zosterops abyssinicus omoensis].

Neumann (1905). *J. Orn.* **53**(1): 228 [Lanius excubitorius intercedens], 236 [Oriolus larvatus angolensis].

Neumann (1906). *Orn. Monatsber.* **14**(1): 6 [Anthreptes longuemarei haussarum, Anthreptes longuemarei angolensis], 7 [Anthreptes longuemarei nyassae, Cinnyris habessinicus alter].

Neumann (1907). *Orn. Monatsber.* **15**(3): 52 [Salpornis spilonotus erlangeri].

Neumann (1908). *Bull. Brit. Orn. Club* **21**(5): 55 [Cinnyris stuhlmanni graueri], 59 [Zosterops abyssinicus sacotranus].

Neumann (1922). *Orn. Monatsber.* **30**(1): 13 [Anthreptes neglectus].

Neumann (1939). *Bull. Brit. Orn. Club* **59**(6): 93 [Oriolus chinensis stresemanni], 156 [Zosterops atrifrons sulaensis].

Newton, E. (1867). *Ibis Ser.* **2**, no. 3: 345 [Zosterops modestus].

Newton, E. (1877). *Proc. Zool. Soc. London* **1877**(2): 297 [Zosterops maderaspatanus anjanensis].

Nicholson (1879). *Ibis Ser.* **4**, no. 3: 167 [Zosterops palpebrosus buxtoni].

Norris (1958). *Univ. Calif. Publ. Zool.* **56**: 148 [Sitta pygmaea brunescens].

North (1895). *Ibis Ser.* **7**, no. 1: 340 [Lichenostomus keartlandi].

North (1899). *Rec. Austr. Mus.* **3**(5): 106 [Lichenostomus penicillatus leilavalensis].

North (1905). *Rec. Austr. Mus.* **6**(1): 20, plate 5, fig. 1–2 [Melithreptus brevirostris magnirostris].

North (1906). *Victorian Naturalist* **23**(5): 104 [Woodfordia, Woodfordia superciliosa].

North (1910). *Victorian Naturalist* **26**(9): 138 [Conopophila whitei].

North (1912). *Ibis Ser.* **9**, no. 6: 120 [Trichodere].

Oberholser (1897). *Auk* **14**: 391 [Auriparus flaviceps lamprocephalus].

Oberholser (1899). *Proc. US Natl. Mus.* **22**: 33 [Deleornis fraseri idius].

Oberholser (1912). *Smithsonian Misc. Coll.* **60**(7): 16 [Oriolus chinensis richmondi], 18 [Cinnyris jugularis polyclystus], 19 [Leptocoma sperata mecynorhyncha, Arachnothera longirostra zarhina], 21 [Chalcopygia singalensis panopsis, Dicaeum trigonostigma antioprocium].

Oberholser (1917). *Bull. US Natl. Mus.* **98**: 61 [Anthreptes malacensis anambae], 63 [Leptocoma sperata eumecis].

Oberholser (1917). *Proc. US Natl. Mus.* **54**: 186 [Oriolus chinensis lamprochryseus].

Oberholser (1919). *Wilson Bull.* **31**: 87 [Lanius ludovicianus grinnelli].

Oberholser (1923). *J. Washington Acad. Sci.* **13**: 228 [Anthreptes malacensis heliolisus], 229 [Anthreptes malacensis heliocalus], 230 [Cinnyris jugularis proselius], 232 [Aethopyga siparaja heliogona].

Oberholser (1932). *Bull. US Natl. Mus.* **159**: 104 [Arachnothera longirostra atita], 109 [Anthreptes malacensis erixanthus], 114 [Leptocoma sperata axantha].

Ogawa (1905). *Annot. Zool. Jap.* **5**: 186 [Zosterops japonicus insularis].

Ogilvie-Grant (1894). *Bull. Brit. Orn. Club* **3**(9): 49 [Aethopyga bella flavipectus, Lanius validirostris, Oriolus steerii albioris, Sitta oenochlamys mesoleuca], 50 [Aethopyga pulcherrima jefferyi, Cinnyris jugularis obscurior, Dicaeum ignipectus luzoniense, Dicaeum hypoleucum obscurum]; **4**(1): 2 [Oriolus isabellae].

Ogilvie-Grant (1895). *Bull. Brit. Orn. Club* **4**(5): 22 [Zosterops nigrorum luzonicus]; **4**(9): 40 [Zosterops nigrorum aureoloris].

Ogilvie-Grant (1896). *Bull. Brit. Orn. Club* **6**(3): 17 [Rhabdornis mystacalis minor], 18 [Rhabdornis inornatus].

Ogilvie-Grant (1896). *Ibis Ser.* **7**, no. 2: 251 [Xanthotis flaviventris pigolaster], 532 [Oriolus steerii basilanicus].

Ogilvie-Grant (1900). *Bull. Brit. Orn. Club* **10**(4): 37 [Sitta yunnanensis].

Ogilvie-Grant (1902). *Novit. Zool.* **9**(3): 480 [Lanius schach longicaudatus].

Ogilvie-Grant (1903). *Bull. Brit. Orn. Club* **14**(1): 18 [Oriolus percivali].

Ogilvie-Grant (1904). *Bull. Brit. Orn. Club* **14**(5): 56 [Pholidornis ruschie bedfordi].

Ogilvie-Grant (1906). *Bull. Brit. Orn. Club* **16**(7): 87 [Sitta villosa corea], **16**(9): 117 [Nectarinia johnstoni dartmouthi]; **19**(1): 10 [Zosterops everetti tahanensis].

Ogilvie-Grant (1907). *Bull. Brit. Orn. Club* **19**(4): 41 [Pholidornis ruschie denti].

Ogilvie-Grant (1908). *Bull. Brit. Orn. Club* **23**(1): 19 [Anthreptes seimundi, Cinnyris batesi].

Ogilvie-Grant (1909). *Bull. Brit. Orn. Club* **23**(5): 59 [Sitta europaea bedfordi].

Ogilvie-Grant (1909). *Ibis Ser.* **9**, no. 3(4): 663 [Zosterops luteus balstoni].

Ogilvie-Grant (1910). *Bull. Brit. Orn. Club* **25**(6): 90 [Tephrozosterops stalkerii]; **25**(7): 96 [Zosterops stalkerii].

Ogilvie-Grant (1910). *Trans. Zool. Soc. London* **19**: 329 [Cinnyris chloropygius kemp].

Ogilvie-Grant (1911). *Bull. Brit. Orn. Club* **29**(2): 27 [Meliphaga mimikae, Meliphaga analoga longirostris].

Ogilvie-Grant (1912). *Bull. Brit. Orn. Club* **29**(8): 109 [Dicaeum ignipectus formosum].

Ogilvie-Grant (1915). *Ibis Ser.* **10**, no. 3 (Suppl. 2): 71 [Lichenostomus subfrenatus utakensis].

van Oort (1909). *Nova Guinea (Zool.)* **9**: 97 [Entomozon cyanotis griseigularis].

van Oort (1910). *Notes Mus. Leyden* **32**: 82 [Oriolus sagittatus magnirostris], 195 [Arachnothera longirostra buettikoferi, Arachnothera longirostra niasensis, Arachnothera longirostra rothschildi], 213 [Paramythia montium olivacea], 214 [Oreornis], 215 [Melidectes nouhuysii, Oreornis chrysogenys].

van Oort (1910). *Orn. Monatsber.* **18**(4): 54 [Cinnyris congensis].

van Oort (1911). *Notes Mus. Leyden* **34**: 63 [Myzomela wakoensis elisabethae].

Osgood (1901). *Auk* **18**: 182 [*Certhia americana zelotes*].

Oustalet (1876). *J. Inst.* **1876**: 108 [*Aethopyga flagrans*].

Oustalet (1889). *Naturaliste (Paris) Ser. 2, no. 3(64)* [vol. 11]: 260 [*Cleptornis, Cleptornis marcheii*].

Oustalet (1892). *Ann. Sci. Nat. (Zool.) Ser. 7, no. 12(18)* (1891): 286, plate 9, fig. 1 [*Aegithalos bonvalotii*].

Oustalet (1904). *Bull. Mus. Natl. Hist. Nat. Paris* **10**: 536 [*Cinnyris osea decorsei*].

Palmer (1898). *Auk* **15**: 248 [*Lanius ludovicianus migrans*].

Parkes (1962). *Postilla Yale Peabody Mus.* **67**: 4 [*Dicaeum agile striatissimum*], 6 [*Dicaeum pygmaeum salomonseni*].

Parkes (1963). *Bull. Brit. Orn. Club* **83(1)**: 8 [*Aethopyga flagrans daphoenonota, Aethopyga flagrans decolor*].

Parkes (1971). *Nemouria* **4**: 44 [*Antheptes malacensis iris*], 51 [*Dicaeum bicolor viridissimum*], 60 [*Zosterops nigrorum mindorensis*].

Parkes (1973). *Nemouria* **11**: 49 [*Rhabdornis inornatus leytensis*].

Parkes (1988). *Nemouria* **30**: 5 [*Dicaeum pygmaeum fugaense*].

Parkes (1989). *Nemouria* **33**: 8 [*Dicaeum trigonostigma necolaenum*].

Peale (1848). *US Expl. Exped.*, 1st edition, **8**: 95 [*Zosterops lateralis flaviceps*], 150 [*Myzomela jugularis, Myzomela cardinalis nigriventris*].

Peltsam (1870). *Protok. Zas. Obsh. Est. Imp. Kazan. Univ.* **1**: 141 [*Remiz pendulinus caspius*].

Peizeln (1863). *Sitzungsber. K. Akad. Wiss. Wien, Math.-naturwiss. Cl.* **48(1)**: 149 [*Sitta krueperi*].

Peters, J.L. & Loveridge (1935). *Proc. Biol. Soc. Washington* **48**: 77 [*Zosterops polioastrus silvanus*].

Peters, W.K.H. (1864). *J. Orn.* **12(3)**: 161 [*Cinnyris comorensis*].

Peters, W.K.H. (1868). *J. Orn.* **16(2)**: 132 [*Oriolus auratus notatus*].

Peters, W.K.H. (1881). *J. Orn.* **29(1)**: 50 [*Cyanomitra olivacea olivacea*].

Phillips, A.R. (1986). In: Phillips, Known Birds North Middle America **1**: 99 [*Auriparus flaviceps sinaloae*], 100 [*Auriparus flaviceps hidalgensis*], 107 [*Sitta pygmaea elii*].

duPont (1971). *Nemouria* **3**: 4 [*Zosterops montanus parkesi*].

Portenko (1955). *Trudy Zool. Inst. Akad. Nauk SSSR* **18**: 497 [*Sitta europaea seorsa*].

Prévost & Des Murs (1847). In: Lefebvre, *Voyage en Abyssinie* **6**: 170, plate 8 [*Lanius excubitoris*].

Prigogine (1952). *Rev. Zool. Bot. Afr.* **46(3/4)**: 412 [*Cinnyris stuhlmanni chapini*], 414 [*Drepanorhynchus reichenowi shellyae*].

Prigogine (1975). *Rev. Zool. Afr.* **89(2)**: 463 [*Cyanomitra alinae derooi*], 467 [*Cyanomitra alinae kaboboensis*], 468 [*Cyanomitra alinae marungensis*].

Prigogine (1977). *Mitt. Zool. Mus. Berlin* **53** (Suppl. Ann. Orn. **1**): 122 [*Nectarinia johnstoni itombwensis*].

Przevalski (1887). *Zapiski Imp. Akad. Nauk, St. Petersburg* **55**: 77 [*Leptopoeile elegans*], 80 [*Leptopoeile sophiae obscurus*], 86 [*Lanius sphenocercus giganteus*].

Pucheran (1853). In: Jacquinot & Pucheran, *Voy. Pôle Sud, Zool.* **3** (Mammifères et oiseaux): 97, Atlas plate 22, fig. 4 [*Dicaeum aeneum*], 98, Atlas plate 22, fig. 5 [*Myzomela lafargei*].

Quoy & Gaimard (1830). In: Dumont d'Urville, *Voy. 'Astrolabe', Zool.* **1**: 192 [*Oriolus bouroensis*], 215, plate 11, fig. 4 [*Zosterops lateralis westernensis*].

Radde (1884). *Ornis Caucasia*: 144 [*Aegithalos caudatus major*].

Raffles (1822). *Trans. Linn. Soc. London* **13**: 299 [*Aethopyga siparaja*].

Ramsay, E.P. (1874). *Sydney Mail* **1874**: 201 [*Lichenostomus frenatus*].

Ramsay, E.P. (1875). *Proc. Linn. Soc. New South Wales* **1(1)**: 10 [*Xanthotis macleayanus*].

Ramsay, E.P. (1877). *Proc. Linn. Soc. New South Wales* **2(1)**: 106 [*Myzomela cruentata coccinea*], 107 [*Myzomela cruentata erythrina*].

Ramsay, E.P. (1878). *Proc. Linn. Soc. New South Wales* **3(1)**: 75 [*Lichmera alboauricularis*].

Ramsay, E.P. (1879). *Nature (London)* **20**: 125 [*Myzomela melanocephala*].

Ramsay, E.P. (1879). *Proc. Linn. Soc. New South Wales* **3(3)**: 288 [*Zosterops griseotinctus longirostris*].

Ramsay, E.P. (1880). *Proc. Linn. Soc. New South Wales* **4(4)**: 469 [*Myzomela nigrita forbesi*].

Ramsay, E.P. (1881). *Proc. Linn. Soc. New South Wales* **6(2)**: 178 [*Myzomela tristrami*], 179 [*Myzomela cardinalis pulcherrima*].

Ramsay, E.P. (1882). *Proc. Linn. Soc. New South Wales* **6(4)**: 718 [*Timeliopsis griseigula fulviventris*].

Ramsay, R.G.W. (1876). *Proc. Zool. Soc. London* **1876(3)**: 677 [*Sitta magna*].

Ramsay, R.G.W. (1880). *Proc. Zool. Soc. London* **1879(4)**: 709 [*Oriolus xanthonotus consobrinus*].

Ramsay, R.G.W. (1881). *Ibis Ser. 4, no. 5*: 33, plate 1 [*Oriolus cruentus consanguineus*].

Rand (1936). *Amer. Mus. Novit.* **872**: 4 [*Meliphaga mimikae granti*], 7 [*Meliphaga montana sepik*], 8 [*Meliphaga montana huonensis*], 9 [*Meliphaga montana aicora*], 16 [*Meliphaga orientalis facialis*], 17 [*Meliphaga orientalis becki*], 20 [*Meliphaga cinereifrons, Meliphaga (analogac) cinereifrons*] stevensi].

Rand (1940). *Amer. Mus. Novit.* **1072**: 12 [*Cinnyris jugularis idenburgi*], 13 [*Philemon brassi, Pitloprora meekiana occidentalis*].

Rand (1941). *Amer. Mus. Novit.* **1102**: 13 [*Toxorhamphus poliopterus maximus*], 14 [*Meliphaga orientalis citreola, Melidectes torquatus mixtus, Dicaeum geelvinkianum setekwa*], 15 [*Melanocharis longicauda umbrosa, Dicaeum geelvinkianum centrale*].

Rand (1948). *Fieldiana Zool.* **31**: 204 [*Rhabdornis inornatus alaris*], 205 [*Prionochilus plateni culionensis*].

Rand (1950). *Nat. Hist. Misc.* **59**: 2 [*Rhabdornis inornatus rabori*].

Rand & Rabor (1957). *Fieldiana Zool.* **42(2)**: 16 [*Sitta oenochlamys zamboanga, Dicaeum anthonyi masawan*], 17 [*Aethopyga boltoni malindangensis, Arachnothera clarae malindangensis*].

Rand & Rabor (1967). *Fieldiana Zool.* **51(6)**: 89 [*Sitta oenochlamys isarog, Dicaeum hypoleucum cagayanense*].

Rand & Rabor (1969). *Fieldiana Zool.* **51(13)**: 160 [*Zosterops nigrorum cataramensis*], 163 [*Dicaeum trigonostigma isidroi*].

Rand & Taylor (1959). *Fieldiana Zool.* **39**: 272 [*Cinnyris superbus nigeriae*].

Reichenbach (1862). *Handb. Spec. Orn.*, Part 9 (Meropinae): 92, plate 461, fig. 3298 [*Zosterops citrinellus albiventris*], 93 [*Speirops*], 94, plate 463, fig. 3307 [*Lophozosterops javanicus frontalis*], 103, plate 467, fig. 3332 [*Meliphaga analoga*], 110 [*Foulehaio*], 119 [*Conopophila*], 139 [*Xanthotis*].

Reichenbach (1853). *Handb. Spec. Orn.*, Part 11 (Scansoriae B. Tenuirostres): 276 [*Rhabdornis*], 277 [*Chalcomitra*], 291 [*Cyanomitra*], 314 [*Hypogramma*], 314, plate 592, fig. 4016 [*Arachnothera crassirostris*].

Reichenow (1880). *J. Orn.* **28(2)**: 142 [*Cyanomitra verouxii fischeri*].

Reichenow (1887). *J. Orn.* **35(1)**: 65 [*Corvinella melanoleuca aequatorialis*], **35(2)**: 214 [*Cyanomitra verticalis bohndorffi*].

Reichenow (1887). *Zool. Anz.* **10**: 370 [*Cinnyris notatus moebii*].

Reichenow (1891). *J. Orn.* **39(2)**: 161 [*Cinnyris mariquensis suahelicus*].

Reichenow (1892). *J. Orn.* **40(1)**: 54 [*Zosterops senegalensis stuhlmanni*], 132 [*Cyanomitra verticalis viridisplendens*], **40(2)**: 190 [*Cyanomitra oritis, Cinnyris reichenowi preussi*], 191 [*Zosterops senegalensis stenocricotus*], 193 [*Zosterops abyssinicus flavilateralis*].

Reichenow (1893). *Orn. Monatsber.* **1(2)**: 32 [*Cinnyris regius, Deleornis axillaris*], **1(4)**: 61 [*Cinnyris stuhlmanni, Nectarinia purpureiventris*].

Reichenow (1897). *J. Orn.* **45(2)**: 196 [*Chalcomitra senegalensis lamperti*].

Reichenow (1899). *J. Orn.* **47(3)**: 418 [*Zosterops senegalensis stierlingi*].

Reichenow (1899). *Orn. Monatsber.* **7(1)**: 7 [*Cinnyris mediocris fuellborni*], **7(11)**: 169 [*Cinnyris chloropygius orthogaster*], 170 [*Cinnyris chalybeus subalaris, Cinnyris minullus*], 171 [*Cinnyris venustus igneiventris*].

Reichenow (1901). *Orn. Monatsber.* **9(4)**: 53 [*Sitta europaea caucasica*], **9(6)**: 90 [*Lanius marvützi*].

Reichenow (1902). *J. Orn.* **50(2)**: 258 [*Lanius excubitorius boehmi*].

Reichenow (1904). *J. Orn.* **52(1)**: 133 [*Zosterops senegalensis toroensis*].

Reichenow (1904). *Orn. Monatsber.* **12(2)**: 27 [*Anthoscopus caroli sylviella*].

Reichenow (1905). *Orn. Monatsber.* **13(11)**: 180 [*Zosterops maderaspatanus voeltzkowi, Cinnyris pembae*], 181 [*Cinnyris notatus voeltzkowi, Anthreptes rubritorques*].

Reichenow (1905). *Vög. Afr.* **3(2)**: 467 [*Anabathmis*], 482 [*Cinnyris chalconmelas*], 496 [*Cinnyris nectarinioides erlangeri*], 526 [*Anthoscopus minutus damarensis*], 529 [*Pholidornis ruschie ussheri*].

Reichenow (1907). *Orn. Monatsber.* **15(12)**: 200 [*Cinnyris manoensis*].

Reichenow (1908). *Orn. Monatsber.* **16(3)**: 47 [*Cinnyris stuhlmanni schubotzi*].

Reichenow (1914). *J. Orn.* **62(3)**: 488 [*Dreptes, Gymnomyza*].

Reichenow (1915). *J. Orn.* **63(1)**: 125 [*Megazosterops palauensis*], 126 [*Melidectes rufocrissalis*], 127 [*Lichenostomus subfrenatus melanoaemus*], 128 [*Cyanomitra alinae tanganjicae*].

Reichenow (1915). *Orn. Monatsber.* **23(6)**: 91 [*Cinnyris shelleyi hofmanni*].

Rensch (1928). *Orn. Monatsber.* **36(1)**: 8 [*Dicaeum trochileum stresemanni, Lophozosterops supercilialis hartertianus*], **36(3)**: 80 [*Dicaeum sanguinolentum rhodopygale*].

Rensch (1929). *J. Orn.* **77** (Suppl. 2): 200 [*Antheptes malacensis convergens*], 201 [*Dicaeum igniferum cretum*].

Rensch (1931). *Mitt. Zool. Mus. Berlin* **17**: 617 [*Dicaeum annae sumbavense*].

Rensch (1931). *Treubia* **13**: 385 [*Antheptes malacensis rubrigena*].

Richmond (1897). *Auk* **14(2)**: 158 [*Cinnyris nectarinioides*].

Richmond (1900). *Proc. US Natl. Mus.* **22**: 319 [*Aethopyga saturata anomala*].

Richmond (1902). *Proc. US Natl. Mus.* **25**: 297 [*Cinnyris jugularis klossi*].

Richmond (1903). *Proc. US Natl. Mus.* **26**: 517 [*Oriolus chinensis mundus*].

Richmond (1912). *Proc. Biol. Soc. Washington* **25**: 104 [*Dicaeum cruentatum batunense*].

Ridgway (1882). *Proc. US Natl. Mus.* **5**: 113 [*Certhia familiaris britannica*], 114 [*Certhia americana montana*], 115 [*Certhia americana occidentalis*].

Ridgway (1883). *Proc. US Natl. Mus.* **6**: 155 [*Psaltiriparus minimus grindae*].

Ridgway (1884). *Proc. Biol. Soc. Washington* **2**: 89 [*Psaltiriparus minimus californicus*].

Ridgway (1894). *Proc. US Natl. Mus.* **17**: 371 [*Zosterops maderaspatanus aldabrensis*], 372 [*Cinnyris sovimganga abbotti, Cinnyris sovimganga aldabrensis*].

Ridgway (1903). *Proc. Biol. Soc. Washington* **16**: 108 [*Lanius ludovicianus mearnsi*], 109 [*Psaltiriparus minimus saturatus*].

Riley (1918). *Proc. Biol. Soc. Washington* **31**: 157 [*Lophozosterops squameiceps striaticeps*].

Riley (1919). *Proc. Biol. Soc. Washington* **32**: 95 [*Zosterops atrifrons surdus*].

Riley (1920). *Proc. Biol. Soc. Washington* **33**: 55 [*Antheptes malacensis bornensis, Anthreptes malacensis paraguayae*].

Riley (1921). *Proc. Biol. Soc. Washington* **34**: 56 [*Myzomela chloroptera juga*].

Riley (1929). *Proc. Biol. Soc. Washington* **42**: 162 [*Aethopyga nipalensis angkanensis*].

Riley (1935). *Proc. Biol. Soc. Washington* **48**: 148 [*Dicaeum agile pallescens*].

Riley (1940). *Proc. Biol. Soc. Washington* **53**: 79 [*Oriolus tenuirostris invisus*], 80 [*Arachnothera magna remota*].

Ripley (1948). *Proc. Biol. Soc. Washington* **61**: 106 [*Aethopyga nipalensis koelzi*].

Ripley (1949). *Bull. Brit. Orn. Club* **69(11)**: 121 [*Lanius validirostris hachisuka*].

Ripley (1959). *Postilla Yale Peabody Mus.* **38**: 13 [*Leptocoma sericea mariae*].

Ripley & Rabor (1966). *Proc. Biol. Soc. Washington* **79**: 305 [*Dicaeum proprium*].

Rippon (1900). *Bull. Brit. Orn. Club* **11(1)**: 11 [*Aegithalos concinnus pulchellus*].

Rippon (1903). *Bull. Brit. Orn. Club* **14(1)**: 18 [*Aegithalos concinnus talifuensis*].

Rippon (1904). *Bull. Brit. Orn. Club* **14(8)**: 83 [*Aethopyga nipalensis victoriae*], 84 [*Aegithalos sharpei, Sitta victoriae*].

Roberts (1914). *Ann. Transvaal Mus.* **4**: 174 [*Anthoscopus caroli hellmayri*].

Roberts (1931). *Ann. Transvaal Mus.* **14**: 242 [*Zosterops senegalensis tongensis*], 243 [*Anthodiaeta collaris zuluisis*].

Robinson & Kloss (1916). *J. Straits Branch Roy. Asiatic Soc.* **73**: 278 [*Dicaeum ignipunctus beccarii*].

Robinson & Kloss (1918). *J. Fed. Malay States Mus.* **8**: 250 [*Zosterops montanus diffidilis*].

Robinson & Kloss (1919). *Bull. Brit. Orn. Club* **40(1)**: 17 [*Sitta azurea nigriventris*].

Robinson & Kloss (1919). *Ibis Ser. 11, no. 1*: 606 [*Aegithalos concinnus annamensis*], 609 [*Certhia manipurensis meridionalis*], 621, plate 18, fig. 1 [*Aethopyga saturata johnsi*], 621, plate 18, fig. 2-3 [*Aethopyga gouldiae annamensis*].

Robinson & Kloss (1919). *J. Siam Soc. (Nat. Hist.)* **3**: 445 [*Zosterops palpebrosus williamsi*].

Robinson & Kloss (1921). *J. Fed. Malay States Mus.* **10(3)**: 206 [*Prionochilus maculatus septentrionalis*], 209 [*Chalcoparia singalensis interposita*].

Robinson & Kloss (1923). *Bull. Brit. Orn. Club* **44(1)**: 14 [*Aethopyga nipalensis australis*].

Robinson & Kloss (1923). *J. Fed. Malay States Mus.* **11(1)**: 56 [*Oriolus cruentus malayanus*].

Rosenberg (1866). *Natuurk. Tijdschr. Ned. Indie* **29**: 143 [*Sphecotheres vieillotii cuculatus*].

van Rossem (1929). *Proc. Biol. Soc. Washington* **42**: 176 [*Sitta pygmaea melanotis*], 177 [*Sitta pygmaea chihuahuae*].

van Rossem (1931). *Trans. San Diego Soc. Nat. Hist.* **6**: 329 [*Certhia americana leucosticta*].

van Rossem (1939). *Proc. Biol. Soc. Washington* **52**: 3 [*Sitta carolinensis kinneari*], 5 [*Sitta pygmaea flavinucha*].

van Rossem & Hachisuka (1938). *Trans. San Diego Soc. Nat. Hist.* **9**: 8 [*Psaltiriparus minimus dimorphicus*].

Rothschild (1903). *Bull. Brit. Orn. Club* **13(5)**: 42 [*Myzomela kuehni*].

Rothschild (1910). *Bull. Brit. Orn. Club* **25(3)**: 32 [*Aethopyga siparaja owstoni*].

Rothschild (1921). *Novit. Zool.* **28(2)**: 285 [*Melidectes belfordi joiceyi*].

Rothschild (1923). *Novit. Zool.* **30(2)**: 263 [*Cephalopyrus flammeiceps olivaceus*].

Rothschild & Hartert, E.J.O. (1901). *Novit. Zool.* **8(3)**: 180 [*Zosterops kulambangrae, Zosterops metcalfi floridanus*], 181 [*Myzomela eichhorni*].

Rothschild & Hartert, E.J.O. (1903). *Novit. Zool.* **10(2)**: 215 [*Dicaeum geelvinkianum diversum*], 223 [*Myzomela eques mynami*], **10(3)**: 442 [*Meliphaga aruensis sharpei*], 445 [*Xanthotis flaviventer saturator*], 446 [*Xanthotis flaviventer madaraszi*], 448 [*Pycnopygius ixoides finschi*].

Rothschild & Hartert, E.J.O. (1907). *Novit. Zool.* **14(2)**: 482 [*Ptiloprora meekiana*].

Rothschild & Hartert, E.J.O. (1911). *Bull. Brit. Orn. Club* **27(4)**: 44 [*Toxorhamphus novaeguineae flaviventris*], **29(1)**: 12 [*Melidectes foersteri*], 13 [*Melipotus ater*], **29(3)**: 34 [*Melipotus fumigatus goliathi*], 36 [*Melanocharis versteri meeki*].

Rothschild & Hartert, E.J.O. (1912). *Novit. Zool.* **19(2)**: 203 [*Meliphaga vicina*].

Rothschild & Hartert, E.J.O. (1914). *Bull. Brit. Orn. Club* **33(6)**: 108 [*Zosterops hypoxanthus admiralitatis*], **35(3)**: 32 [*Dicaeum nitidum rosselli*].

Rothschild & Hartert, E.J.O. (1918). *Novit. Zool.* **25(1)**: 319 [*Philemon buceroides tagulamus*].

Rothschild & Hartert, E.J.O. (1923). *Bull. Brit. Orn. Club* **43(7)**: 117 [*Madanga*], 118 [*Madanga ruficollis*].

Rothschild & Hartert, E.J.O. (1924). *Bull. Brit. Orn. Club* **45(1)**: 8 [*Philemon eichhorni*].

Rothschild & Hartert, E.J.O. (1926). *Novit. Zool.* **33(1)**: 41 [*Leptocoma sericea eichhorni*], 143 [*Philemon cockerelli umboi*].

Rüppell (1840). *Neue Wirbelth. Fauna Abyss. Vög.* **2**: 91, footnote [*Chalcomitra senegalensis proteus*].

Sachtleben (1919). *Anz. Orn. Ges. Bayern* **1(2)**: 7 [*Sitta europaea cisalpina*].

Salomonsen (1953). *Vidensk. Medd. Dan. Naturhist. Foren.* **114**: 356 [*Rhabdornis grandis*], **115**: 251 [*Antheptes griseigularis birgatae*], 256 [*Leptocoma sperata trochilus*], 271 [*Arachnothera longirostra randi*], 274 [*Dicaeum nigriore diuatae*], 275 [*Aethopyga primigenia diuatae*], 278 [*Lanius validirostris tertius*], 280 [*Zosterops montanus diuatae*].

Salomonsen (1960). *Amer. Mus. Novit.* **1991**: 19 [*Dicaeum aueolimbatum laterale*], **2016**: 34 [*Dicaeum aeneum malaitae*].

Salomonsen (1961). *Amer. Mus. Novit.* **2057**: 29 [*Dicaeum cruentatum simalurense*], **2067**: 5 [*Paramythia montium alpina*].

Salomonsen (1964). *Biol. Sk. Kong. Danske Vid. Selsk.* **14(1)**: 5 [*Dicaeum eximium phaephygium*].

Salomonsen (1966). *Breviora* **254**: 2 [*Lichmera incana marensis, Oedistoma pygmaeum waigeuense*], 3 [*Lichmera incana griseoviridis, Myzomela pammelaena nigerrima, Myzomela rubrata asuncionis*], 7 [*Lichenostomus obscurus viridifrons*], 8 [*Pycnopygius ixoides cinereifrons*], 11 [*Phylidomyris novaehollandiae caudatus*].

Salomonsen / Swainson

Salomonsen (1966). *Dan. Orn. Foren. Tidssk.* **60**: 122 [*Myzomela cruentata lavongai*, *Myzomela cruentata vinacea*].

Salvadori (1864). *Atti Soc. Ital. Sci. Nat. Milano* **7**: 161 [*Oriolus larvatus rolleti*].

Salvadori (1868). *Atti R. Accad. Sci. Torino* **3**: 416 [*Prionochilus xanthopygius*].

Salvadori (1874). *Ann. Mus. Civ. Storia Nat. Genova Ser. 1, no. 5(11)*: 165 [*Dicaeum cruentatum nigrimentum*]; **6(5)**: 77 [*Leptocoma sericea chlorolaema*], **78** [*Zosterops uropygialis*]; **6(20)**: 313 [*Dicaeum hirundinaceum keiense*].

Salvadori (1875). *Ann. Mus. Civ. Storia Nat. Genova Ser. 1, no. 7(42)*: 659 [*Aethopyga siparaja beccarii*].

Salvadori (1876). *Ann. Mus. Civ. Storia Nat. Genova Ser. 1, no. 7(59)* (1875): 937 [*Leptocoma sericea nigriscapularis*], **939** [*Oreocharis*], **942** [*Melanocharis longicauda*], **943** [*Rhamphocharis*, *Rhamphocharis crassirostris*], **944** [*Dicaeum geelvinkianum maforensis*], **945** [*Dicaeum geelvinkianum misoriense*]; **7(60)** (1875): 946 [*Myzomela adolphinae*], **947** [*Xanthotis flaviventer meyeri*, *Xanthotis flaviventer fusciventris*], **948** [*Lichenostomus subfrenatus*], **949** [*Ptiloprora erythropleura*], **950** [*Melilestes*], **951** [*Oedistoma iliolophus*], **952** [*Oedistoma*, *Oedistoma iliolophus affine*, *Oedistoma pygmaeum*], **954** [*Zosterops minor chrysolaemus*], **955** [*Zosterops fuscicapilla*]; **7(61)** (1875): 963 [*Timeliopsis*]; **7(62)** (1875): 987 [*Melanocharis nigra chloroptera*]; **9(3)** (1876/1877): 33 [*Meliphaga albonotata*], **34** [*Pycnopygius stictcephalus*]; **9(4)** (1876/1877): 58 [*Dicaeum celebicum sanghirensis*].

Salvadori (1878). *Ann. Mus. Civ. Storia Nat. Genova Ser. 1, no. 12(21)*: 333 [*Melanocharis nigra unicolor*], **334** [*Myzomela obscura rubrotincta*], **335** [*Glycichaera*, *Glycichaera fallax*], **336** [*Glycichaera fallax polylophata*]; **12(22)**: 337 [*Lichmera squamata*], **338** [*Pycnopygius ixoides*], **339** [*Philemon meyeri*, *Zosterops atriceps fuscifrons*], **341** [*Zosterops novaeguineae*, *Zosterops buruensis*].

Salvadori (1878). *Atti R. Accad. Sci. Torino* **13**: 319 [*Leptocoma sericea cornelia*], **532** [*Leptocoma sericea corinna*].

Salvadori (1879). *Ann. Mus. Civ. Storia Nat. Genova Ser. 1, no. 14(14)*: 215 [*Zosterops atricapilla*].

Salvadori (1880). *Ann. Mus. Civ. Storia Nat. Genova Ser. 1, no. 16(5)*: 67 [*Dicaeum eximium lyardorum*], **75** [*Meliarchus*], **76** [*Meliphaga flaviviridis*], **77** [*Meliphaga montana*], **78** [*Pycnopygius*].

Salvadori (1881). *Agg. Orn. Papua. Molucche*, Part 2: 292 [*Myzomela nigrita meyeri*].

Salvadori (1881). *Atti R. Accad. Sci. Torino* **16**: 623 [*Zosterops hypoxanthus*], **624** [*Myzomela erythromelas*].

Salvadori (1882). *Agg. Orn. Papua. Molucche*, Part 3: 566 [*Myzomela blasii*].

Salvadori (1888). *Ann. Mus. Civ. Storia Nat. Genova Ser. 2, no. 6(16)*: 247 [*Cyanomitra obscura ragazzii*].

Salvadori (1891). *Agg. Orn. Papua. Molucche*, Part 3, App.: 231 [*Meliphaga pulchella*].

Salvadori (1894). *Ann. Mus. Civ. Storia Nat. Genova Ser. 2, no. 14(10)*: 150 [*Melanocharis striativentris*], **151** [*Ptiloprora plumbea*].

Salvadori (1896). *Ann. Mus. Civ. Storia Nat. Genova Ser. 2, no. 16(7)*: 97 [*Timeliopsis fulvigula meyeri*].

Salvadori (1901). *Boll. Mus. Zool. Anat. Comp. Univ. Torino* **16(414)**: 1 [*Zosterops ficedulinus feae*].

Salvadori (1903). *Boll. Mus. Zool. Anat. Comp. Univ. Torino* **18(442)**: 1 [*Speirops brunneus*].

Salvadori (1906). *Boll. Mus. Zool. Anat. Comp. Univ. Torino* **21**: 2 [*Anthoscopus caroli roccatii*].

Sarasin, F. (1913). In: Sarasin & Roux, *Nova Caledonia* (11), A. Zool.: 34, plate 1, fig. 2 [*Zosterops lateralis nigrescens*], **75** [*Myzomela cardinalis sanctaecrucis*].

Schalow (1875). *J. Orn.* **23(2)**: 148 [*Lanius isabellinus phoenicuroides*].

Schlegel (1867). *Proc. Zool. Soc. London* **1866(3)**: 422 [*Zosterops mayottensis*].

Schlegel (1871). *Ned. Tijdschr. Dierk.* **4(1)**: 14 [*Aethopyga duyvenbodei*]; **4(3)**: 38 [*Myzomela rosenbergii*], **39** [*Timeliopsis griseigula*], **40** [*Timeliopsis fulvigula*].

Schlegel (1872). *De Dierentuin Kon. Zoöl. Genoot. Nat. Artis Magistra*: 125 [*Phylidomyris niger gouldii*].

Schodde (1889). *Canberra Bird Notes* **13(4)** (1988): 121 [*Meliphaga fordiana*, *Meliphaga lewinii amphochlora*], **122** [*Melithreptus albobarbis inopinatus*].

Schodde & Mason (1999). *Directory Austr. Birds - Passerines*: 279 [*Melithreptus brevirostris wombeyi*], **316** [*Gliciphila melanops chelidonia*], **598** [*Oriolus flavocinctus tiwi*], **599** [*Oriolus flavocinctus flavotinctus*], **601** [*Oriolus sagittatus griseiscens*], **689** [*Zosterops lateralis ochrochrous*, *Zosterops lateralis pinarochrous*].

Schodde, Mason & McKean (1979). *Emu* **79(1)**: 28 [*Philemon buceroides ammitophilus*].

Sc Slater, P.L. (1858). *J. Linn. Soc. London* **2(2)**: 28; **157** [*Melanocharis*].

Sc Slater, P.L. (1872). *Proc. Zool. Soc. London* **1872(2)**: 730 [*Dicaeum vincens*].

Sc Slater, P.L. (1874). *Proc. Zool. Soc. London* **1873(3)**: 693 [*Pycnopygius cinereus*], **694** [*Melidectes*], **694**, plate 55 [*Melidectes torquatus*], **695** [*Melipotus*], **695**, plate 56 [*Melipotus gymnops*].

Sc Slater, P.L. (1877). *Proc. Zool. Soc. London* **1877(1)**: 102, plate 14, fig. 2 [*Dicaeum eximium*], **104** [*Philemon cockerelli*]; **1877(3)**: 553 [*Myzomela pammelaena*, *Philemon albigularis*].

Sc Slater, P.L. (1879). *Proc. Zool. Soc. London* **1879(3)**: 448, plate 37, fig. 1 [*Myzomela cineracea*].

Sc Slater, P.L. (1883). *Proc. Zool. Soc. London* **1883(1)**: 56 [*Dicaeum hirundinaceum fulgidum*, *Myzomela boiei annabellae*]; **1883(2)**: 199 [*Oriolus boureensis decipiens*].

Sc Slater, P.L. (1906). *Bull. Brit. Orn. Club* **19(3)**: 30 [*Nectarinia kilimensis arturii*].

Sc Slater, P.L. & Hartlaub (1881). *Proc. Zool. Soc. London* **1881(1)**: 168, fig. 1 [*Lanius meridionalis uncinatus*], **169**, plate 15, fig. 2 [*Chalcomitra balfourii*].

Sc Slater, W.L. (1932). *Bull. Brit. Orn. Club* **52(9)**: 143 [*Anthoscopus caroli rhodesiae*].

Sc Slater, W.L. (1933). In: Slater & Moreau, *Ibis Ser. 13, no. 3*: 214 [*Cinnyris moreaui*].

Sc Slater, W.L. (1934). *Bull. Brit. Orn. Club* **55(1)**: 14 [*Zosterops polioastrus winifredae*].

Sc Slater, W.L. & Moreau (1935). *Bull. Brit. Orn. Club* **56(1)**: 13 [*Zosterops polioastrus mbuluensis*], **17** [*Anthodiaeta pallidigaster*].

Scopoli (1786). *Deliciae Florae Faunae Insubricae*, Part 2: 85 [*Lanius schach nasutus*], **91** [*Anthreptes malacensis*, *Dicaeum trigonostigma*].

Seeböhm (1891). *Ibis Ser. 6, no. 3*: 273 [*Zosterops japonicus stejnegeri*].

Serle (1863). *Bull. Brit. Orn. Club* **83(7)**: 118 [*Chalcomitra rubescens crossensis*].

Seventsov (1873). *Izv. Imper. Obsh. Liubit. Estestvozn. Antropol. Etnogr.* **8(2)** [= *Veri. Turkest. Zhivotn*] (1872): 135 [*Leptopoeicte*], **135**, plate 8, figs. 8–9 [*Leptopoeicte sophiae*], **136**, plate 9, fig. 3 [*Remiz coronatus*], **137**, plate 9, fig. 8 [*Remiz macronyx*], **138** [*Certhia himalayana taeniura*], plate 9, fig. 2 [*Remiz pendulinus jaxarticus*].

Sharpe (1871). *Ibis Ser. 3, no. 1*: 415 [*Anthoscopus caroli*].

Sharpe (1872). *Ann. Mag. Nat. Hist. Ser. 4, no. 10*: 450 [*Sitta tephronota*].

Sharpe (1876). *Nature (London)* **14**: 297 [*Aethopyga pulcherrima*, *Aethopyga shelleyi*, *Aethopyga siparaja magnifica*], **298** [*Archinothra longirostra dilutor*, *Dicaeum haematostictum*, *Dicaeum hypoleucum*, *Dicaeum trigonostigma dorsale*], **339** [*Dicaeum geelvinkianum rubrocoronatum*].

Sharpe (1877). *Cat. Birds Brit. Mus.* **3**: 197 [*Oriolus chinensis diffusus*], **205** [*Oriolus chinensis suluensis*], **213**, plate 10 [*Oriolus steerii*], **224**, plate 12 [*Sphecotheres vieillotii salvadorii*].

Sharpe (1877). *Ibis Ser. 4, no. 1(1)*: 16 [*Dicaeum everetti*].

Sharpe (1877). In: Layard & Sharpe, *Birds South Africa*, 2nd edition, Part 4: 326 [*Zosterops pallidus atmorii*].

Sharpe (1877). *Trans. Linn. Soc. London (Zool. Ser. 2, no. 1(6))*: 338, plate 53, fig. 3 [*Sitta oenochlamys*], **342** [*Anthreptes malacensis chlorigaster*].

Sharpe (1882). *J. Linn. Soc. London (Zool.)* **16(92)**: 318 [*Toxorhamphus poliopterus*, *Zosterops minor delicatulus*], **319** [*Pycnopygius cinereus marmoratus*].

Sharpe (1884). *Cat. Birds Brit. Mus.* **9**: 165 [*Zosterops novaeguineae crissalis*].

Sharpe (1884). *Proc. Zool. Soc. London* **1884(2)**: 233 [*Sitta whiteheadi*]; **1883(4)**: 579 [*Dicaeum celebicum sulaense*, *Dicaeum tristrani*].

Sharpe (1884). *Rep. Zool. Coll. Voy. 'Aleri'*, Aves: 19 [*Meliphaga aruensis*].

Sharpe (1886). *Nature (London)* **34**: 340 [*Melidectes ochromelas batesi*].

Sharpe (1887). *Ibis Ser. 5, no. 5*: 437 [*Oriolus cruentus vulneratus*], **451**, plate 14 [*Archinothra juliae*], **452** [*Dicaeum monticulum*].

Sharpe (1887). *Proc. Zool. Soc. London* **1887(3)**: 440, plate 38, fig. 2 [*Aethopyga saturata wrayi*].

Sharpe (1888). *Ibis Ser. 5, no. 6*: 392 [*Chlorocharis*], **392**, plate 11, fig. 1 [*Chlorocharis emiliae*], **479** [*Sitta frontalis corallipes*].

Sharpe (1891). *Ibis Ser. 6, no. 3*: 444 [*Cinnyris reichenowi*, *Zosterops polioastrus kikuyuensis*], **444**, plate 13 [*Lanius mackinnoni*].

Sharpe (1892). *Bull. Brit. Orn. Club* **1(2)**: 4 [*Oriolus hosii*].

Sharpe (1892). *Ibis Ser. 6, no. 4*: 323 [*Oculocincta squamifrons*].

Sharpe (1893). *Bull. Brit. Orn. Club* **3(2)**: 10 [*Dicaeum trigonostigma sibuense*].

Sharpe (1893). *Ibis Ser. 6, no. 5*: 561 [*Archinothra affinis everetti*].

Sharpe (1897). *Bull. Brit. Orn. Club* **7(2)**: 17 [*Oriolus brachyrhynchus laetior*].

Sharpe (1899). *Bull. Brit. Orn. Club* **10(3)**: 29 [*Glyciphila notabilis*].

Sharpe (1900). *Ibis Ser. 7, no. 6*: 345 [*Zosterops flavifrons magillivrayi*].

Sharpe (1902). *Bull. Brit. Orn. Club* **13(1)**: 11 [*Certhia himalayana vunnanensis*].

Sharpe & Dresser (1871). *Proc. Zool. Soc. London* **1871(2)**: 312 [*Aegithalos caudatus irbii*].

Shaw (1790). In: White, *J. Voy. New South Wales*: 240 [*Anthochaera carunculata*].

Shaw (1792). In: Shaw & Nodder, *Nat. Misc.* **4**: plate 111 [*Pardalotus punctatus*], plate 114 [*Dicaeum hirundinaceum*].

Shaw (1794). *Zool. New Holland* **1**: 13, plate 4 [*Anthochaera phrygia*].

Shaw (1799). In: Shaw & Nodder, *Nat. Misc.* **10**: plate 369 [*Cinnyris venustus*].

Shaw (1809). *Gen. Zool.* **7(2)**: 337 [*Corvinella corvina*].

Shaw (1811). *Gen. Zool.* **8(1)**: 193 [*Cinnyris superbus*], **195** [*Chalcomitra amethystina*], **198** [*Cinnyris bifasciatus*], **201** [*Cinnyris cupreus*], **203** [*Cyanomitra verticalis cyanocephala*], **222** [*Chalcomitra fuliginosa*], **246** [*Anthreptes rectirostris*].

Shaw (1812). In: Shaw & Nodder, *Nat. Misc.* **23**: plate 997 [*Anthoscopus minutus*].

Shelley (1876). *Monogr. Nectariniidae* **1**: 219 [*Cinnyris bifasciatus microrhynchus*], **343** [*Anthodiaeta collaris zambesiana*]; **2**: 17 [*Nectarinia famosa cupreonitens*], **273** [*Chalcomitra amethystina kirkii*].

Shelley (1877). *Monogr. Nectariniidae* **3**: 227 [*Cinnyris bouvieri*]; **5**: 105, plate 35 [*Leptocoma sericea hirundorii*].

Shelley (1878). *Monogr. Nectariniidae* **6**: 313 [*Anthreptes rhodolaemus*], **319** [*Anthreptes malacensis celebensis*].

Shelley (1879). *Monogr. Nectariniidae* **9/10**: 21 [*Nectarinia bocagii*].

Shelley (1880). *Proc. Zool. Soc. London* **1879(4)**: 676 [*Zosterops maderaspatanus kirkii*].

Shelley (1885). *Proc. Zool. Soc. London* **1884(4)**: 555 [*Nectarinia kilimensis*]; **1885(2)**: 227, plate 14 [*Nectarinia johnstoni*], **228** [*Cinnyris mediocris*].

Shelley (1889). *Proc. Zool. Soc. London* **1889(3)**: 365, plate 41, fig. 2 [*Chalcomitra hunteri*].

Shelley (1892). *Bull. Brit. Orn. Club* **1(2)**: 5 [*Zosterops senegalensis anderssoni*].

Shelley (1896). *Ibis Ser. 7, no. 2*: 183, plate 4 [*Oriolus chlorocephalus*].

Shelley (1900). *Birds Afr.* **2**: 196 [*Zosterops maderaspatanus comorensis*].

Siebers (1928). *Treubia* **10**: 403 [*Myzomela dammermani*].

Slater (1891). *Ibis Ser. 6, no. 3*: 43, plate 1 [*Aethopyga christinae latouchii*].

Smith, A. (1831). *South Afr. Quart. J. Ser. 1, no. 5*: 13 [*Cyanomitra veronii*].

Smith, A. (1836). *Rep. Exped. Explor. Central Africa*: 52 [*Eurocephalus*, *Eurocephalus anguitimens*], **53** [*Cinnyris talatala*, *Cinnyris mariquensis*].

Smith, A. (1840). *Illustr. Zool. South Afr.*, Part **11**: plate 57 and text, footnote [*Cyanomitra olivacea*].

Smith, A. (1841). *Illustr. Zool. South Afr.*, Part **14**: plate 68 and text [*Lanius collaris subcoronatus*].

Snellman (1887). In: Veth, *Midden-Sumatra* **4(1)**: 31, plate 1 [*Archinothra modesta concolor*].

van Someren (1920). *Bull. Brit. Orn. Club* **40(4)**: 94 [*Cinnyris habessinicus turkanae*].

van Someren (1921). *Bull. Brit. Orn. Club* **41(4)**: 63 [*Anthreptes reichenowi yokanae*].

van Someren (1922). *Novit. Zool.* **29(1)**: 196 [*Cinnyris tsavoensis*].

van Someren (1932). *Novit. Zool.* **37(2)**: 352 [*Cinnyris superbus buvuma*].

Sparman (1786). *Mus. Carlsonianum*, Part 1: plate 5 [*Anthornis melanura*].

Sparman (1787). *Mus. Carlsonianum*, Part 2: plate 34 [*Glyciphila undulata*].

Sparman (1789). *Mus. Carlsonianum*, Part 4: plate 80 [*Dicaeum trochileum*].

Stanley (1814). In: Salt, *Voy. Abyssinia*, App. 4: 51 [*Lanius collaris humeralis*], **58** [*Nectarinia tacaze*].

Statius Müller (1776). *Vollst. Natursystem*, Part 7 (Suppl.): 99 [*Cinnyris notatus*].

Steere (1890). *List Birds Mammals Steere Exped.*: 17 [*Oriolus steerii samarensis*], **21** [*Archinothra clarae philippinensis*, *Zosterops everetti basilanicus*], **22** [*Aethopyga flagrans guimarasensis*, *Dicaeum trigonostigma bestii*, *Prionochilus olivaceus samarensis*].

Stegmann (1929). *J. Orn.* **77(2)**: 248 [*Lanius cristatus confusus*].

Stegmann (1930). *Orn. Monatsber.* **38(4)**: 115 [*Lanius isabellinus tsaidamensis*].

Stejneger (1887). *Proc. US Natl. Mus.* **9** (1886): 392 [*Sitta europaea clara*].

Stepanyan (1985). *Ornitologiya* **20**: 135 (In English) **13** [*Aethopyga christinae sokolovi*].

Stresemann (1912). *Bull. Brit. Orn. Club* **31(1)**: 5 [*Lichmera monticola*, *Lophozosterops pinaiae*], **6** [*Lichmera deningeri*].

Stresemann (1912). *Novit. Zool.* **19(2)**: 344 [*Lichmera indistincta nupta*], **347** [*Zosterops citrinella harterti*].

Stresemann (1913). *Novit. Zool.* **20(2)**: 309 [*Cinnyris jugularis keiensis*], **366** [*Lophozosterops javanicus elongatus*].

Stresemann (1914). *Novit. Zool.* **21(4)**: 394 [*Toxorhamphus*].

Stresemann (1921). *Anz. Orn. Ges. Bayern* **1(5)**: 35 [*Xanthotis flaviventer philemon*].

Stresemann (1922). *Orn. Monatsber.* **30(3)**: 64 [*Oriolus mellianus*].

Stresemann (1923). *Arch. Naturges.* **89** (Abt. A), **7**: 68 [*Melanocharis versteri virago*].

Stresemann (1929). *Orn. Monatsber.* **37(3)**: 74 [*Sitta villosa bangsi*].

Stresemann (1930). *Orn. Monatsber.* **38(5)**: 159 [*Megazosterops*].

Stresemann (1931). *Mitt. Zool. Mus. Berlin* **17**: 211 [*Zosterops everetti mandibularis*], **234** [*Tephrozosterops*].

Stresemann (1931). *Orn. Monatsber.* **39(3)**: 82 [*Lophozosterops squameiceps heinrichi*], **84** [*Myza sarasinorum chionogenys*].

Stresemann (1932). *Orn. Monatsber.* **40(4)**: 106 [*Myza sarasinorum pholidota*], **107** [*Lophozosterops squameiceps stachyrinus*, *Lophozosterops squameiceps analogus*].

Stresemann & Grote (1926). *Orn. Monatsber.* **34(5)**: 147 [*Cinnyris humbloti mohelicus*].

Stresemann & Paludan (1932). *Novit. Zool.* **38(1)**: 143 [*Myzomela eques primitiva*], **144** [*Oedistoma iliolophus cinerascens*], **147** [*Meliphaga analoga flavida*], **151** [*Melanocharis nigra pallida*], **222** [*Meliphaga montana steini*].

Stresemann & Paludan (1932). *Orn. Monatsber.* **40(1)**: 14 [*Myzomela nigrita steini*], **15** [*Glycichaera fallax pallida*, *Leptocoma sericea cochranii*].

Stresemann & Paludan (1934). *Orn. Monatsber.* **42(2)**: 44 [*Ptiloprora erythropleura dammermani*, *Pycnopygius cinereus dorsalis*], **45** [*Melanocharis longicauda chloris*].

Strickland (1841). *Proc. Zool. Soc. London* **1841(9)**, no. 99: 29 [*Prionochilus*].

Strickland (1852). In: Jardine, *Contr. Orn.* **1852**: 42, plate 86 (plate dated Dec. 1851 but issued 1852) [*Cinnyris venustus albiventris*].

Stuart Baker (1920). *Bull. Brit. Orn. Club* **41(1)**: 8 [*Aegithalos concinnus iredalei*].

Stuart Baker (1921). *Bull. Brit. Orn. Club* **41(4)**: 71 [*Cinnyris jugularis blanfordi*, *Aethopyga ignicauda flavescens*]; **41(7)**: 108 [*Dicaeum trigonostigma rubropygium*].

Stuart Baker (1925). *Bull. Brit. Orn. Club* **46(1)**: 13 [*Aethopyga gouldiae isolata*].

Stuart Baker (1930). *Fauna Brit. India, Birds*, 2nd edition, **7**: 90 [*Certhia manipurens shanensis*].

Sundevall (1850). *Öfver. Kongl. Vet. Akad. Förhandl.* **7(4)**: 101 [*Zosterops virens*], **102** [*Zosterops pallidus capensis*]; **7(5)**: 129 [*Anthoscopus punctifrons*], **129**, footnote [*Auriparus flaviceps*].

Sundevall (1872). *Meth. Nat. Avium Disponend. Tentamen*: 50 [*Melitrograis*].

Swainson (1820). *Zool. Illustr.*, Part 1: plate 2 and text [*Sitta frontalis*].

Swainson (1825). *Zool. J.* **1**: 480 [*Entomozon*].

Swainson (1832). In: Swainson & Richardson, *Fauna Bor.-Amer.* **2** (1831): 115, plate 34 [*Lanius ludovicianus excubitorides*], **122** [*Lanius meridionalis elegans*], **495** [*Anthreptes*].

Swainson (1837). *Birds West. Afr.* **2**: 35 [*Oriolus brachyrhynchus*].

Swainson (1837). *Classif. Birds* **2**: 326 [Meliphaga lewinii, Gliciphila].
Swainson (1838). *Anim. in Menag.*: 295 [Zosterops pallidus], 325 [Philemon buceroides].
Swinhoe (1861). *Ibis Ser. 1, no. 3*: 331 [Zosterops japonicus simplex].
Swinhoe (1862). *Ibis Ser. 1, no. 4*: 363, plate 13 [Oriolus traillii ardens].
Swinhoe (1863). *Ibis Ser. 1, no. 5(3)*: 294 [Zosterops erythropleurus].
Swinhoe (1869). *Ann. Mag. Nat. Hist. Ser. 4, no. 4*: 436 [Cinnyris jugularis rhizophorae, Aethopyga christinae].
Swinhoe (1870). *Ibis Ser. 2, no. 6*: 240 [Dicaeum concolor minullum], 342, plate 13 [Oriolus traillii nigellicauda].
Swinhoe (1870). *Proc. Zool. Soc. London* **1870(1)**: 133 [Remiz consobrinus].
Swinhoe (1871). *Proc. Zool. Soc. London* **1871(2)**: 350 [Sitta europaea amurensis].
Sykes (1832). *Proc. Zool. Soc. London* **1832(2)**, no. 18: 86 [Lanius meridionalis lahtora], 87 [Oriolus kundoo], 98 [Aethopyga vigorsii], 99 [Leptocoma minima].
Taczanowski (1882). *Bull. Soc. Zool. France* **7**: 385 [Sitta europaea albifrons], 386 [Sitta europaea baicalensis].
Takatsukasa & Yamashina (1931). *Dôbuts. Zasshi* **43**: 486 [Zosterops rotensis], 599 [Rukia longirostra].
Temminck (1820). *Man. d'Orn. Tabl. Syst.*, 2nd edition, **1**: 143 [Lanius meridionalis].
Temminck (1820). *Planches Color.*, Livr. **5**: plate 29, fig. 2 and text [Meliphaga reticulata].
Temminck (1821). *Planches Color.*, Livr. **12**: plate 72, fig. 3 and text [Sitta frontalis velata].
Temminck (1822). *Planches Color.*, Livr. **18**: plate 108, fig. 1 and text [Chalcoparia singalensis phoenicotis]; **21**: plate 126 and text [Aethopyga mystacalis].
Temminck (1824). *Planches Color.*, Livr. **49**: plate 293, fig. 3 and text [Zosterops palpebrosus].
Temminck (1825). *Planches Color.*, Livr. **56**: plate 335, fig. 2 and text [Rhabdornis mystacalis]; **58**: plate 347, fig. 3 and text [Cinnyris solaris].
Temminck (1826). *Planches Color.*, Livr. **65**: plate 388, fig. 1 and text [Arachnothera, Arachnothera chrysogenys]; **66**: plate 394, fig. 1 and text [Pardalotus striatus ornatus], plate 394, fig. 2 and text [Prionochilus percussus].
Temminck (1829). *Planches Color.*, Livr. **80**: plate 478, fig. 1 and text [Dicaeum chrysorrheum], plate 478, fig. 2 and text [Dicaeum sanguinolentum].
Temminck (1835). *Man. d'Orn. Tabl. Syst.*, 2nd edition, **3**: 286 [Sitta neumayer syriaca].
Temminck (1836). *Planches Color.*, Livr. **101**: plate 600, figs. 1–2 and text [Prionochilus thoracicus], plate 600, fig. 3 and text [Prionochilus maculatus], plate 600, fig. 4 and text [Psaltria, Psaltria exilis].
Temminck (1839). *Planches Color.*, Livr. **102** (Tab. Mèth.): 19 [Lanius senator rutilans].
Temminck & Schlegel (1845). In: Siebold, *Fauna Jap., Aves*, Part 2: 39, plate 14 [Lanius bucephalus], plate 22 (text in Part 3: 57) [Zosterops japonicus].
Temminck & Schlegel (1848). In: Siebold, *Fauna Jap., Aves*, Part 4–8: 71 [Aegithalos caudatus trivirgatus].
Tiechurst (1927). *Bull. Brit. Orn. Club* **47(5)**: 89 [Zosterops palpebrosus nilgiriensis].
Tiechurst (1939). *Ibis Ser. 14, no. 3*: 755 [Aethopyga nipalensis karenensis].
Tickell (1833). *J. Asiatic Soc. Bengal* **2**: 577 [Aethopyga siparaja seheriae], 578 [Dicaeum agile].
Townsend, J.K. (1837). *J. Acad. Nat. Sci. Philadelphia* **7**: 190 [Psaltriparus minimus].
Tristram (1879). *Ibis Ser. 4, no. 3*: 444 [Zosterops lateralis vatensis].
Tristram (1882). *Ibis Ser. 4, no. 6*: 135 [Zosterops rendovae].
Tristram (1889). *Ibis Ser. 6, no. 1*: 229 [Zosterops japonicus loochooensis], 555 [Dicaeum nitidum, Leptocoma sericea christinae].
Tristram (1894). *Ibis Ser. 6, no. 6*: 29, plate 3 [Zosterops metcalffii], 31 [Zosterops sanctaecrucis].
Tschusi & Zarudny (1905). *Orn. Jahrb.* **16(3/4)**: 140 [Sitta europaea rubiginosa].
Tweeddale (1877). *Ann. Mag. Nat. Hist. Ser. 4, no. 20*: 95 [Dicaeum trigonostigma xanthopygium], 536 [Prionochilus olivaceus], 537 [Aethopyga bella].
Tweeddale (1877). *Proc. Zool. Soc. London* **1877(3)**: 547 [Dicaeum hypoleucum mindanense, Leptocoma sperata juliae].
Tweeddale (1878). *Proc. Zool. Soc. London* **1877(4)**: 760, plate 76 [Oriolus steerii assimilis], 762 [Zosterops everetti], 762, plate 77, fig. 2 [Dicaeum quadricolor], 829 [Dicaeum trigonostigma cinereigulare], 830 [Anthreptes griseigularis]; **1878(1)**: 286 [Zosterops nigrorum]; **1878(2)**: 343 [Arachnothera longirostra flammifera]; **1878(3)**: 620 [Cinnyris jugularis aurora].
Ulfstrand (1960). *Bull. Brit. Orn. Club* **80(1)**: 12 [Anthoscopus caroli pallescens].
Unitt & Rea (1997). In: Dickerman, *The Era of Allan R. Phillips: A Festschrift*: 180 [Certhia americana phillipsi].
Valenciennes (1826). In: Levrault, *Dict. Sci. Nat.* **40**: 227 [Lanius vittatus].
Vaurie (1950). *Amer. Mus. Novit.* **1752**: 5 [Sitta cinnamoventris koelzi].
Vaurie (1955). *Amer. Mus. Novit.* **1752**: 10 [Lanius vittatus nargianus].
Verreaux, J. (1865). *Nouv. Arch. Mus. Hist. Nat. Paris (Bull.) Ser. 1, no. 1*: 78, plate 5, fig. 1 [Sitta villosa].
Verreaux, J. (1867). *Rev. Mag. Zool. Ser. 2, no. 19*: 173, plate 15 [Aethopyga gouldiae dabryii].
Verreaux, J. (1869). *Nouv. Arch. Mus. Hist. Nat. Paris (Bull.) Ser. 1, no. 5*: 36 [Aegithalos fuliginosus].
Verreaux, J. (1870). *Nouv. Arch. Mus. Hist. Nat. Paris (Bull.) Ser. 1, no. 6*: 34 [Sitta europaea sinensis], 39 [Aegithalos glaucogularis vinaceus].
Verreaux, J. (1871). *Proc. Zool. Soc. London* **1871(1)**: 135, plate 8 [Promerops gurneyi].
Verreaux, J. & Des Murs (1860). *Rev. Mag. Zool. Ser. 2, no. 12*: 432 [Gymnomiza aubryana].
Verreaux, J. & Verreaux, É. (1851). *Rev. Mag. Zool. Ser. 2, no. 3*: 314 [Cinnyris johannae], 417 [Anthreptes aurantius].
Verreaux, J. & Verreaux, É. (1855). *J. Orn.* **3(2)**: 105 [Oriolus nigripennis].
Vieillot (1802). In: Audebert & Vieillot, *Oiseaux Dorés* **2**: 95, plate 61 [Melithreptus lunatus].
Vieillot (1808). *Oiseaux Amérique Septentrionale* **1** (1807): 80, plate 50 [Lanius excubitor borealis].
Vieillot (1816). *Analyse Nouv. Orn. Elément.*: 31 [Pardalotus], 42 [Sphecotheres], 46 [Melithreptus], 47 [Philemon], 68 [Sphecotheres viridis].
Vieillot (1817). *Nouv. Dict. Hist. Nat.*, 2nd edition, **9**: 408 [Zosterops chloronothos]; **14**: 325 [Lichenostomus flavicollis, Lichmera flavicans], 329 [Lichenostomus virescens]; **17**: 194 [Oriolus chinensis maculatus]; **18**: 194 [Oriolus auratus].
Vieillot (1818). *Nouv. Dict. Hist. Nat.*, 2nd edition, **19**: 236 [Manorina].
Vieillot (1819). *Nouv. Dict. Hist. Nat.*, 2nd edition, **31**: 501 [Anthodiaeta platura], 502 [Anthodiaeta collaris, Arachnothera longirostra cinireicollis], 506 [Chalcomitra rubescens, Cinnyris fuscus].
Vieliard (1976). *Alauda* **44(3)**: 351 [Sitta ledanti].
Vigors (1831). *Proc. Zool. Soc. London* **1830/1831(1)**, no. 4: 42 [Lanius schach erythronotus], 43 [Lanius tephronotus], 44 [Aethopyga gouldiae].
Vigors (1832). *Proc. Zool. Soc. London* **1830/1831(1)**, no. 14: 171 [Certhia himalayana], 175 [Oriolus traillii].
Vigors (1839). In: Beechey, *Zool. Voy. 'Blossom'*: 25, plate 4 [Sitta pygmaea].
Vigors & Horsfield (1827). *Trans. Linn. Soc. London* **15** (1826): 215 [Sphecotheres vieilloti], 234 [Zosterops], 315 [Lichmera indistincta, Melithreptus brevirostris], 318 [Myzomela], 320 [Anthochaera].
Vincent (1934). *Ibis Ser. 13, no. 4*: 90 [Cyanomitra olivacea alfredi, Cyanomitra obscura sclateri], 91 [Cyanomitra obscura granti].
Vorderman (1893). *Natuurk. Tijdschr. Ned. Indië* **52(4)**: 200 [Oriolus chinensis insularis].
Wagler (1827). *Systema Avium (Additamenta)*: 3 (spec. 9) [Oriolus cruentus].
Wakefield (1958). *Emu* **58(3)**: 177 [Lichenostomus melanops gippslandicus].
Walden (1870). *Ann. Mag. Nat. Hist. Ser. 4, no. 5*: 218 [Sitta neglecta].
Walden (1872). *Ann. Mag. Nat. Hist. Ser. 4, no. 9*: 399 [Myzomela chloroptera].
Walden (1872). *Trans. Zool. Soc. London* **8(2)**: 112 [Oriolus chinensis celebensis].
Walden (1875). *Ann. Mag. Nat. Hist. Ser. 4, no. 15*: 400 [Aethopyga saturata sanguinepectus], 401 [Dicaeum concolor olivaceum].
Wallace (1862). *Ibis Ser. 1, no. 4*: 351 [Philemon fuscicapillus].
Wallace (1863). *Proc. Zool. Soc. London* **1862(3)**: 340, plate 40 [Oriolus chinensis frontalis]; **1863(1)**: 32 [Dicaeum vulneratum, Leptocoma sericea proserpina].
Wallace (1864). *Proc. Zool. Soc. London* **1863(3)**: 493 [Zosterops atrifrons, Zosterops chloris intermedius], 494 [Zosterops grayi, Dicaeum igniferum].
Wallace (1865). *Proc. Zool. Soc. London* **1865(2)**: 477, plate 29, fig. 1 [Dicaeum aureolimbatum], 478, plate 29, fig. 2 [Aethopyga siparaja flavostriata], 479 [Leptocoma sericea grayi, Leptocoma sericea porphyrolaema].
Webster (1986). In: Phillips, *Known Birds North Middle America* **1**: 199 [Certhia americana alascensis], 200 [Certhia americana stewarti].
Wetmore (1917). *Proc. Biol. Soc. Washington* **30**: 117 [Myzomela rubrata saffordii].
Wetmore (1919). *Bull. Mus. Comp. Zool. Harvard* **63**: 220 [Myzomela rubrata dichromata].
Whistler (1929). *Bull. Brit. Orn. Club* **49(6)**: 87 [Aegithalos caudatus aremoricus].
Whistler (1933). *J. Bombay Nat. Hist. Soc.* **36**: 811 [Zosterops palpebrosus salimalii].
Whistler (1944). *Spolia Zeylanica* **23**: 199 [Cinnyris lotenius hindustanicus], 201 [Dicaeum agile zeylonicum].
Whitaker (1901). *Bull. Brit. Orn. Club* **11(5)**: 52 [Aegithalos caudatus siculus].
White, C.M.N. (1946). *Ibis* **88**: 101 [Anthoscopus caroli winterbottomi].
White, H.L. (1917). *Emu* **16**: 165 [Meliphaga abilineata].
Whitehead, J. (1897). *Bull. Brit. Orn. Club* **6(8)**: 49 [Sitta oenochlamys lilaceae].
Wiglesworth (1891). *Abh. Ber. Mus. Dresden* **3(6)**: 34 [Foulehaio carunculatus taviunensis].
Williams, J.G. (1948). *Bull. Brit. Orn. Club* **68(5)**: 101 [Zosterops polioastrus kulalensis].
Williams, J.G. (1950). *Ibis* **92**: 644 [Cinnyris regius anderseni].
Williams, J.G. (1953). *Bull. Brit. Orn. Club* **73(1)**: 10 [Cinnyris mediocris bensoni].
Williams, J.G. (1953). *Ibis* **95**: 502, plate 5 [Cinnyris sovimanga buchenorum].
Williams, J.G. (1956). *Bull. Brit. Orn. Club* **76(8)**: 137 [Drepanorhynchus reichenowi lathburyi].
Wilson, F.E. (1911). *Emu* **11**: 124 [Manorina melanotis].
Winterbottom (1959). *Bull. Brit. Orn. Club* **79(8)**: 152 [Anthoscopus minutus gigi].
Witherby (1903). *Ibis Ser. 8, no. 3*: 531 [Sitta europaea persica].
Witherby (1905). *Bull. Brit. Orn. Club* **15(4)**: 35 [Certhia brachydactyla mauritanica].
Witherby (1913). *Bull. Brit. Orn. Club* **31(7)**: 78 [Sitta europaea hispaniensis].
Wolf (1810). In: Meyer & Wolf, *Taschenb. Deutsch. Vögelkunde*, Part **1**: 128 [Sitta europaea caesia].
Wolters (1965). *J. Orn.* **106(3)**: 357 [Cinnyris manoensis pinto].
Wolters (1977). *Bonn. Zool. Beitr.* **28(1/2)**: 88 [Deleornis].
Wolters & Clancey (1969). In: Clancey, *Durban Mus. Novit.* **8(15)**: 249 [Oriolus chlorocephalus speculifer].
Yamashina (1930). *Tori* **6**: 330 [Apalopteron familiare hahasima].
Zarudny (1904). *Orn. Jahrb.* **15(5/6)**: 218 [Sitta neumayer tschitscherimi].
Zarudny (1904). *Orn. Monatsber.* **12(10)**: 164 [Aegithalos caudatus passekii].
Zarudny (1908). *Orn. Monatsber.* **16(10)**: 162 [Remiz macronyx nigricans], 163 [Remiz macronyx neglectus].
Zarudny (1913). *Mess. Orn.* **4**: 50 [Remiz pendulinus menzbieri].
Zarudny & Buturlin (1906). *Orn. Monatsber.* **14(7/8)**: 132 [Sitta tephronota dresseri].
Zarudny & Loudon (1905). *Orn. Monatsber.* **13(5)**: 76 [Sitta tephronota obscura]; **13(6/7)**: 106 [Certhia familiaris persica].
Zedlitz (1913). *Orn. Monatsber.* **21(4)**: 58 [Eurocephalus rueppelli erlangeri].
Zedlitz (1916). *J. Orn.* **64(1)**: 4 [Oriolus larvatus reichenowi].
Zimmer, J.T. (1918). *Phil. J. Sci.* **13** (Sect. D): 348 [Dicaeum agile affine].

GENERAL LIST OF REFERENCES

- Abbott, C.L., Pöldmaa, T., Lougheed, S., Clarke, M. & Boag, P.T. (2002). Hierarchical analysis of genetic population structure in the Noisy Miner using DNA microsatellite markers. *Condor* **104**(3): 652–656.
- Abbott, I. (1974). The avifauna of Kangaroo Island and causes of its impoverishment. *Emu* **74**(3): 124–134.
- Abbott, I. (1976). Avifauna of Black Point–Cape Beaufort area, S.W. Australia. *West. Austr. Nat.* **13**(7): 158–159.
- Abbott, I. (1981). The avifauna of the Porongurup Range, an isolated habitat in south-western Australia. *Emu* **81**(2): 91–96.
- Abbott, I. (1982). Birds recorded on 22 tropical islands of Western Australia. *Corella* **6**(5): 119–122.
- Abbott, I. & van Heurck, P. (1985). Tree species preferences of foraging birds in Jarrah forest in Western Australia. *Austr. Wildl. Res.* **12**(3): 461–466.
- Abdusalyamov, A.I. (1973). *Fauna Tadzhikskoi SSR – Ptitsy*. [Fauna of the Tajik SSR – Birds]. Vol. 19(2). Donish Press, Dushanbe, Tajikistan. In Russian.
- Abe, H. & Hasegawa, M. (2007). Impact of volcanic activity on a plant-pollinator module in an island ecosystem: the example of the association of *Camellia japonica* and *Zosterops japonica*. *Ecol. Res.* **23**(1): 141–150.
- Able, K.P. (1980). Mechanisms of orientation, navigation and homing. Pp. 283–373 in: Gauthreaux, S.A. ed. (1980). *Animal Migration, Orientation and Navigation*. London, Academic Press.
- Able, K.P. (1982). Skylight polarization patterns at dusk influence migratory orientation in birds. *Nature (London)* **299**: 550–551.
- Able, K.P. (1989). Skylight polarization patterns and the orientation of migratory birds. *J. Exper. Biol.* **141**: 241–256.
- Able, K.P. (1993). Orientation cues used by migratory birds: a review of cue-conflict experiments. *Trends Ecol. Evol.* **8**: 367–371.
- Able, K.P. & Able, M.A. (1995). Interactions in the flexible orientation system of a migratory bird. *Nature (London)* **375**: 230–232.
- Adam, P. (1992). *Australian Rainforests*. Oxford Monographs on Biogeography **6**. Oxford University Press, Oxford, UK.
- Adamian, M.S. & Klem, D. (1999). *Handbook of the Birds of Armenia*. The American University of Armenia, Oakland & Yerevan.
- Addicott, A.B. (1938). Behavior of the Bush-tit in the breeding season. *Condor* **40**: 49–63.
- Ade, B. (1984). Birds attendant at *Cassia singuena*. *Honeyguide* **30**: 33–34.
- Adhikerana, A.S. (1994). Observation on the avifauna of Siberut Island, 1992–1994. *Treubia* **31**(1): 11–24.
- Adler, G.H. (1994). Avifaunal diversity and endemism on tropical Indian Ocean islands. *J. Biogeogr.* **21**: 85–95.
- Adriano, S. (1995). *Niche Breadths of Island and Mainland Populations of the Singing Honeyeater* *Lichenostomus virescens*. BSc thesis, Murdoch University, Perth, Western Australia.
- Agnew, N.V.I. (1921). Further notes from Peel Island, Moreton Bay, Queensland. *Emu* **21**: 131–137.
- Aho, T. (1997). Determinants of breeding performance of the Eurasian Treecreeper. *Biological Research Reports from the University of Jyväskylä* **58**: 1–113. In English with Finnish summary.
- Aho, T., Kuittunen, M., Suhonen, J., Jantti, A. & Hakkarri, T. (1997). Behavioural responses of Eurasian Treecreeper, *Certhia familiaris*, to competition with ants. *Anim. Behav.* **54**(5): 1283–1290.
- Akatsuka, T. (2005a). Nest predation of Long-tailed Tits at Kiso-river, central Japan. *Strix* **23**: 51–58. In Japanese with English summary.
- Akatsuka, T. (2005b). Predators of the Long-tailed Tits and caution reaction for it in the winter. *Strix* **23**: 59–64. In Japanese with English summary.
- Akatsuka, T. (2006). Morphological development in young Long-tailed Tits. *Orn. Sci.* **5**(2): 231–235.
- Åkesson, S. (2003). Avian long-distance navigation: experiments with migratory birds. Pp. 471–492 in: Berthold *et al.* (2003).
- Åkesson, S., Morin, J., Mulheim, R. & Ottoson, U. (2001). Avian orientation at steep angles of inclination: experiments with migratory White-crowned Sparrows at the magnetic North Pole. *Proc. Royal Soc. London (Ser. B Biol. Sci.)* **268**: 1907–1913.
- Åkesson, S., Morin, J., Mulheim, R. & Ottoson, U. (2005). Dramatic orientation shift of White-crowned Sparrows displaced across longitudes in the high arctic. *Curr. Biol.* **15**: 1591–1597.
- Akinpelu, A. (1989). Competition for the nectar of *Tecomna stans* flowers between Olive Sunbird (*Nectarinia olivacea*) and insects. *Malimbus* **11**: 3–6.
- Al Hajji, R., Alsirhan, A., Fagel, P., Foster, B. & Pope, M. (2008). The Purple Sunbird in Kuwait – a new Western Palearctic bird. *Birding World* **21**(2): 71–74.
- Al Safadi, M.M. & Kasperek, M. (1995). Breeding observations on the birds of the Tihamah, Yemen. *Zool. Middle East* **11**: 15–20.
- Alam, M.K. & Rahman, M.M. (1988). Some observations on the feeding of *Scurrula parasitica* Linn. (Loranthaceae) seeds by birds. *Bano Biggyan Patrika* **17**: 89–90.
- Albayrak, T. & Erdogan, A. (2005). Observations on some behaviours of Krüper’s Nuthatch (*Sitta krueperi*), a little-known west Palaearctic bird. *Turkish J. Zool.* **29**(2): 177–181. In English with Turkish summary.
- Albayrak, T. & Erdogan, A. (2006). Breeding ecology of Krüper’s Nuthatch (*Sitta krueperi*) near Antalya, Turkey. *Israel J. Zool.* **51**(4): 309–314.
- Alcasid, G.L. & Gonzales, P. (1968). A new race of the Naked-faced Spider-hunter (*Arachnothera clarae*) from Luzon. *Bull. Brit. Orn. Club* **88**(7): 129–130.
- Aldrich, J.W. (1944). Notes on the races of the White-breasted Nuthatch. *Auk* **61**: 592–604.
- Alerstam, T. (1978). Analysis and a theory of visible bird migration. *Oikos* **30**: 273–349.
- Alerstam, T. & Gudmundsson, G.A. (1999). Bird orientation at high latitudes: flight routes between Siberia and North America across the Arctic Ocean. *Proc. Royal Soc. London (Ser. B Biol. Sci.)* **266**: 2499–2505.
- Alerstam, T. & Lindström, Å. (1990). Optimal bird migration: the relative importance of time, energy and safety. Pp. 331–351 in: Gwinner (1990a).
- Alexander, F. (1995a). Ulugulu [sic] Violet-backed Sunbirds *Anthreptes neglectus* at Sable Valley Wildlife Sanctuary, Shimba Hills. *Kenya Birds* **4**(1): 30–31.
- Alexander, F. (1995b). Active anting by Collared Sunbirds. *Kenya Birds* **4**(1): 31–32.
- Alexander, H.G. (1971). Do some Wallcreepers migrate? *British Birds* **64**: 236–237.
- Alexander, W.B. (1926). Notes on a visit to North Queensland. *Emu* **25**: 245–260.
- Aley, J. & Aley, R. (1995). Red-breasted Nuthatch in Norfolk: new to Britain and Ireland. *British Birds* **88**(3): 150–153.
- Ali, S. (1931). The role of sunbirds and flowerpeckers in the propagation and distribution of the tree-parasite *Loranthus longiflorus* Desr. in the Konkan (W. India). *J. Bombay Nat. Hist. Soc.* **35**: 144–149.
- Ali, S. (1932). Flower-birds and bird-flowers in India. *J. Bombay Nat. Hist. Soc.* **35**: 573–605.
- Ali, S. (1962). *The Birds of Sikkim*. Oxford University Press, London & Delhi.
- Ali, S. (1969). *Birds of Kerala*. 2nd edition. Oxford University Press, Oxford & Madras.
- Ali, S. & Ripley, S.D. (1972a). *Handbook of the Birds of India and Pakistan, together with those of Nepal, Sikkim, Bhutan and Ceylon*. Vol. 5. Larks to the Grey Hypoclious. Oxford University Press, Bombay.
- Ali, S. & Ripley, S.D. (1972b). *Handbook of the Birds of India and Pakistan, together with those of Nepal, Sikkim, Bhutan and Ceylon*. Vol. 7. Laughing thrushes to the Mangrove Whistler. Oxford University Press, Bombay.
- Ali, S. & Ripley, S.D. (1973). *Handbook of the Birds of India and Pakistan, together with those of Nepal, Sikkim, Bhutan and Ceylon*. Vol. 8. Warblers to redstarts. Oxford University Press, Bombay.
- Ali, S. & Ripley, S.D. (1974). *Handbook of the Birds of India and Pakistan, together with those of Nepal, Sikkim, Bhutan and Ceylon*. Vol. 10. Flowerpeckers to buntings. Oxford University Press, Bombay, India.
- Ali, S. & Ripley, S.D. (1983). *Handbook of the Birds of India and Pakistan, together with those of Bangladesh, Nepal, Bhutan and Sri Lanka*. Compact edition. Oxford University Press, Delhi & Oxford.
- Ali, S. & Ripley, S.D. (1987). *Compact Handbook of the Birds of India and Pakistan, together with those of Bangladesh, Nepal, Bhutan, and Sri Lanka*. 2nd edition. Oxford University Press, Delhi, Oxford & New York.
- Ali, S. & Ripley, S.D. (1998). *Handbook of the Birds of India and Pakistan, together with those of Bangladesh, Nepal, Sikkim, Bhutan and Sri Lanka*. Vol. 9. 2nd edition. Oxford University Press, Oxford & New York.
- Allan, B.M. (1989). Successful breeding of Regent Honeyeaters on Lake Ginninderra Peninsula. *Canberra Bird Notes* **14**(2): 25–26.
- Allan, D.G. & Tree, A.J. (1997). Bluethroated Sunbird *Anthreptes reichenowi*. Page 522 in: Harrison *et al.* (1997).
- Allen, C.R. & Saunders, D.A. (2002). Variability between scales: predictors of nomadism in birds of an Australian Mediterranean-climate ecosystem. *Ecosystems (New York)* **5**(4): 348–359.
- Allen, C.R. & Saunders, D.A. (2006). Multimodel inference and the understanding of complexity, discontinuity, and nomadism. *Ecosystems (New York)* **9**(5): 694–699.
- Allen, C.R., Lutz, R.S., Lockley, T., Phillips, S.A. & Demarais, S. (2001). The non-indigenous ant, *Solenopsis invicta*, reduces Loggerhead Shrike and native insect abundance. *J. Agric. Urban Entomol.* **18**: 249–259.
- Allen, D., Espanola, C., Broad, G., Oliveros, C. & Gonzalez, J.C.T. (2006). New bird records for the Babuyan Islands, Philippines, including two first records for the Philippines. *Forktail* **22**: 57–70.
- Allen, E.F. & Berwick, E.J.H. (1958). Nesting of the Mountain Black-eye (*Chlorochoris*). *Sarawak Mus. J.* **8**(11): 462–463.
- Allen, F.G.H. (1957). Unusual food for an oriole. *Malay. Nat. J.* **11**(3): 80–81.
- Allport, G. & Milton, G.R. (1988). A note on the recent sighting of Javan White-eye *Zosterops flava*. *Kukila* **3**(3/4): 142–149.
- Alström, P., Ericson, P.G.P., Olsson, U. & Sundberg, P. (2006). Phylogeny and classification of the avian superfamily Sylvioidea. *Mol. Phylogen. Evol.* **38**(2): 381–397.
- Althofer, G.W. (1936). Stray visitors. *Emu* **35**: 240.
- Altwegg, R. & Underhill, L.G. (2006). Apparent survival rates of Cape Sugarbirds *Promerops cafer* at a breeding and a non-breeding site. *Ostrich* **77**(3/4): 220–224.
- Alvard, M.S. & Winarni, N.L. (1999). Avian biodiversity in Morowali Nature Reserve, Central Sulawesi, Indonesia and the impact of human subsistence activities. *Tropical Biodiversity* **6**: 59–74.
- Amadon, D. (1951). Le pseudo-souimanga de Madagascar. *Oiseau et RFO (Nouv. Sér.)* **21**: 59–63. In French.
- Amadon, D. (1953). Avian systematics and evolution in the Gulf of Guinea. *Bull. Amer. Mus. Nat. Hist.* **100**(3): 395–451.
- Amadon, D. & Jewett, S.G. (1946). Notes on Philippine birds. *Auk* **63**: 541–559.
- Amidon, F.A., Haas, C.A. & Morton, J.M. (2004). Breeding biology of the endangered Rota Bridled White-eye. *Wilson Bull.* **116**(4): 342–346.
- Andersen, J.C. (1909). New Zealand bird-song. *Trans. New Zealand Inst.* **41**(43): 422–428.
- Andersen, J.C. (1910). New Zealand bird-song. *Trans. New Zealand Inst.* **43**(56): 656–669.
- Andersen, J.C. (1912). New Zealand bird-song: further notes. *Trans. New Zealand Inst.* **45**(51): 387–397.
- Andersen, J.C. (1918). Further notes on New Zealand bird-song: Kapiti Island. *Trans. New Zealand Inst.* **50**(30): 282–295.
- Andersen, J.C. (1926). *Bird-song and New Zealand Song Birds*. Whitcombe & Tombs, Auckland.
- Anderson, B., Cole, W.W. & Barrett, S.C.H. (2005). Specialised bird perch aids cross-pollination. *Nature (London)* **435**: 41–42.
- Anderson, C. (1994). Seychelles Sunbirds (*Nectarinia dussumieri*) on Aride Island. *Phelsuma* **2**: 67–70.

Anderson / Atkinson

- Anderson, R.M. (1976). Shrikes feed on prey remains left by hawks. *Condor* **78**: 269.
- Anderson, S.H. & Craig, J.L. (2003). Breeding biology of Bellbirds (*Anthornis melanura*) on Tiritiri Matangi Island. *Notornis* **50**(2): 75–82.
- Anderson, W.L. & Duzan, R.E. (1978). DDE residues and eggshell thinning in Loggerhead Shrikes. *Wilson Bull.* **90**: 215–220.
- Andrew, P. (1985). An annotated checklist of the birds of Cibodas-Gunung Gede Nature Reserve. *Kukila* **2**: 92–95.
- Andrew, P. (1993). The birds of Indonesia: Kukila Checklist No. 1. Additions, corrections and notes. *Kukila* **6**(2): 47–52.
- Andrew, P. & Holmes, D.A. (1990). Sulawesi bird report. *Kukila* **5**(1): 4–26.
- Andrews, C.W. (1900). *A Monograph of Christmas Island (Indian Ocean): Physical Features and Geology*. British Museum (Natural History), London.
- Andrews, I.J. (1995). *The Birds of the Hashemite Kingdom of Jordan*. Published privately, Musselburgh, UK.
- Andrews, I.J., Khoury, F. & Shirihai, H. (1999). Jordan bird report 1995–97. *Sandgrouse* **21**: 10–35.
- Andrews, R. & Righter, R. (1992). Loggerhead Shrike (*Lanius ludovicianus*). Page 209 in: Andrews, R. & Righter, R. eds. (1992). *Colorado Birds: a Reference to their Distribution and Habitat*. Denver Museum of Natural History, Denver, Colorado.
- Andronova, R.S. (2003). [On the biology of Black-naped Oriole (*Oriolus chinensis*) in the middle Amur River area]. *Ornitologiya* **30**: 188–189. In Russian.
- Ankney, C.D. & MacInnes, C.D. (1978). Nutrient reserves and reproductive performance of female Lesser Snow Geese. *Auk* **95**: 459–471.
- Anon. (1914). Order Passeriformes, family Meliphagidae, genus *Ptilotula*. *South Austr. Orn.* **1**(3): 8–11.
- Anon. (1926). North-east Eyre Peninsula. *South Austr. Orn.* **8**(6): 171–219.
- Anon. (1976). The birds of the Bendigo district. *Austr. Bird Watcher* **6**(6): 186–208.
- Anon. (1977). A checklist of the birds of Mount Field National Park. *Tasmanian Nat.* **48**: 6–8.
- Anon. (1978a). Review of the birds observed in the Veimaui Sago patch. *Papua New Guinea Bird Soc. Newsl.* **144**: 11–20.
- Anon. (1978b). Hisiu – an ornithological study of mangrove habitat. *Papua New Guinea Bird Soc. Newsl.* **145**: 10–17.
- Anon. (1978c). Observations. *Papua New Guinea Bird Soc. Newsl.* **146**: 17–20.
- Anon. (1978d). *White-breasted Silveveve* Zosterops albobularis. Australian Endangered Species (Birds) 18. Australian National Parks & Wildlife Service, Norfolk Island. 2 pp.
- Anon. (1980a). Rare birds of Southern Africa. Neergaard's Sunbird *Nectarinia neergaardi* (Grant). *Afr. Wildl. J.* **34**: [inside back cover].
- Anon. (1980b). Rekordalter für Bronzenektarvogel (*Nectarinia kilimensis*): 27 Jahre. *Gefiederte Welt* **104**(10): 199. In German.
- Anon. (1980c). [A Report on Studies of Vertebrates in the Gaoligong-shan District (Yunnan Province)]. Vol. 2. [Birds]. Bird Section of Kunming Institute of Zoology, Academia Sinica & Science Press, Beijing. In Chinese.
- Anon. (1987). Slaughter on Malta. *Bokmakierie* **39**: 95.
- Anon. (1988). Field guides Inc. tour of PNG 1986. *Muruk* **3**(1): 23–24.
- Anon. (1990). *Checklist of the Birds of New Zealand and the Ross Dependency: Antarctica*. 3rd edition. Random Century, Auckland.
- Anon. (1994a). *Oman Bird List*. 4th edition. Oman Birds Record Committee, Muscat, Oman.
- Anon. (1994b). *USDA Forest Service 1994. Region 2. Sensitive Species List*. United States Department of Agriculture, Forest Service, Rocky Mountain Region, Denver, Colorado.
- Anon. (1994c). Reports 1992. *Muruk* **6**(3): 17–28.
- Anon. (1998a). *Breeding Bird Atlas of Oman*. Oman Bird Records Committee, Muscat, Oman.
- Anon. (1998b). *Check-list of North American Birds*. 7th edition. American Ornithologists' Union, Washington, D.C.
- Anon. (2002). [On the Chinese Grey Shrike *Lanius sphenocercus*]. Pp. 215–216 in: Pak, U.I. ed. (2002). *Red Data Book of the Democratic Peoples Republic of Korea – Animals*. The Institute of Natural Protection and Management of Natural Resources, Biology of the Academy of Sciences, Pyongyang.
- Anon. (2004). *Recovery Outline for the Rota Bridled White-eye (Zosterops rotensis)*. United States Fish and Wildlife Service, Portland, Oregon. 16 pp.
- Anon. (2005). Bell Miner associated Dieback National Forum 2005 Proceedings. Southern Cross University, Lismore, Australia. 30 March to 1 April 2005. Department of Environment & Conservation (NSW), Sydney, URL: http://contacts.environment.nsw.gov.au/PDFs/BMAD_proceedings_2005.pdf (download 01 September 2007).
- Anon. (2006a). *Forty-spotted Pardalote* Pardalotus quadraginatus: *Recovery Plan 2006–2010*. Department of Primary Industries and Water, Hobart, Tasmania. Pp. 28.
- Anon. (2006b). *Recovery Plan for the Ma'oma'o or Mao (Gymnomys samoensis)*. Ministry of Natural Resources & Environment, Government of Samoa, Apia, Samoa.
- Anon. (2006c). *Revised Recovery Plan for Hawaiian Forest Birds*. United States Fish and Wildlife Service (Region I), Portland, Oregon. 622 pp. URL: http://ecos.fws.gov/docs/recovery_plan/060922a.pdf (download January 2008).
- Anon. (2007a). Globally threatened birds – family Melanocharitidae (berrypeckers). Species factsheets, BirdLife International, Cambridge, UK. URL: <http://www.birdlife.org/datazone/species/index.html> (download 15 August 2007).
- Anon. (2007b). Globally threatened birds – family Promeropidae (sugarbirds). Species factsheets, BirdLife International, Cambridge, UK. URL: <http://www.birdlife.org/datazone/species/index.html> (download 19 August 2007).
- Anon. (2007c). Globally threatened birds – family Pardalotidae (pardalotes). Species factsheets, BirdLife International, Cambridge, UK. URL: <http://www.birdlife.org/datazone/species/index.html> (download 21 August 2007).
- Anon. (2007d). Globally threatened birds – family Certhiidae (treecreepers). Species factsheets, BirdLife International, Cambridge, UK. URL: <http://www.birdlife.org/datazone/species/index.html> (download 18 September 2007).
- Anon. (2007e). Globally threatened birds – family Dicaeidae (flowerpeckers). Species factsheets, BirdLife International, Cambridge, UK. URL: <http://www.birdlife.org/datazone/species/index.html> (download 21 September 2007).
- Anon. (2007f). Globally threatened birds – family Nectariniidae (sunbirds). Species factsheets, BirdLife International, Cambridge, UK. URL: <http://www.birdlife.org/datazone/species/index.html> (download 17 October 2007).
- Anon. (2007g). Globally threatened birds – family Oriolidae (orioles and figbirds). Species factsheets, BirdLife International, Cambridge, UK. URL: <http://www.birdlife.org/datazone/species/index.html> (download 29 November 2007).
- Anon. (2007h). Globally threatened birds – family Aegithalidae (Long-tailed tits). Species factsheets, BirdLife International, Cambridge, UK. URL: <http://www.birdlife.org/datazone/species/index.html> (download 17 December 2007).
- Anon. (2007i). Globally threatened birds – family Sittidae (nuthatches and wallcreeper). Species factsheets, BirdLife International, Cambridge, UK. URL: <http://www.birdlife.org/datazone/species/index.html> (download 07 January 2008).
- Anon. (2007j). Globally threatened birds – family Remizidae (penduline-tits). Species factsheets, BirdLife International, Cambridge, UK. URL: <http://www.birdlife.org/datazone/species/index.html> (download 11 February 2008).
- Anon. (2007k). Globally threatened birds – family Rhabdornithidae (Philippine creepers). Species factsheets, BirdLife International, Cambridge, UK. URL: <http://www.birdlife.org/datazone/species/index.html> (download 14 February 2008).
- Anon. (2007m). Globally threatened birds – family Laniidae (shrikes). Species factsheets, BirdLife International, Cambridge, UK. URL: <http://www.birdlife.org/datazone/species/index.html> (download 08 March 2008).
- Anon. (2007n). Globally threatened birds – family Zosteropidae (white-eyes). Species factsheets, BirdLife International, Cambridge, UK. URL: <http://www.birdlife.org/datazone/species/index.html> (download 20 April 2008).
- Anon. (2007o). Globally threatened birds – family Meliphagidae (honeyeaters). Species factsheets, BirdLife International, Cambridge, UK. URL: <http://www.birdlife.org/datazone/species/index.html> (download 13 May 2008).
- Anon. (2007p). Opinion 2187 (Case 3330). *Nectarinia senegalensis cruentata* Rüppell, 1845 (Aves, Passeriformes): subspecific name not conserved. *Bull. Zool. Nomencl.* **64**(4): 267–268.
- Anon. (2007q). *Phylidomyris undulata*. URL: <http://www.endemia.nc> (download 21 March 2007).
- Anon. (2007r). Advisory list of threatened vertebrate fauna in Victoria – 2007. Department of Sustainability and Environment (Victoria), Melbourne, Victoria. URL: <http://www.dse.vic.gov.au/CA256F310024B628/0/C6CBD5DCFD80B465CA257338001024AB/SFile/Advisory+List+of+Threatened+Vertebrate+Fauna+in+Victoria+-+2007.pdf> (download 31 October 2007).
- Antaran, B. (1985). Omen birds: their influence on the life of the Dusuns with special reference to the Merimbun Dusuns. *Brunei Mus. J.* **6**(1): 105–112.
- Antczak, M., Hromada, M., Grzybek, J. & Tryjanowski, P. (2004). Breeding biology of the Great Grey Shrike *Lanius excubitor* in W Poland. *Acta Orn. (Warszawa)* **39**: 9–14.
- Antczak, M., Hromada, M. & Tryjanowski, P. (2005a). Frogs and toads in the food of the Great Grey Shrike (*Lanius excubitor*): using larders and skinning as two ways to consume dangerous prey. *Anim. Biol.* **55**: 227–233.
- Antczak, M., Hromada, M. & Tryjanowski, P. (2005b). Spatio-temporal changes in Great Grey Shrike *Lanius excubitor* impaling behaviour: from food caching to communication signs. *Ardea* **93**(1): 101–107.
- Antczak, M., Hromada, M. & Tryjanowski, P. (2005c). Research activity induces change in nest position of the Great Grey Shrike *Lanius excubitor*. *Ornis Fenn.* **80**: 20–25.
- Antikainen, E. (1990). Bronze Sunbird catching food in a classroom. *Bull. East Afr. Nat. Hist. Soc.* **20**: 12–13.
- Appert, O. (1994). Gibt es in Madagaskar einen Vertreter der Pirole (Oriolidae)? Zur systematischen Stellung der Gattung *Tylas*. *Orn. Beob.* **91**: 255–267. In German.
- Ap-Thomas, M. & Ap-Thomas, J. (1977). Birds of the Kimbe region. *Papua New Guinea Bird Soc. Newsl.* **136**: 6–9.
- Arcas, J. (1998). Datos sobre la dieta del Alcaudón Dorsirrojo (*Lanius collurio* L.) en Orense (Galicia, Noroeste de España). *Ardeola* **45**(1): 69–71. In Spanish.
- Archard, G.A., Robertson, R.J., Jones, D., Painter, J., Crozier, R. & Clarke, M.F. (2006). Brooding behaviour in the cooperatively breeding Bell Miner (*Manorina melanophrys*). *Emu* **106**(2): 105–112.
- Archbold, R. & Rand, A.L. (1935). Summary of the 1933–34 Papuan Expedition. *Bull. Amer. Mus. Nat. Hist.* **68**(8): 527–579.
- Archbold, R., Rand, A.L. & Brass, L.J. (1942). Results of the Archbold Expeditions. No. 41. Summary of the 1938–1939 New Guinea Expedition. *Bull. Amer. Mus. Nat. Hist.* **79**(3): 197–288.
- Archer, A.L. & Parker, I.S.C. (1993). Fruit-eating sunbirds. *Scopus* **17**: 60–61.
- Archer, A.L. & Turner, D.A. (1993). Notes on the endemic species and some additional new birds occurring on Pemba Island, Tanzania. *Scopus* **16**: 94–98.
- Archer, D.M. (1992). The broad-leaved *Erythrina* as a food source. *Honeyguide* **38**: 173–176.
- Archer, G.F. & Godman, E.M. (1961). *The Birds of British Somaliland and the Gulf of Aden – Their Life Histories: Breeding Habits, and Eggs*. Vol. 4. Oliver and Boyd, Edinburgh & London.
- Argent, G.C.G. (1985). *Vireya* rhododendrons in Borneo. *Notes Roy. Bot. Garden Edinburgh* **43**(1): 53–61.
- Armstrong, D.P. (1990a). Co-operative care of fledglings by New Holland Honeyeaters. *Emu* **90**(2): 132–135.
- Armstrong, D.P. (1990b). *The Role of Energy Supply in Breeding Territoriality of New Holland and White-cheeked Honeyeaters*. PhD thesis, University of Sydney, Sydney.
- Armstrong, D.P. (1991a). Aggressiveness of breeding territorial honeyeaters corresponds to seasonal changes in nectar availability. *Behav. Ecol. Sociobiol.* **29**: 103–111.
- Armstrong, D.P. (1991b). Nectar depletion and its implication for honeyeaters in heathland near Sydney. *Austr. J. Ecol.* **16**(1): 99–109.
- Armstrong, D.P. (1992a). Correlation between nectar supply and aggression in territorial honeyeaters: causation or coincidence? *Behav. Ecol. Sociobiol.* **30**(2): 95–102.
- Armstrong, D.P. (1992b). Use of sugar-water feeders to supplement energy availability to honeyeaters for experimental tests. *Emu* **92**(3): 170–179.
- Armstrong, D.P. (1996). Territorial behaviour of breeding White-cheeked and New Holland Honeyeaters: conspicuous behaviour does not reflect aggressiveness. *Emu* **96**(1): 1–11.
- Armstrong, D.P. & Pyke, G.H. (1991). Seasonal patterns of reproduction in heathland honeyeaters are not responses to changing nectar availability. *Auk* **108**: 99–107.
- Arnold, G.W. (1989). Changes with time of day in the species and numbers of birds seen in wandoo woodland. *Corella* **13**(3): 81–85.
- Arnold, G.W. (2003). Bird species richness and abundance in wandoo woodland and in tree plantations on farmland at Baker's Hill, Western Australia. *Emu* **103**(3): 259–269.
- Ash, J.S. (1956). Mimetic posturing of Red-backed Shrikes. *British Birds* **49**: 178–180.
- Ash, J.S. (1970). Observations on a decreasing population of Red-backed Shrikes. *British Birds* **63**: 185–205, 225–239.
- Ash, J.S. (1994). Comments. *Scopus* **18**: 55–56.
- Ash, J.S. & Miskell, J.E. (1983). Birds of Somalia, their habitat, status and distribution. *Scopus Special Supplement* **1**: 1–97.
- Ash, J.S. & Miskell, J.E. eds. (1998). *Birds of Somalia*. Pica Press, Robertsbridge, UK.
- Ashby, E. (1925). Notes on Tasmanian bird-life. *South Austr. Orn.* **8**: 107–125.
- Ashby, E. & Le Souëf, A.S. (1928). Birds observed during the R.A.O.U. campout at Nornalup, south-west Australia. *Emu* **27**: 266–270.
- Ashmole, M.J. (1963). *Guide to the Birds of Samoa*. Pacific Science Information Center, Bernice P. Bishop Museum, Honolulu, Hawaii.
- Ashton, C.B. (1985). The birds of the Aldinga-Sellicks beach scrub. *South Austr. Orn.* **29**(7): 169–179.
- Ashton, C.B. (1996). Changes in the avifauna using Aldinga Scrub Conservation Park. *South Austr. Orn.* **32**: 93–98.
- Ashton, I., Goodreid, G., Goodreid, G. & Hunt, T. (1996). Birds of the Eyre Bird Observatory. Pp. 24–106 in: Anon. (1996). *Eyre Bird Observatory Report 6 1988–1992*. RAOU Report **97**. Royal Australasian Ornithologists Union, Melbourne, Victoria.
- Ashwell, D. (1980). Heat avoidance by some birds of the Big Desert, Victoria. *Austr. Bird Watcher* **8**: 256.
- Aspinwall, D.R. (1971). Olive Sunbirds near Lusaka. *Bull. Zambian Orn. Soc.* **3**: 58.
- Aspinwall, D.R. (1989). Oustalet's White-bellied Sunbird on Malawi/Zambia border. *Nyala* **14**(1): 39–40.
- Astheimer, L.B. & Buttemer, W.A. (2002). Changes in latitude, changes in altitude: a perspective on ecophysiological studies of Australian birds. *Emu* **102**(1): 19–27.
- Atchison, N. (1992). Breeding Blue-faced Honeyeaters at Taronga Zoo. *Austr. Avicult.* **46**(2): 29–35.
- Atchison, N. (1993). The Spiny-cheeked Honeyeater. *Austr. Avicult.* **47**(10): 234–237.
- Atkins, J.D. (1994). An isolated population of the Olive-bellied Sunbird *Nectarinia chloropygia* in Ethiopia. *Scopus* **18**(1): 54–56.
- Atkinson, E.C. (1997). Singing for your supper: acoustical luring of avian prey by Northern Shrikes. *Condor* **99**: 203–206.
- Atkinson, P.W., Dutton, J.S., Peet, N.B. & Sequeira, V.A.S. (1994). *A Study of the Birds, Small Mammals, Turtles and Medicinal Plants of São Tomé with Notes on Príncipe*. BirdLife International Study Report **56**. BirdLife International, Cambridge, UK.

- Atkinson, P.W., Peet, N.B. & Alexander, J. (1991). The status and conservation of the endemic bird species of São Tomé and Príncipe, West Africa. *Bird. Conserv. Int.* 1: 255–282.
- Atkinson, W.M.L. (1901). Nesting habits of the California Shrike. *Condor* 3: 9–11.
- Attenborough, D. (1995). *The Private Life of Plants*. BBC Books, London.
- Atyeo, W.T. (1971). Analagid mites (Proctophylloidae) from the Dicaeidae (Aves: Passeriformes). *J. Austr. Entomol. Soc.* 10: 37–42.
- August, U. (1985). Vom Mauierläufer, *Tichodroma muraria*, im Elbsandsteingebirge. *Beitr. Vogelkd.* 31(4): 235. In German.
- Aumann, T. (1991). Notes on the birds of the upper and middle reaches of Kimberley rivers during the dry season, 1989. *Austr. Bird Watcher* 14(2): 51–67.
- Austin, C.N. (1950). Further notes on the birds of Dunk Island, Queensland. *Emu* 49(4): 225–231.
- Austin, G.T. (1971). Body composition and organ weights of the Verdun *Auriparus flaviceps*. *Great Basin Nat.* 31(2): 66–68.
- Austin, G.T. (1976). Behavioural adaptations of the Verdun to the desert. *Auk* 93(2): 245–262.
- Austin, G.T. (1977). Production and survival of the Verdun. *Wilson Bull.* 89(4): 572–582.
- Austin, G.T. (1978a). Daily time budget of the postnesting Verdun. *Auk* 95(2): 247–251.
- Austin, G.T. (1978b). Pattern and timing of moult in penduline tits (*Anthoscopus*). *Ostrich* 49(4): 168–173.
- Austin, G.T. & Rea, A.M. (1971). Key to age and sex determination of Verduns. *Western Bird Bander* 46: 41.
- Austin, O.L. & Kuroda, N. (1953). The birds of Japan. Their status and distribution. *Bull. Mus. Comp. Zool. Harvard* 109: 279–637.
- Babbington, J. (1992). A report on the birds of Sabah. A visit between March 8th & March 23rd 1992. Unpubl. trip report.
- Backhouse, G.N. (1987). Management of remnant habitat for conservation of the Helmeted Honeyeater *Lichenostomus melanops cassidix*. Pp. 287–294 in: Saunders, D.A., Arnold, G.W., Burbidge, A.A. & Hopkins, A.J.M. eds. (1987). *Nature Conservation: the Role of Remnants of Native Vegetation*. Surrey Beatty & Sons, Chipping Norton, New South Wales.
- Backhouse, G.N., McLaughlin, J., Clarke, M. & Copley, P. (1997). *Recovery Plan for the Black-eared Miner* *Manorina melanotis* 1997–2001. Department of Natural Resources & Environment (Victoria), Melbourne, Victoria.
- Backhurst, G.C. (1973). East African bird ringing report 1971–1972. *J. East Afr. Nat. Hist. Soc. & Natl. Mus.* [No.] 144: 1–15.
- Backhurst, G.C. (1977). East African bird ringing report 1974–1977. *J. East Afr. Nat. Hist. Soc. & Natl. Mus.* [No.] 163: 1–10.
- Badhwar, D. (1990). Der Purpurkehlnektarvogel *Nectarinia asiatica asiatica*. *Trochilus* 11: 82–85. In German.
- Badman, F.J. (1979). Birds of the southern and western Lake Eyre drainage. *South Austr. Orn.* 28(2/3): 29–81.
- Badman, F.J. (1981). Birds of the Willouran Ranges and adjacent plains. *South Austr. Orn.* 28(6): 141–153.
- Badman, F.J. (1989). *The Birds of Middle and Lower Cooper Creek in South Australia*. Nature Conservation Society of South Australia, Adelaide.
- Baha el Din, S.M. (1985). The occurrence of the Palestine Sunbird (*Nectarinia osea*) in Egypt. *Bull. Orn. Soc. Middle East* 14: 1–2.
- Baha el Din, S.M. (1992). Ornithological report for Egypt. *Courser* 3: 59–67.
- Bailey, S.F. (1992). Bird observations in lowland Madang province. *Muruk* 5(3): 111–135.
- Baillie, J.E.M., Hilton-Taylor, C. & Stuart, S.M. eds. (2004). *IUCN Red List of Threatened Species: a Global Species Assessment*. The International Union for the Conservation of Nature and Natural Resources, The World Conservation Union, Gland, Switzerland.
- Bailly, J.B. (1854). *Ornithologie de la Savoie*. Vol. 3. J.-B. Clarey & J. Perrin, Paris & Chambéry. In French.
- Bairlein, F. (1992). Recent prospects on trans-Saharan migration of songbirds. *Ibis* 134: 41–46.
- Baker, A.J. (1991). A review of New Zealand ornithology. *Curr. Orn.* 8: 1–67.
- Baker, A.R. (1992). Food plants of the Bellbird, Tit, and New Zealand Pigeon. *Notornis* 39(4): 261–262.
- Baker, G.B., Dettmann, E.B., Scotney, B.T., Hardy, L.J. & Drynan, D.A.D. (1995). *Report on the Australian Bird and Bat Banding Scheme, 1984–95*. Australian Nature Conservation Agency (Australian Bird and Bat Banding Scheme), Canberra.
- Baker, K. (1997). *Warblers of Europe, Asia and North Africa*. Christopher Helm, London.
- Baker, M.C. (1993). Evidence of intraspecific vocal imitation in Singing Honeyeaters (Meliphagidae) and Golden Whistlers (Pachycephalidae). *Condor* 95: 1044–1048.
- Baker, M.C. (1994). Loss of function in territorial song: comparison of island and mainland populations of the Singing Honeyeater (*Meliphaga virescens*). *Auk* 111: 178–184.
- Baker, M.C. (1996). Depauperate meme pool of vocal signals in an island population of Singing Honeyeaters. *Anim. Behav.* 51(4): 853–858.
- Baker, M.C., Baker, E.M. & Baker, M.S.A. (2001). Island and island-like effects on vocal repertoire of Singing Honeyeaters. *Anim. Behav.* 62(4): 767–774.
- Baker, N. & Baker, L. eds. (2007). Tanzania Bird Atlas Project. URL: <http://tanzaniabirdatlas.com/> (download 16 October 2007).
- Baker, R.H. (1948). Report on collections of birds made by United States Naval Medical Research Unit No. 2 in the Pacific War area. *Smithsonian Misc. Coll.* 107: 1–74.
- Baker, R.H. (1951). The avifauna of Micronesia. Its origin, evolution, and distribution. *Univ. Kansas Publ. Mus. Nat. Hist.* 3: 1–359.
- Balachandran, S. (1999). Moults in some birds of Palni Hills, Western Ghats. *J. Bombay Nat. Hist. Soc.* 96: 48–54.
- Balatsky, N.N. (1999). [The kinglets *Regulus* and tit-warblers *Leptopoecile* in taxonomic system of birds]. *Russ. Orn. Zhurnal Ekspress Vypusk* 71: 18–22. In Russian.
- Baldwin, M. (1973). Nests of the Red Wattlebird. *Sunbird* 4(1): 10–12.
- Baldwin, M. (1975). Birds of Inverell district, NSW. *Emu* 75(3): 113–120.
- Baldwin, M. (1976). Striped Honeyeater and case moth. *Canberra Bird Notes* 3(6): 25.
- van Balen, S. [= B.] (1991). Faunistic notes from Bali. *Kukila* 5(2): 125–132.
- van Balen, S. [= B.] (1992). Gunung Gede-Pangrango National Park, Java. *Bull. Oriental Bird Club* 15: 23–29.
- van Balen, S. [= B.] (1993). The identification of tit-babblers and red sunbirds on Java. *Bull. Oriental Bird Club* 18: 26–28.
- van Balen, S. [= B.] (1997). Faunistic notes from Kayan Mentarang with new records for Kalimantan. *Kukila* 9: 108–113.
- van Balen, S. [= B.] (1998). More birds feeding on arils of acacia seeds. *Forktail* 13: 121–122.
- van Balen, S. [= B.] (1999). *Birds on Fragmented Islands: Persistence in the Forests of Java and Bali*. PhD thesis, Wageningen University, Wageningen, The Netherlands.
- van Balen, S. [= B.] & Rombang, W.M. (1998). *The Birds of the PT Freeport Indonesia Contract of Work Mining and Project Area, Irian Jaya, Indonesia*. P.T. Freeport Indonesia-Environmental Department, Jakarta, Indonesia.
- Ballingall, B. (1990). Parental care and feeding of nestlings in the Mistletoebird *Dicaeum hirundinaceum*. *Austr. Bird Watcher* 13(6): 174–177.
- Bangs, O. (1932). Birds of Western China obtained by the Kelley-Roosevelts Expedition. *Field Mus. Nat. Hist. (Zool. Ser.)* 18(11): 343–379.
- Bangs, O. & Peters, J.L. (1928). Birds collected by Dr. Joseph F. Rock in western Kansu and eastern Tibet. *Bull. Mus. Comp. Zool. Harvard* 68: 313–381.
- Bangs, O. & Van Tyne, J. (1931). Birds of the Kelley-Roosevelts Expedition to French Indo-China. *Field Mus. Nat. Hist. (Zool. Ser.)* 18(3): 33–119.
- Bankovics, A. (1977). Observations on the Wallcreeper (*Tichodroma muraria*). *Aquila* 83: 143–149. In Hungarian and English.
- Bankovics, A. (1983). New record of the Wall Creeper (*Tichodroma muraria*) in Mongolia. *Aquila* 90: 113–116.
- Banks, J. & Banks, J. (1986). Sri Lanka – a note on some birdwatching areas. *Bull. Oriental Bird Club* 3: 18–22.
- Banks, R.C. (1978). Prealternate molt in nuthatches. *Auk* 95(1): 179–181.
- Banks, R.C. (1984). Bird specimens from American Samoa. *Pacific Sci.* 38(2): 150–169.
- Bannerman, D.A. (1914). Report on the birds collected by the late Mr. Boyd Alexander (Rifle Brigade) during his last expedition to Africa. Part 1. The birds of Prince's Island. *Ibis Ser.* 10, no. 2: 596–631.
- Bannerman, D.A. (1915a). Report on the birds collected by the late Mr. Boyd Alexander (Rifle Brigade) during his last expedition to Africa. Part 2. The birds of St. Thomas' Island. *Ibis Ser.* 10, no. 3: 89–121.
- Bannerman, D.A. (1915b). Report on the birds collected by the late Mr. Boyd Alexander (Rifle Brigade) during his last expedition to Africa. Part 3. The birds of Annobón island. *Ibis Ser.* 10, no. 3: 227–234.
- Bannerman, D.A. (1921a). Exhibition and description of a new species of sunbird (*Anthreptes ogilvie-granti*) from Cameroon. *Bull. Brit. Orn. Club* 42: 8–9.
- Bannerman, D.A. (1921b). The birds of southern Nigeria including a detailed review of the races of species known to occur there. *Rev. Zool. Bot. Afr.* 9: 254–426.
- Bannerman, D.A. (1939). *The Birds of Tropical West Africa: with Special Reference to those of the Gambia, Sierra Leone, the Gold Coast and Nigeria*. Vol. 5. The Crown Agents for the Colonies, London.
- Bannerman, D.A. (1948). *The Birds of Tropical West Africa: with Special Reference to those of the Gambia, Sierra Leone, the Gold Coast and Nigeria*. Vol. 6. The Crown Agents for the Colonies, London.
- Bannerman, D.A. (1949). *The Birds of Tropical West Africa: with Special Reference to those of the Gambia, Sierra Leone, the Gold Coast and Nigeria*. Vol. 7. The Crown Agents for the Colonies, London.
- Bannerman, D.A. (1951). *The Birds of Tropical West Africa: with Special Reference to those of the Gambia, Sierra Leone, the Gold Coast and Nigeria*. Vol. 8. The Crown Agents, London.
- Bannerman, D.A. (1953). *The Birds of the British Isles*. Oliver and Boyd, London.
- Baptista, L.F. & Johnson, R.B. (1982). Song variation in insular and mainland California Brown Creepers (*Certhia familiaris*). *J. Orn.* 123(2): 131–144.
- Baptista, L.F. & Krebs, R. (2000). Vocalizations and relationships of Brown Creeper *Certhia americana*: a taxonomic mystery. *Ibis* 142(3): 457–465.
- Barea, L.P. & Watson, D.M. (2007). Temporal variation in food resources determines onset of breeding in an Australian mistletoe specialist. *Emu* 107(3): 203–209.
- Barker, F.K., Barrowclough, G.F. & Groth, J.G. (2002). A phylogenetic hypothesis for passerine birds: taxonomic and biogeographic implications of an analysis of nuclear DNA sequence data. *Proc. Royal Soc. London (Ser. B Biol. Sci.)* 269: 295–308.
- Barker, F.K., Cibois, A., Schikler, P., Feinstein, J. & Cracraft, J. (2004). Phylogeny and diversification of the largest avian radiation. *Proc. Natl. Acad. Sci. USA* 101: 11040–11045.
- Barker, R.D. & Vestjens, W.J.M. (1990). *The Food of Australian Birds*. Vol. 2. Passerines. CSIRO, Lynham, Australian Capital Territory.
- Barker, W.R. & Croft, J.R. (1977). The distribution of Macgregor's Bird-of-paradise. *Emu* 77(4): 219–222.
- Barlow, C., Wacher, T. & Disley, T. (1997). *A Field Guide to Birds of the Gambia and Senegal*. Pica Press, Robertsbridge, UK.
- Barnard, H.G. (1911). Field notes from Cape York. *Emu* 11(1): 17–32.
- Barnard, H.G. (1926). Birds of the Cardwell district, Queensland. *Emu* 26(1): 1–13.
- Barnes, R. & Brooks, T. (1997). The Taïta Hills, Kenya. *Birding World* 10: 437–438.
- Barnett, C.A. & Briskie, J.V. (2007). Energetic state and the performance of dawn chorus in Silvereyes (*Zosterops lateralis*). *Behav. Ecol. Sociobiol.* 61: 579–587.
- Barnicoat, F.C. (1984). Breeding the Black Sunbird *Nectarinia (Chalcomitra) amethystina amethystina*. *Avicult. Mag.* 90(2): 86–87.
- Barré, N., Villard, P., Manceau, N., Monimeau, L. & Ménard, C. (2006). Les oiseaux de l'Archipel des Loyauté (Nouvelle-Calédonie): inventaire et éléments d'écologie et de biogéographie. *Rev. Écol. (Terre Vie)* 61(2): 175–194. In French with English summary.
- Barrett, G. (1995). Pollen loads of vertebrates in heath vegetation during autumn at Eneabba. *West. Austr. Nat.* 20(3): 155–158.
- Barrett, G.W., Ford, H.A. & Recher, H.F. (1994). Conservation of woodland birds in a fragmented rural landscape. *Pacific Conserv. Biol.* 1(3): 245–256.
- Barrett, G.W., Silcocks, A., Barry, S., Cunningham, R. & Poulter, R. (2003). *The New Atlas of Australian Birds*. Royal Australasian Ornithologists Union, Melbourne, Victoria.
- Barruel, P. (1954). *Birds of the World: their Life and Habits*. George G. Harrap, London.
- Barry, K.J. (1998). Black-headed Oriole using same nest twice. *Honeyguide* 44: 221.
- Barry, K.J. (2002). Scarlet-chested Sunbird and a fledgling Klaas's Cuckoo. *Honeyguide* 48(1): 88–89.
- Bartels, M. (1931). Verwendung von Spinnengewebe beim Nestbau durch die Vögel. *Beitr. Fortpflanzungsbiol. Vögel* 7: 64–65. In German.
- Bartels, M. (1937). *Zosterops melanura melanura* Hartl., *Zosterops melanura gallii* Sharpe und *Zosterops melanura unica* Hart., drei verkannte Vertreter des Rassenkreises *Zosterops palpebrosa*. *Orn. Monatsber.* 45: 85–86. In German.
- Bartels, M.E.G. (1908). Zur Kenntnis der Vogelwelt der Tausendinseln. *J. Orn.* 56: 471–480. In German.
- Bartels, M.E.G. (1915–1930). Aufzeichnungen über Java-Vögel. Vol. 3. Unpubl. typescripts and manuscripts held at Naturalis in Leiden. In German.
- Bartholomew, G.A. & Cade, T.J. (1963). The water economy of land birds. *Auk* 80(4): 504–539.
- Bartle, J.A. & Paulin, C.D. (1986). Bird observations, Auckland Island, December 1976. Pp. 51–61 in: Penniket, A., Garrick, A. & Breese, E. eds. (1986). *Preliminary Reports of Expeditions to the Auckland Islands Nature Reserve 1973–1984*. Department of Lands & Survey (New Zealand), Wellington, New Zealand.
- Bartle, J.A. & Sagar, P.M. (1987). Intraspecific variation in the New Zealand Bellbird *Anthornis melanura*. *Notornis* 34(4): 253–306.
- Bartlett, C.M. & Anderson, R.C. (1987). Additional comments on species of *Pelecitus* (Nematoda: Filarioidae) from birds. *Can. J. Zool.* 65(11): 2813–2814.
- Basden, R. (1965). The occurrence and composition of manna in *Eucalyptus* and *Angophora*. *Proc. Linn. Soc. New South Wales* 90: 152–156.
- Bashta, A.T. (2005). Biotope distribution and habitat preference of breeding bird communities in alpine and subalpine belts in the Tatra and Babia Góra Mts. (southern Poland). *Berkut* 14(2): 145–162.
- Basil-Edwardes, S. (1923). Nidification of the Himalayan Tree-creeper (*Certhia himalayana*). *J. Bombay Nat. Hist. Soc.* 29: 557–559.
- Basilio, A. (1957). *Caza y Pesca en Annobón. Aves de la Isla*. La Pesca de la Ballena Instituto de Estudios Africanos, Madrid. In Spanish.
- Bates, G.L. (1911). Further notes on the birds of southern Cameroon. Part 2. With descriptions of the eggs by W.R. Ogilvie-Grant. *Ibis Ser.* 9, no. 5: 581–631.
- Bates, G.L. (1927). Notes on some birds of Cameroon and the Lake Chad region: their status and breeding-times. *Ibis Ser.* 12, no. 3: 1–64.
- Bates, G.L. (1934). Birds of the southern Sahara and adjoining countries in French West Africa. Part 5. *Ibis Ser.* 13, no. 4: 685–717.
- Bates, R.S.P. & Lowther, E.H.N. (1952). *Breeding Birds of Kashmir*. Oxford University Press, London & Delhi.
- Battley, P.F., Piersma, T., Dietz, M., Tang, S., Dekinga, P. & Hulsman, K. (2000). Empirical evidence for differential organ reductions during trans-oceanic bird flight. *Proc. Royal Soc. London (Ser. B Biol. Sci.)* 267: 191–195.
- Bauer, H.G., Bezzel, E. & Fiedler, W. (2005). *Das Kompendium der Vögel Mitteleuropas. Alles über Biologie, Gefährdung und Schutz*. Vol. 2. Passeriformes – Sperlingsvögel. 2nd edition. Aula-Verlag, Wiebelsheim, Germany. In German.

- Baumann, S. (1999a). Telemetrische Untersuchungen zu Raumnutzung und Habitatpräferenz des Pirols (*Oriolus oriolus*) in Schleswig-Holstein. *Corax* 18: 73–87. In German.
- Baumann, S. (1999b). Zur Zugphänologie und zum Überwinterungsgebiet des Europäischen Pirols (*Oriolus o. oriolus*) in Afrika. *Vogelwarte* 40(1/2): 63–79. In German with English summary.
- Baumann, S. (2000). Vergleich von Habitatstruktur und Habitatnutzung in Brutgebiet und Winterareal des Europäischen Pirols (*Oriolus o. oriolus*, L. 1758). *J. Orn.* 141(2): 142–151. In German with English summary.
- Baumann, S. (2001). Observations on the coexistence of Palearctic and African orioles *Oriolus* spec. in Zimbabwe. *Vogelwelt* 12: 67–79.
- Baumgart, W. (1970). Schreckreaktion zweier Mauerläufer. *Der Falke* 17: 382–384. In German.
- Baumgart, W. (1995). *Die Vögel Syriens: eine Übersicht*. Max Kasperek, Heidelberg, Germany. In German.
- Baxter, C.I. (1989). *An Annotated List of the Birds of Kangaroo Island*. National Parks and Wildlife Service South Australia, Kingscote, Kangaroo Island, South Australia.
- Baxter, C.I. (1995). *An Annotated List of Birds of Kangaroo Island*. 2nd edition. National Parks and Wildlife Service South Australia (Department of Environment and Natural Resources), Kingscote, Kangaroo Island, South Australia.
- Baxter, C.I. & Paton, P.A. (1998). Further notes on the birds of the Gawler Ranges. *South Austr. Orn.* 33(1/2): 1–15.
- Bayley, K.L. & Blumstein, D.T. (2001). Pied Currawongs and the decline of native birds. *Emu* 101(3): 199–204.
- Beaman, M. & Madge, S. (1998). *The Handbook of Bird Identification for Europe and the Western Palearctic*. Christopher Helm & A&C Black, London.
- Beaud, P. (2000). Comportement solidaire de mâles de Pies-grêches écorcheurs *Lanius collurio* face à un renard *Vulpes vulpes*. *Nos Oiseaux* 47(2): 121–122. In French with English summary.
- Beaufort, L.F. de (1909). Birds from Dutch New Guinea. *Nova Guinea (Zool.)* 5: 389–420.
- Beck, N. (1992). Conservation de la Sittelle corse *Sitta whiteheadi* Sharpe, 1844: sa place dans les aménagements forestiers. *Trav. Scient. Parc Nat. Reg. Reserves Nat. Corse* 40: 1–32. In French.
- Beck, W. & Witschko, W. (1988). Magnetic factors control the migratory direction of Pied Flycatcher (*Ficedula hypoleuca* Pallas). Pp. 1955–1962 in: Ouellet, H. ed. (1988). *Proceedings of the 19th International Ornithological Congress, 1986, Ithaca, New York*. University of Ottawa Press, Ottawa, Ontario.
- Becker, P. & Notthohm, G. (1976). Ein Beitrag zur Nahrung des Rotkopfwürgers. *Vogelwelt* 97: 193–195. In German.
- Beckett, B. (1996). Relationship between sunbirds and pitcher plants *Nepenthes pervillei*. *Birdwatch (London)* 17: 20.
- Becking, J.H. (1989). *Henri Jacob Victor Sody (1892–1959). His Life and Work – A Biographical and Bibliographical Study*. E.J. Brill, Leiden.
- Beckon, W.N. (1993). The effect of insularity on the diversity of land birds in the Fiji Islands: implications for refuge design. *Oecologia (Berlin)* 94: 318–329.
- Bedgood, G.W. (1970). Bird notes from East Gippsland. *Austr. Bird Watcher* 3(8): 252–265.
- Bedgood, G.W. (1973). Birds of the Caniamba district, Victoria. *Austr. Bird Watcher* 5(1): 12–22.
- Bedgood, G.W. (1980). Birdlife between Lake Tyers and Marlo, Victoria. *Austr. Bird Watcher* 8(5): 147–162.
- Beecher, W.J. (1953). A phylogeny of the oscines. *Auk* 70: 270–333.
- Beehler, B.M. (1978a). *Upland Birds of Northeastern New Guinea*. Wau Ecology Institute Handbook 4. Wau Ecology Institute, Wau, Papua New Guinea.
- Beehler, B.M. (1978b). Notes on the mountain birds of New Ireland. *Emu* 78: 65–70.
- Beehler, B.M. (1978c). Historical changes in the avifauna of the Wau Valley, Papua New Guinea. *Emu* 78: 61–64.
- Beehler, B.M. (1980a). Notes on some birds of the upper Eloa river, Papua New Guinea. *Emu* 80(2): 87–88.
- Beehler, B.M. (1980b). A comparison of avian foraging at flowering trees in Panama and New Guinea. *Wilson Bull.* 92(4): 513–519.
- Beehler, B.M. (1981). Ecological structuring of forest bird communities in New Guinea. Pp. 837–861 in: Gressitt, J.L. ed. (1981). *Monographie Biologique*, 42. W. Junk, The Hague, The Netherlands.
- Beehler, B.M. (1983). Notes on the behaviour and ecology of Macgregor's Bird-of-paradise. *Emu* 83: 28–30.
- Beehler, B.M. (1985). Conservation of New Guinea rainforest birds. Pp. 233–247 in: Diamond, A.W. & Lovejoy, T.E. eds. (1985). *Conservation of Tropical Forest Birds*. ICBP Technical Publication 4. International Council for Bird Preservation, Cambridge, UK.
- Beehler, B.M. (1988). Miscellaneous observations of birds in Irian Jaya and Papua New Guinea. *Muruk* 3(2): 51–52.
- Beehler, B.M. (1991a). *A Naturalist in New Guinea*. University of Texas Press, Austin, Texas.
- Beehler, B.M. (1991b). Papuan New Guinea's wildlife and environments – what we don't yet know. Pp. 1–10 in: Pearl, M., Beehler, B.M., Allison, A. & Taylor, M. eds. (1991). *Conservation and Environment in Papua New Guinea: Establishing Research Priorities*. Wildlife Conservation International, New York.
- Beehler, B.M. (1993). Biodiversity and conservation of the warm-blooded vertebrates of Papua New Guinea. Pp. 77–121 in: Beehler, B.M. ed. (1993). *Papua New Guinea – Conservation Needs Assessment 2*. Biodiversity Support Program, Washington, D.C.
- Beehler, B.M. (1994). Canopy-dwelling honeyeater aggressively defends terrestrial nectar resource. *Biotropica* 26: 459–461.
- Beehler, B.M. & Alonso, L.E. eds. (2001). *Southern New Ireland, Papua New Guinea: a Biodiversity Assessment*. Rapid Assessment Program Bulletin of Biological Assessment 21. Conservation International, Washington, D.C.
- Beehler, B.M. & Dumbacher, J.P. (1996a). More examples of fruiting trees visited predominantly by birds of paradise. *Emu* 96(2): 81–88.
- Beehler, B.M. & Dumbacher, J.P. (1996b). Interesting observations of birds at Varirata National Park, June–July 1989. *Muruk* 4(3): 111–112.
- Beehler, B.M. & Finch, B.W. (1985). *Species Checklist of the Birds of New Guinea*. Australasian Ornithologists Union Monograph 1. Australasian Ornithologists Union, Melbourne, Victoria.
- Beehler, B.M., Pratt, T.K. & Zimmermann, D.A. (1986). *Birds of New Guinea*. Princeton University Press, Princeton, New Jersey.
- Beehler, B.M., Prawiradilaga, D.M., de Fretes, Y. & Kemp, N. (2007). A new species of Smoky Honeyeater (Meliphagidae: *Melipotes*) from Western New Guinea. *Auk* 124(3): 1000–1009.
- Beehler, B.M., Sengo, J.B., Filardi, C. & Merg, K. (1995). Documenting the lowland rainforest avifauna in Papua New Guinea – effects of patchy distributions, survey effort and methodology. *Emu* 95(3): 149–161.
- Beesley, J.S. (1972). Birds of the Arusha National Park, Tanzania. *J. East Afr. Nat. Hist. Soc. & Natl. Mus. [No.]* 132: 1–30.
- Beiche, U. (2008). A consise guide to the landbirds of Samoa. Unpubl. MS.
- Beiche, U. & Baumann, S. (2003). *Die Landvögel der Samoa-Inseln*. Jahrbuch 10. Übersee-Museum, Bremen, Germany. In German.
- Beiche, U. & Maelzer, M. (1985). A conservation programme for Western Samoa. Pp. 297–299 in: Diamond, A.W. & Lovejoy, T.E. eds. (1985). *Conservation of Tropical Forest Birds*. ICBP Technical Publication 4. International Council for Bird Preservation, Cambridge, UK.
- Bekhuus, J., Nienhuis, J., Wymenga, E., Beemster, N. & van Beusekom, R. (1993). Opmars van den Buidelmees *Remiz pendulinus* in Nederland in de periode 1988–92. *Limosa* 66(3): 97–106. In Dutch with English summary.
- Béland, P. (1977). Mimicry in orioles of south-eastern Queensland. *Emu* 77(4): 215–218.
- Bell, B.D. (1975). Report on the birds of the Auckland Islands Expedition 1972–73. Pp. 136–142 in: Yaldwyn, J.C. ed. (1975). *Preliminary Results of the Auckland Islands Expedition 1972–1973*. Reserves Series 1975(3). Department of Lands & Survey (New Zealand), Wellington, New Zealand.
- Bell, B.D. (1991). Recent avifauna changes and the history of ornithology in New Zealand. Pp. 195–230 in: Bell, B.D., Cossee, R.O., Flux, J.E.C., Heather, B.D., Hitchmough, R.A., Robertson, C.J.R. & Williams, M.J. eds. (1991). *Acta XX Congressus Internationalis Ornithologici*. New Zealand Ornithological Congress Trust Board, Wellington, New Zealand.
- Bell, H.L. (1959). Some observations on the Black-headed Pardalote in the Brisbane area. *Emu* 59: 131–135.
- Bell, H.L. (1964). Unusual flocking of the Red Wattle-bird. *Emu* 64(1): 65–66.
- Bell, H.L. (1969). Field notes on the birds of the Ok Tedi river drainage, New Guinea. *Emu* 69(4): 193–211.
- Bell, H.L. (1970a). Field notes on the birds of Amazon Bay, Papua. *Emu* 70(1): 23–26.
- Bell, H.L. (1970b). Extension of altitudinal range of the Black-and-red Honeyeater. *Emu* 70(1): 31.
- Bell, H.L. (1970c). Field notes on birds of the Nomad river sub-district, Papua. *Emu* 70(3): 97–104.
- Bell, H.L. (1970d). Additions to the avifauna of Goodenough Island, Papua. *Emu* 70(4): 179–182.
- Bell, H.L. (1971a). Field notes on birds of Mt Albert Edward, Papua. *Emu* 71: 13–19.
- Bell, H.L. (1971b). Sedentary status of some New Guinea jungle birds. *Austr. Bird Bander* 9(4): 85.
- Bell, H.L. (1975). Avifauna of the Ninigo and Hermit Islands, New Guinea. *Emu* 75(2): 77–84.
- Bell, H.L. (1979). The effects on rain-forest birds of plantings of teak, *Tectona grandis*, in Papua New Guinea. *Austr. Wildl. Res.* 6(3): 305–318.
- Bell, H.L. (1980a). The effects of a power-line clearing on birds of dry sclerophyll forest at Black Mountain Reserve, Australian Capital Territory. *Corella* 4(1): 8–19.
- Bell, H.L. (1980b). Composition and seasonality of mixed-species feeding flocks of insectivorous birds in the Australian Capital Territory. *Emu* 80(4): 227–232.
- Bell, H.L. (1982a). A bird community of lowland rainforest in New Guinea. 1. Composition and density of the avifauna. *Emu* 82(1): 24–41.
- Bell, H.L. (1982b). A bird community of lowland rainforest in New Guinea. 2. Seasonality of the avifauna. *Emu* 82(2): 65–74.
- Bell, H.L. (1982c). A bird community of lowland rainforest in New Guinea. 3. Vertical distribution of the avifauna. *Emu* 82(3): 143–162.
- Bell, H.L. (1982d). A bird community of lowland rainforest in New Guinea. 4. Birds of secondary vegetation. *Emu* 82(4): 217–224.
- Bell, H.L. (1982e). Survival among birds of the understorey in lowland rainforest in Papua New Guinea. *Corella* 6(4): 77–82.
- Bell, H.L. (1983a). A bird community of lowland rainforest in New Guinea. 5. Mixed-species feeding flocks. *Emu* 82(Suppl.): 256–275.
- Bell, H.L. (1983b). Forty years of change in the avifauna of a Sydney suburb. *Austr. Birds* 18(1): 1–6.
- Bell, H.L. (1983c). Where do figbirds *Sphecotheres* roost in the wet season? *Papua New Guinea Bird Soc. Newsl.* 203–206: 8–10.
- Bell, H.L. (1984a). A bird community of lowland rainforest in New Guinea. 6. Foraging ecology and community structure of the avifauna. *Emu* 84(3): 142–158.
- Bell, H.L. (1984b). The importance of foothill forest in the diversity of rainforest birds in New Guinea. *Emu* 84(4): 225–235.
- Bell, H.L. & Ford, H.A. (1987). Fidelity to breeding-site in four migratory species near Armidale, New South Wales. *Corella* 11(1): 1–5.
- Bellamy, P.E., Brown, N.J., Enoksson, B., Firbank, L.G., Fuller, R.J., Hinsley, S.A. & Schotman, A.G.M. (1998). The influences of habitat, landscape structure and climate on local distribution patterns of the Nuthatch (*Sitta europaea* L.). *Oecologia (Berlin)* 115(1/2): 127–136.
- Bellatreche, M. (1991). Deux nouvelles localisations de la Sittelle kabyle *Sitta ledanti* en Algérie. *Oiseau et RFO (Nouv. Sér.)* 61: 269–272. In French.
- Bellatreche, M. & Chalabi, B. (1990). Données nouvelles sur l'aire de distribution de la Sittelle kabyle *Sitta ledanti*. *Alauda* 58: 95–97. In French.
- Bellchambers, K. & Carpenter, G. (1990). Birds recorded at Lake Torrens during its 1989 flooding. *South Austr. Orn.* 31(1): 1–7.
- Bellchambers, K., Adams, E. & Edwards, S. (1994). Observations of some birds of coastal and lowland Western Province, Papua New Guinea. *Muruk* 6(3): 28–39.
- Bellingham, M. & Davis, A. (1988). Forest bird communities in Western Samoa. *Notornis* 35: 117–128.
- van Bemmél, A.C.V. (1939). Zwei neue Vögel von der Insel Morotai. *Treubia* 17: 125–126. In German.
- van Bemmél, A.C.V. (1948). A faunal list of the birds of the Moluccan Islands. *Treubia* 19(2): 323–402.
- van Bemmél, A.C.V. & Voous, K.H. (1951). On the birds of the islands of Muna and Buton, S.E. Celebes. *Treubia* 21(1): 27–104.
- van Bemmél, A.C.V. & Voous, K.H. (1953). Supplement to the faunal list of the birds of the Moluccan Islands. *Beaufortia* 4(32): 1–7.
- Bengston, S.A. (1981). Does bird predation influence the spot number variation in *Maniola jurtina* (Lepidoptera)? *Biol. J. Linn. Soc.* 15: 23–27.
- Bennett, G.F. & Bishop, M.A. (1991). The haemoproteids (Apicomplexa: Haemoproteidae) of the flowerpeckers of the avian family Dicaeidae (Passeriformes). *Syst. Parasitol.* 18(3): 159–164.
- Bennett, G.F. & de Swardt, D.H. (1989). First African record of *Leucocytozoon anellobiae* (Apicomplexa: Leucocytozoidae) in Gurney's Sugarbird *Promeropis gurneyi*. *Ostrich* 60(4): 171.
- Bennett, G.F., Earlé, R.A. & Peirce, M.A. (1992). The Leucocytozoidae of South African birds: Passeriformes. *Onderstepoort J. Vet. Res.* 59(4): 235–247.
- Bennett, G.F., Earlé, R.A., du Toit, H. & Huchzermeyer, F.W. (1992). A host-parasite catalogue of the haematophagous of the sub-Saharan birds. *Onderstepoort J. Vet. Res.* 59(1): 1–73.
- Bennun, L. (1986). Montane birds of the Bwindi (Impenetrable) Forest. *Scopis* 10: 87–91.
- Bensch, S., Hasselquist, D., Hedenström, A. & Ottosson, U. (1991). Rapid moult among Palearctic passerines in West Africa – an adaptation to the oncoming dry season? *Ibis* 133(1): 47–52.
- Benson, C.W. (1944). Notes from Nyasaland. *Ibis* 86: 445–480.
- Benson, C.W. (1946). Notes on the birds of southern Abyssinia. *Ibis* 88: 180–205.
- Benson, C.W. (1948). A new race of sunbird from Nyasaland. *Bull. Brit. Orn. Club* 69(2): 19–20.
- Benson, C.W. (1950). The races of *Lanius souzai* Bocage. *Auk* 67: 394–395.
- Benson, C.W. (1960). The birds of the Comoro Islands: results of the British Ornithologists' Union Centenary Expedition 1958. *Ibis* 103B(1): 5–106.
- Benson, C.W. (1966). Some misidentified female sunbirds. *Bull. Brit. Orn. Club* 86: 65–66.
- Benson, C.W. (1967). The birds of Aldabra and their status. *Atoll Res. Bull.* 118(4): 63–111.
- Benson, C.W. (1969). The white-eye *Zosterops maderaspatana* (Linn.) of Menai Island, Cosmoledo Atoll. *Bull. Brit. Orn. Club* 89: 24–27.
- Benson, C.W. (1970). Sunbirds of the Indian Ocean, illustrated by Chloe Talbot Kelly. *Animals (London)* 12(11): 496–497.
- Benson, C.W. (1984). Origins of Seychelles land birds. Pp. 469–486 in: Stoddart (1984).
- Benson, C.W. & Benson, F.M. (1947). Some breeding and other records from Nyasaland. *Ibis* 89: 279–290.
- Benson, C.W. & Benson, F.M. (1963). Further breeding records from Northern Rhodesia. Part 3. *Bull. Brit. Orn. Club* 83: 36.
- Benson, C.W. & Benson, F.M. (1977). *The Birds of Malawi*. Mountfort Press, Limbe, Malawi.
- Benson, C.W. & Irwin, M.P.S. (1966). The sunbirds *Nectarinia bouvieri* and *batesi*. *Bull. Brit. Orn. Club* 86: 62–65.
- Benson, C.W. & Irwin, M.P.S. (1967). A contribution to the ornithology of Zambia. *Zambia Mus. Pap.* 1: i–Xiii, 1–139.
- Benson, C.W. & Penny, M.J. (1971). The land birds of Aldabra. *Phil. Trans. Roy. Soc. London (Ser. B)* 260: 417–527.
- Benson, C.W. & Prigogine, A. (1981). The status of *Nectarinia afra* *prigoginei*. *Gerfaut* 71: 47–57.
- Benson, C.W., Beamish, H.H., Jouanin, C., Salvan, J. & Watson, G.E. (1975). The birds of the Îles Glorieuses. *Atoll Res. Bull.* 176: 1–34.

- Benson, C.W., Brooke, R.K., Dowsett, R.J. & Irwin, M.P.S. (1971). *The Birds of Zambia*. Collins, London.
- Bent, A.C. (1946). Life histories of North American jays, crows, and titmice. Order Passeriformes. *US Natl. Mus. Bull.* **191**: i–xi, 1–495, pls. 1–68.
- Bent, A.C. (1948). Life histories of North American nuthatches, wrens, thrashers and their allies. *US Natl. Mus. Bull.* **195**: i–xi, 1–475, pls. 1–90.
- Beresford, P., Barker, F.K., Ryan, P.G. & Crowe, T.M. (2005). African endemics span the tree of song-birds (Passeri): molecular systematics of several evolutionary 'enigmas'. *Proc. Royal Soc. London (Ser. B Biol. Sci.)* **272**: 849–858.
- van den Berg, A.B. & Bosman, C.A.W. (1986). Supplementary notes on some birds of Lore Lindu Reserve, Central Sulawesi. *Forktail* **1**: 7–13.
- van den Berg, A.B. & Bosman, C.A.W. (1999). *Zeldzame Vogels van Nederland: met Vermelding van alle Soorten – Avifauna van Nederland. Rare Birds of the Netherlands: with Complete List of all Species*. Vol. 1. Pica Press, Robertsbridge, UK. In English and Dutch.
- Berger, A.J. (1972). *Hawaiian Birdlife*. The University Press of Hawaii, Honolulu, Hawaii.
- Berggy, J. (1978). Bird observations in the Madang province. *Papua New Guinea Bird Soc. Newsl.* **148**: 9–22.
- Bergmann, H.H. (1983). Some peculiarities of Cyprus bird voices. *Cyprus Orn. Soc. (1970) Bird Rep.* **8**: 41–54.
- Bergmann, H.H. & Helb, H.W. (1982). *Stimmen der Vögel Europas: Gesänge und Rufe von über 400 Vogelarten in mehr als 2000 Sonogrammen*. BLV Verlagsgesellschaft, Munich, Vienna & Zurich. In German.
- Bergmann, H.H., Helb, H.W. & Baumann, S. (2008). *Die Stimmen der Vögel Europas: 474 Vogelporträts mit 914 Rufen und Gesängen auf 2.200 Sonogrammen*. Aula-Verlag, Wiesbaden, Germany. In German.
- Bergquist, C.A.L. (1985a). Movements of groups of Tui (*Prosthemadera novaeseelandiae*) in winter and settlement of juvenile tui in summer. *New Zealand J. Zool.* **12**: 569–571.
- Bergquist, C.A.L. (1985b). Differences in the diet of the male and female Tui (*Prosthemadera novaeseelandiae*: Meliphagidae). *New Zealand J. Zool.* **12**: 573–576.
- Bergquist, C.A.L. (1986). Occurrence of disease in Tui. *Notornis* **33**(1): 61–62.
- Bergquist, C.A.L. (1987). Foraging tactics of the Tui (Meliphagidae). *New Zealand J. Zool.* **14**(3): 299–303.
- Bergquist, C.A.L. & Craig, J.L. (1988). Competitive asymmetries, status, and breeding success of Tui (Meliphagidae) at an established feeding station. *New Zealand J. Zool.* **15**(3): 369–380.
- Berlepsch, H. & Graf von (1911). Die Vögel der Aru-Inseln mit besonderer Berücksichtigung der Sammlungen des Herrn Dr. H. Merton. *Abh. Senckenbergischen Naturf. Gesell.* **34**: 53–98. In German.
- Berlioz, J. (1984). Sunbirds. Pp. 331–339 in: Grzimek *et al.* (1984).
- Bernard, M. & Fremillon, J.L. (1984). Synthèse des observations de Pie-grièche à tête rousse (*Lanius senator*) en Isère. *Niverolle* **8**: 23–28. In French.
- Berndt, R. (1984a). Long-tail tits. Pp. 310–311 in: Grzimek *et al.* (1984).
- Berndt, R. (1984b). True nuthatches. Pp. 321–323 in: Grzimek *et al.* (1984).
- Berndt, R. (1984c). True tree creepers. Pp. 326–328 in: Grzimek *et al.* (1984).
- Bernis, F. & Maluquer, J.M. (1955). Datos Sobre *Tichodroma muraria* (L.) en la Península Ibérica. *Ardeola* **2**: 1–11. In Spanish.
- Bersuder, D. & Koenig, P. (1995). *Biologie d'une Population de Pies-grièches à tête rousse* (*Lanius senator*) dans le Bas-Rhin. Compte-rendu Centre de Recherche sur la Biologie des Populations d'Oiseaux & Centre d'Études Ornithologiques d'Alsace, Paris & Strasbourg. In French.
- Berthold, P. (1973). Relationships between migratory restlessness and migration distance in *Sylvia* species. *Ibis* **115**: 594–599.
- Berthold, P. (1984). The control of partial migration in birds: a review. *Ring* **10**: 253–265.
- Berthold, P. (1996). *Control of Bird Migration*. Chapman & Hall, London.
- Berthold, P. & Querner, U. (1981). Genetic basis of migrating behaviour in European warblers. *Science (Washington, D.C.)* **212**: 77–79.
- Berthold, P. & Terrill, S.B. (1991). Recent advances in studies of bird migration. *Ann. Rev. Ecol. Syst.* **22**: 357–378.
- Berthold, P., Gwinner, E. & Klein, H. (1972). Circannuale Periodik bei Grasmücken. 1. Periodik des Körpergewichtes, der Mauser und der Nachtunruhe bei *Sylvia atricapilla* und *S. borin* unter verschiedenen konstanten Bedingungen. *J. Orn.* **113**(4): 170–190. In German with English summary.
- Berthold, P., Gwinner, E. & Sonnenschein, E. eds. (2003). *Avian Migration*. Springer-Verlag, Berlin.
- Beruldsen, G.R. (1979). Ten days at Weipa, Cape York Peninsula. *Austr. Bird Watcher* **8**(4): 128–132.
- Beruldsen, G.R. (1980). *A Field Guide to Nests and Eggs of Australian Birds*. Rigby, Adelaide.
- Beruldsen, G.R. (1990). Cape York in the wet. *Austr. Bird Watcher* **13**(7): 209–217.
- Beruldsen, G.R. & Uhlenhuth, K. (1995). Cape York in the wet. Part 2. *Austr. Bird Watcher* **16**(1): 3–10.
- Beusink, P., Nijssen, M., van Duinen, G.J. & Esselink, H. (2003). *Broed-en Voedsel生态学 van Grauwe Klauwieren in Intacte Kustduinen bij Skagen, Denemarken*. Rapport Stichting Bargerveen, Nijmegen. 52pp. In Dutch.
- Bevacqua, D. (1983). Osservazione di Picchio Muraiolo *Tichodroma muraria* sul Monte Tiriolo (CZ). *Uccelli d'Italia* **8**(4): 277. In Italian.
- Bezzel, E. (1967). Einige Notizen über den Mauerläufer in den Bayerischen Alpen. *Anz. Orn. Ges. Bayern* **8**: 172–174. In German.
- Bezzel, E. (1989). *Das besondere Vogelportrait – Der Pirol*. Blüchel & Philler, Minden & Munich, Germany.
- Bezzel, E. (1993). Der Mauerläufer *Tichodroma muraria* im Werdenfelser Land, Oberbayern. *Limicola* **7**: 35–48. In German.
- Bezzel, E., Geiersberger, I., Lossow, G. von & Pfeifer, R. (2005). *Brutvögel in Bayern. Verbreitung 1996 bis 1999*. Eugen Ulmer, Stuttgart, Germany. In German.
- Bharucha, E.K. (1982). Sunbirds fostering fledglings of Plaintive Cuckoos. *J. Bombay Nat. Hist. Soc.* **79**(3): 670–671.
- Bibby, C.J. & Green, R.E. (1981). Autumn migration strategies of Reed and Sedge Warblers. *Ornis Scand.* **12**: 1–12.
- Biebach, H. (1990). Strategies of trans-desert migrants. Pp. 352–367 in: Gwinner (1990a).
- Biebach, H., Dallmann, M., Schuy, W. & Siebenrock, K.H. (1983). Die Herbstzugrichtung von Neuntöttern (*Lanius collurio*) auf Karpathos (Griechenland). *J. Orn.* **124**(3): 251–257. In German with English summary.
- Bielewicz, J. & Bielewicz, F. (1996). The birds of the Redcliffe Peninsula, southeast Queensland. *Sunbird* **26**(4): 81–120.
- Bijlens, L., Stevens, J., Janssens, L. & Louette, M. (1987). Community structure of Grand Comoro land birds with special reference to the ecology of congeneric species. *Rev. Zool. Afr.* **101**(2): 221–232.
- Bildstein, K.L. & Grubb, T.C. (1980). Spatial distributions of American Kestrels and Loggerhead Shrikes wintering sympatrically in eastern Texas. *J. Raptor Res.* **14**: 90–91.
- Bingman, V.P. (1987). Earth's magnetism and the nocturnal orientation of migratory European Robins. *Auk* **104**: 523–525.
- Birand, A. & Pawar, S. (2004). An ornithological survey in north-east India. *Forktail* **20**: 15–24.
- Bishop, K.D. (1977). Further bird observations from Baiyer river. *Papua New Guinea Bird Soc. Newsl.* **138**: 9–17.
- Bishop, K.D. (1978). Birds of the lower Jimmi [Jimi] valley, WHP. *Papua New Guinea Bird Soc. Newsl.* **145**: 17–22.
- Bishop, K.D. (1982). Endemic birds of Biak island. International Council for Bird Preservation. Unpubl.
- Bishop, K.D. (1985). Scarlet-headed Flowerpecker *Dicaeum trochileum*: a new bird for Sumatra. *Kukila* **2**(1): 7–8.
- Bishop, K.D. (1987). Interesting bird observations in Papua New Guinea. *Muruk* **2**(2): 52–57.
- Bishop, K.D. (1992). New and interesting records of birds in Wallacea. Part 2. Miscellaneous observations. Part 3. Preliminary lists of small and ornithologically previously unexplored islands. *Kukila* **6**(1): 13–34.
- Bishop, K.D. (1999). Preliminary notes on some birds in Bhutan. *Forktail* **15**: 87–91.
- Bishop, K.D. & Brickle, N.W. (1999). An annotated checklist of the birds of the Tanimbar Islands. *Kukila* **10** (1998): 115–150.
- Bishop, K.D. & Jones, D.N. (2001). The montane avifauna of West New Britain, with special reference to the Nakanai Mountains. *Emu* **101**(3): 205–220.
- Bison, P. & van der Laan, J. (1985). Juvenile plumage of Algerian Nuthatch. *Dutch Birding* **7**(3): 108–109.
- Biswas, B. (1950). On the shrike *Lanius tephronotus* (Vigors), with remarks on the *erythronotus* and *tricolor* groups of *Lanius schach* Linné, and their hybrids. *J. Bombay Nat. Hist. Soc.* **49**: 444–455.
- Biswas, B. (1962). Further notes on the shrikes *Lanius tephronotus* and *Lanius schach*. *Ibis* **104**: 112–115.
- Bjorge, R.R. & Kiliaan, H.P.L. (1997). Densities of Loggerhead Shrike on study blocks in southeastern Alberta inventoried in both 1993 and 1996. *Blue Jay* **55**: 217–219.
- Bjorge, R.R. & Prescott, D.R.C. (1996). Population estimate and habitat associations of the Loggerhead Shrike, *Lanius ludovicianus*, in southeastern Alberta. *Can. Field-Nat.* **110**: 445–449.
- Blaber, S.J.M. (1990). A checklist and notes on the current status of birds of New Georgia, Western Province, Solomon Islands. *Emu* **90**(4): 205–214.
- Blaber, S.J.M. (1995). Abundance, site fidelity, morphometrics and sex ratios of Scarlet Honeyeater *Myzomela sanguinolenta* at a site in south-east Queensland. *Corella* **19**(2): 55–60.
- Black, A.B. & Badman, F.J. (1986). Birds of the Great Victoria Desert. Pp. 66–94 in: Greenslade, P., Joseph, L. & Barley, R. eds. (1986). *The Great Victoria Desert*. Nature Conservation Society of South Australia, Adelaide.
- Blackburn, A. (1963). Nesting record of Tui. *Notornis* **10**(4): 176–179.
- Blackburn, A. (1967). [Letter to editors]. *Notornis* **14**: 70.
- Blackburn, A. (1971). Some notes on Fijian birds. *Notornis* **18**: 147–174.
- Blackney, J.R. & Menkhurst, P.W. (1993). Distribution of subspecies of the Yellow-tufted Honeyeater in the Yarra Valley region, Victoria. *Emu* **93**(4): 209–213.
- Blackwell, K.E. & Wells, D.R. (1965). Collared Sunbird feeding on berries. *Bull. Nigerian Orn. Soc.* **2**: 81.
- Blakers, M., Davies, S.J.J.F. & Reilly, P.N. (1984). *The Atlas of Australian Birds*. Royal Australasian Ornithologists Union & Melbourne University Press, Melbourne, Victoria.
- Blanchard, B.D. (1941). The White-crowned Sparrows *Zonotrichia leucophrys* of the Pacific seaboard: environment and annual cycle. *Univ. Calif. Publ. Zool.* **46**: 1–178.
- Blancou, L. (1939). Contribution à l'étude des oiseaux de l'Oubangui-Chari occidental (Bassin supérieur de l'Ouham). Part 2. Liste des espèces. *Oiseau et RFQ (Nouv. Sér.)* **9**: 410–485. In French.
- Blasius, A.W.H. (1888a). Verein für Naturwissenschaft. 7. Sitzung am 5. Januar 1888. *Braunsch. Anzeiger* **11**(9): 85–86. In German.
- Blasius, A.W.H. (1888b). Die Vögel von Gross-Sanghir [...] nebst einem Anhang über die Vögel von Siao. *Ornis* **4**(4): 527–647. In German.
- Blasius, A.W.H. (1897). Neuer Beitrag zur Kenntniss [sic] der Vogelfauna von Celebes (nach Sammlungen des Herrn Dr. C. Platen von Rurukan in der Minahassa, Nord-Celebes). Pp. 276–395 in: Beckurts, H. ed. (1897). *Fest-Schrift der Herzöglichen Technischen Hochschule ?Carolo-Wilhelmina?*. Herzogliche Technische Hochschule ?Carolo-Wilhelmina? & Friedrich Vieweg und Sohn, Brunswick.
- Bleitz, D. (1951). Nest of Pygmy Nuthatches attended by four parents. *Condor* **53**: 150–151.
- Blem, C.R. (1990). Avian energy storage. *Curr. Orn.* **7**: 59–113.
- Blumton, A.K. (1989). *Factors Affecting Loggerhead Shrike Mortality in Virginia*. MSc thesis, Virginia Polytechnic Institute and State University, Blacksburg, Virginia.
- Bocage, J.V.B. du (1891). Oiseau de l'île St. Thomé. *J. Sci. Math. Phys. e Nat., Acad. Real Sci. Lisboa Ser. 2, no. 2(6): 77–87. In French.*
- Bocage, J.V.B. du (1904). Contribution à la faune des quatre îles du Golfe de Guinée IV. Île de St Thomé. *J. Sci. Math. Phys. e Nat., Acad. Real Sci. Lisboa Ser. 2, no. 7(26): 65–96. In French.*
- Bochenki, Z. (1998). Systematyczne implikacje oparte na budowie gniazd remizow. [The nest building of penduline tits and its systematic implications]. *Notatki Ornitolozyczne* **39**(4): 231–241. In Polish with English summary.
- Bock, C.E. (1969). Intra- vs. interspecific aggression in Pygmy Nuthatch flocks. *Ecology* **50**: 903–905.
- Bock, C.E. & Lephien, L.W. (1972). Winter eruptions of Red-breasted Nuthatches in North America, 1950–1970. *Amer. Birds* **26**: 558–561.
- Bock, W.J. (1963). Relationships between the birds of paradise and the bowerbirds. *Condor* **65**: 91–125.
- Bock, W.J. (1985). Relationships of the sugarbird (*Promerops*; Passeriformes, ?Meliphagidae). Pp. 349–374 in: Schuchmann, K.L. ed. (1985). *Proceedings of the International Symposium on African Vertebrates: Systematics, Phylogeny and Evolutionary Ecology*. Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn, Germany.
- Bock, W.J. (1994). History and nomenclature of avian family-group names. *Bull. Amer. Mus. Nat. Hist.* **222**: 1–281.
- Bock, W.J. & Morioka, H. (1971). Morphology and evolution of the ectethmoid-mandibular articulation in the Meliphagidae. *J. Morph.* **135**: 13–50.
- Boehm, E.F. (1945). Nidification of the Yellow-fronted Honeyeater in South Australia. *South Austr. Orn.* **5**: 51–52.
- Boehm, E.F. (1948). Australian birds on animate perches. *Emu* **47**(3): 233–234.
- Boehm, E.F. (1957). Perching birds (Passeriformes) of the Mount Mary Plains, South Australia. *Emu* **57**(5): 311–324.
- Boehm, E.F. (1978). Banding the Yellow-plumed Honeyeater on the Mount Mary Plains, South Australia. *Corella* **2**(4): 65–68.
- Boekel, C. (1976). Ten months on Gove Peninsula. *Austr. Bird Watcher* **6**(7): 231–245.
- Boekel, C. (1979a). Notes on the status and behaviour of the Purple-crowned Fairy-wren *Malurus coronatus* in the Victoria River Downs area, Northern Territory. *Austr. Bird Watcher* **8**(3): 91–97.
- Boekel, C. (1979b). Birds, crocodiles, and (perhaps?) waterside safety. *Austr. Bird Watcher* **8**(4): 123–127.
- Boekel, C. (1980a). Birds of Victoria River Downs Station and of Yarralin, Northern Territory. Part 1. *Austr. Bird Watcher* **8**(6): 171–193.
- Boekel, C. (1980b). Birds of Victoria River Downs Station and of Yarralin, Northern Territory. Part 2. *Austr. Bird Watcher* **8**(7): 205–211.
- Bogdanov, M.N. (1881). *Sorokoputy russkoi fauny: ikh Sorodichi*. [Shrikes of the Russian Fauna and their Relatives]. Imperatorskaya akademiya nauk, St. Petersburg. In Russian.
- Bohall-Wood, P. (1987). Abundance, habitat use and perch use of Loggerhead Shrikes in north-central Florida. *Wilson Bull.* **99**: 82–86.
- Boles, W.E. (2005). Fossil honeyeaters (Meliphagidae) from the Late Tertiary of Riversleigh, north-western Queensland. *Emu* **105**: 21–26.
- Boles, W.E. (2007). Notes on a possible new longbill from New Guinea. Unpubl.
- Boles, W.E. & Longmore, N.W. (1985). Generic allocation of the Tawny-crowned Honeyeater. *South Austr. Orn.* **29**: 221–223.
- Boles, W.E. & Longmore, N.W. (1989). Altitudinal distribution of birds at Thornton Peak, North Queensland. *Sunbird* **19**: 1–15.
- Bonaccorsi, G. & Isenmann, P. (1994). Biologie de la reproduction et nourriture de la Pie-grièche à tête rousse *Lanius senator badius* et de la Pie-grièche écorcheur *Lanius collurio* en Corse (France). *Alauda* **62**: 269–274. In French.
- Bonnin, J.M. (1989). Deaths from thiamine deficiency in honeyeaters fed in a suburban garden. *South Austr. Orn.* **30**(7): 190–192.
- Bonnin, J.M. & Angove, R.C. (1980). Wedge Island. *South Austr. Orn.* **28**(4): 104–106.
- Booth, A. (1969). The Orange-bellied Flowerpecker *Dicaeum trigonostigma*. *Avicult. Mag.* **75**: 273–274.
- Borello, W.D. (1992). An incidence of mass sunbird migration in northern Botswana. *Babbler (Botswana)* **23**: 18–21.

Borghesio / Browne

- Borghesio, L. & Laiolo, P. (2004). Habitat use and feeding ecology of Kulal White-eye *Zosterops kulalensis*. *Bird Conserv. Int.* **14**(1): 11–24.
- Borghesio, L. & Ndag'ang'a, K. (1999). Threatened birds of Kenya. 11: Kulal White-eye. *Kenya Birds* 7(1/2): 75–77.
- Borghesio, L., John, J.R.M. & Cordeiro, N.J. (2007). Bedrohte Vogelarten der östlichen Usambara-Berge – Grund zum Optimismus? [Threatened bird species in the East Usambara mountains. Reasons for optimism?]. *ZGAP Mitt.* **23**(1): 13. In German with English summary.
- Borghesio, L., John, J.R.M., Mulungu, E., Mkongewa, V., Joho, M. & Cordeiro, N.J. (2008). Observations of threatened birds in the East Usambara Mountains, Tanzania. *Bull. Afr. Bird Club* **15**(1): 59–70.
- Borrett, R.P. (1972). Fat deposition in *Oriolus auratus* in Rhodesia. *Ostrich* **43**: 64.
- Borrow, N. & Demey, R. (2001). *Birds of Western Africa*. Helm Identification Guides. Christopher Helm, London.
- Bosch, S. (2007). Viel Lehm – viel Kleibern. *Der Falke* **54**(9): 349. In German.
- Bostock, N. & Sujanika (1993). Indonesia birding itineraries. *Bull. Oriental Bird Club* **18**: [–XVI] 30–46.
- Bouet, G. (1942). Les oiseaux de la forêt du sud Cameroun (fin). *Oiseau et RFO (Nouv. Sér.)* **12**: 133–178. In French.
- Boulton, R. & Rand, A.L. (1952). A collection of birds from Mount Cameroon. *Fieldiana Zool.* **34**(5): 35–64.
- Boulton, R.L., Cassey, P., Schipper, C. & Clarke, M.F. (2003). Nest site selection by Yellow-faced Honeyeaters *Lichenostomus chrysops*. *J. Avian Biol.* **34** (3): 267–274.
- Bounds, J. (1994). Painted Honeyeaters at Jindalee State Forest, near Wallendbeen, NSW, and their status in the Canberra region. *Canberra Bird Notes* **19**(4): 53–57.
- Bounds, J. (1996). Lone Fuscous and Yellow-faced Honeyeaters keeping company. *Canberra Bird Notes* **21**(1): 14.
- Bounds, J. & Lepski, B.J. (1988). Mulligan's Flat atlasing – notes on the Regent Honeyeater. *Canberra Bird Notes* **13**(2): 42–43.
- Bounds, J., Brookfield, M. & Delahoy, M. (1996). Observations of a breeding colony of four pairs of Regent Honeyeaters at North Watson, Canberra, in 1995–96. *Canberra Bird Notes* **21**(3): 41–55.
- Bounds, J., Clayton, M. & Taws, N. (1999). Observations of Regent Honeyeaters in failed breeding attempts at Mulligan's Flat Nature Reserve and Gooroo in the 1988/99 summer. *Canberra Bird Notes* **24**(1): 18–25.
- Bourke, P.A. & Austin, A.F. (1947). The Atherton Tablelands and its avifauna. *Emu* **47**(2): 87–116.
- Bourne, J.M. (1987). Black Honeyeater breeding in the south east of South Australia. *South Austr. Orn.* **30**(3): 77.
- Bourne, W.R.P. (1979). Birds and gas flares. *Marine Pollution Bull.* **10**: 124–125.
- Bourns, F.S. & Worcester, D.C. (1894). Preliminary notes on the birds and mammals collected by the Menage Scientific Expedition to the Philippine islands. *Minnesota Acad. Nat. Sci. Occ. Pap.* **1**(1): 1–64.
- Bowie, R.C.K., Fjeldsø, J., Hackett, S.J. & Crowe, T.M. (2004a). Systematics and biogeography of double-collared sunbirds from the Eastern Arc Mountains, Tanzania. *Auk* **121**(3): 660–681.
- Bowie, R.C.K., Fjeldsø, J., Hackett, S.J. & Crowe, T.M. (2004b). Molecular evolution in space and through time: mtDNA phylogeography of the Olive Sunbird (*Nectarinia olivacea/obscura*) throughout continental Africa. *Mol. Phylog. Evol.* **33**(1): 56–74.
- Bowler, J. & Taylor, J. (1989a). An annotated checklist of the birds of Manusela National Park, Seram (birds recorded on the Operation Raleigh Expedition). *Kukila* **4**(1/2): 3–29.
- Bowler, J. & Taylor, J. (1989b). Aggressive behaviour displayed by the Grey-necked Friarbird. *Kukila* **4**(3/4): 148.
- Bowler, J. & Taylor, J. (1993a). Birdwatching areas: Manusela National Park, Seram, Maluku, Indonesia. *Bull. Oriental Bird Club* **18**: 21–25.
- Bowler, J. & Taylor, J. (1993b). The avifauna of Seram. Pp. 143–159 in: Edwards, I.D., MacDonald, A.A. & Proctor, J. eds. (1993). *Natural History of Seram: Maluku, Indonesia*. Intercept, Andover, Hampshire, UK.
- Bowman, D.M.J.S., Woinarski, J.C.Z., Sands, D.P.A., Wells, A. & McShane, V.J. (1990). Slash-and-burn agriculture in the wet coastal lowlands of Papua New Guinea: response of birds, butterflies and reptiles. *J. Biogeogr.* **17**(3): 227–239.
- Bradley, D. & Wolff, T. (1958). The birds of Rennell Island. *Nat. Hist. Rennell Island British Solomon Islands* **1**: 85–120.
- Brahimia, Z., Dziri, H., Benyacoub, S., Chabi, Y. & Banbura, J. (2003). Breeding ecology of Algerian Woodchat Shrikes: low breeding success. *Folia Zool. (Brno)* **52**(3): 309–316.
- Braithwaite, R.W., Dudzinski, M.L., Ridpath, M.G. & Parker, B.S. (1984). The impact of water buffalo on the monsoon forest ecosystem in Kakadu National Park. *Austr. J. Ecol.* **9**(4): 309–322.
- Brandl, R., Lübecke, W. & Mann, W. (1986). Nestlingswachstum und Niederschlag beim Neuntöter. *J. Orn.* **127**: 97–98. In German with English summary.
- Brandt, J.H. (1962). Nests and eggs of the birds of the Truk islands. *Condor* **64**(5): 416–437.
- Branson, N.J.B.A., Ponting, E.D. & Minton, C.D.T. (1979). Turnstone populations on the Wash. *Bird Study* **26**: 47–54.
- Bravery, J.A. (1970). The birds of Atherton Shire, Queensland. *Emu* **70**(2): 49–63.
- Brazil, M.A. (1991). *The Birds of Japan*. Christopher Helm, A&C Black & Smithsonian Institution Press, London & Washington, D.C.
- Bregulla, H.L. (1992). *Birds of Vanuatu*. Anthony Nelson, Oswestry, UK.
- Brent, A.E. (1905). The Black-headed Honey-eater (*Melithreptus melanocephalus*). *Emu* **5**: 12–15.
- Brichetti, P. & Di Capi, C. (1985). Distribution, population and breeding ecology of the Corsican Nuthatch, *Sitta whiteheadi* Sharpe. *Riv. Ital. Orn.* **55**(1): 3–26. In English with Italian and French summary.
- Brichetti, P. & Di Capi, C. (1987). Conservation of the Corsican Nuthatch *Sitta whiteheadi* Sharpe, and proposals for habitat management. *Biol. Conserv.* **39**: 13–21.
- Bridgewater, P.B. (1987). The present Australian environment – terrestrial and freshwater. Pp. 69–100 in: Dyne, G.R. & Walton, D.W. eds. (1987). *Fauna of Australia*. Vol. 1A. General Articles. Australian Government Publishing Service, Canberra.
- Brieschke, H. (1990). Zur Biologie des Amethystglanzköpfchens *Chalcomitra amethystina* (Shaw, 1812). *Trochilus* **11**(1): 3–14. In German with English summary.
- Brieschke, H. (1991). *Biologische Untersuchungen am Kleinen Halsbandnektarvogel* (Paneola chalybea) und am Großen Halsbandnektarvogel (Paneola afra) im Freiland (Südafrika) und im Labor. PhD thesis. Johann Wolfgang Goethe-Universität, Frankfurt am Main, Germany. In German.
- Brieschke, H. (1992a). Nektarvögel und ihre Nester. Teil 1. *Trochilus* **13**: 9–18. In German.
- Brieschke, H. (1992b). Nektarvögel und ihre Nester. Teil 2. *Trochilus* **13**: 124–128. In German.
- Briggs, S.V. & Tooth, L. (1994). Terrestrial birds in uncropped and cropped lakebeds and surrounding woodlands. Pp. 57–66 in: Briggs, S.V. ed. (1994). *Ecological Management of Lakebed Cropping*. New South Wales National Parks and Wildlife Service, Sydney.
- Brinkmann, R.P. (1978). Breeding the Indian White-eye. *Avicult. Mag.* **84**: 2–4.
- Bristowe, E.K., Laybourne Smith, H. & London, A. (1971). Further notes on Northern Territory and Kimberley birds. *Austr. Bird Watcher* **4**(3): 84–95.
- Britton, P.L. (1977). A Kenya record of *Cercococcyx montanus* at sea-level. *Scopus* **1**: 23–24.
- Britton, P.L. ed. (1980). *Birds of East Africa, their Habitat, Status and Distribution*. East Africa Natural History Society, Nairobi.
- Britton, P.L. (1981). Notes on the Andersen collection and other specimens from Tanzania housed in some West German museums. *Scopus* **5**(1): 14–21.
- Britton, P.L. (1997). Winter mixed-species flocks at Charters Towers, North Queensland. *Sunbird* **27**(2): 29–37.
- Britton, P.L. & Britton, H.A. (1977). Sunbirds nesting inside buildings at the Kenya coast. *Scopus* **1**: 68–70.
- Britton, P.L. & Britton, H.A. (1978). Notes on the Amani Sunbird *Antheptes pallidigaster* including a description of the nest and eggs. *Scopus* **2**(4): 102–103.
- Britton, P.L. & Zimmerman, D.A. (1979). The avifauna of Sokoke forest. *J. East Afr. Nat. Hist. Soc. & Nat. Mus. [No.]* **169**: 1–15.
- Broadbent, K. (1910). Birds of Cardwell and Herbert River districts (N.Q.). *Emu* **10**: 233–245.
- Broekhuysen, G.J. (1959). The biology of the Cape Sugarbird *Promerops cafer* (L.). Pp. 180–221 in: Rowan, M.K. ed. (1959). *Proceedings of the First Pan-African Ornithological Congress*. Ostrich (Suppl. 3). The South African Ornithological Society, Cape Town.
- Broekhuysen, G.J. (1963). The biology of the Orange-breasted Sunbird *Anthobaphes violacea* (Linnaeus). *Ostrich* **34**: 187–234.
- Broekhuysen, G.J. (1971). Partial albino sugarbird. *Ostrich* **42**: 70.
- Broekhuysen, G.J. & Winterbottom, J.M. (1968). Breeding activity of the Cape White-eye *Zosterops virens capensis* Sundevall in the South-west Cape. *Ostrich* **39**: 163–176.
- Bromley, R.G. & Jarvis, R.L. (1993). The energetics of migration and reproduction of Dusky Canada Geese. *Condor* **95**: 193–210.
- Brook, B. & Kikkawa, J. (1998). Examining threats faced by island birds: a population viability analysis on the Capricorn Silvereye using long-term data. *J. Appl. Ecol.* **35**: 491–503.
- Brooke, R.K. (1962). Further incubation and nestling periods revealed by Rhodesian nest-record cards. *Ostrich* **33**: 23–25.
- Brooke, R.K. (1964). Avian observations on a journey across Central Africa and additional information on some of the species seen. *Ostrich* **35**: 277–292.
- Brooke, R.K. (1965). Ornithological notes on the Furancungo district of Mozambique. *Arnoldia (Rhodesia)* **2**: 1–13.
- Brooke, R.K. (1970a). Birds eating winged termites. *Honeyguide* no. **64** [vol. 16(1)]: 17–18, 38.
- Brooke, R.K. (1970b). Bursal colours, weights and races of *Nectarinia bifasciata*. *Bull. Brit. Orn. Club* **90**: 11–14.
- Brooke, R.K. (1986). Visitors to a fruiting *Ficus* at Karoi. *Honeyguide* **32**(2): 93.
- Brooker, M.G. & Brooker, L. (2004). Yellow-plumed Honeyeaters *Lichenostomus ornatus* milking the fruit of ruby saltbush *Enchylaena tomentosa*. *Austr. Field Orn.* **21**(2): 81–82.
- Brooker, M.G. & Estbergs, A.J. (1976). A survey of terrestrial vertebrates in the Carnarvon region, W.A. *West. Austr. Nat.* **13**(7): 160–170.
- Brooker, M.G. & Parker, B.S. (1985). Birds of the Kakadu National Park. Pp. 327–388 in: Braithwaite, R.W. ed. (1985). *The Kakadu Fauna Survey. Final Report*. Australian National Parks and Wildlife Service, Canberra.
- Brooker, M.G. & de Rebeira, C.P. (1996). Does colour-banding affect the survival of adult honeyeaters? *Corolla* **20**(4): 145–146.
- Brooker, M.G., Braithwaite, R.W. & Estbergs, J.A. (1990). Foraging ecology of some insectivorous and nectarivorous species of birds in forests and woodlands of the wet-dry tropics of Australia. *Emu* **90**(4): 215–230.
- Brooker, M.G., Ridpath, M.G., Estbergs, A.J., Bywater, J., Hart, D.S. & Jones, M.S. (1979). Bird observations on the north-western Nullarbor Plain and neighbouring regions, 1967–1978. *Emu* **79**(4): 176–190.
- Brooks, B.L. & Temple, S.A. (1990a). Habitat availability and suitability for Loggerhead Shrikes in the upper Midwest. *Amer. Midl. Nat.* **123**: 75–83.
- Brooks, B.L. & Temple, S.A. (1990b). Dynamics of a Loggerhead Shrike population in Minnesota. *Wilson Bull.* **102**: 441–450.
- Brooks, M. (1999). Effects of protective fencing on birds, lizards, and black-tailed hares in the western Mojave Desert. *Environm. Management* **23**: 387–400.
- Brooks, T.M. & Butchart, S. (1993). Expedition finds islands' rare birds. *Bull. Oriental Bird Club* **18**: 17.
- Brooks, T.M. & Dutton, G.C.L. (1997). Twenty-nine new island records of birds from the Philippines. *Bull. Brit. Orn. Club* **117**(1): 32–37.
- Brooks, T.M., Dutton, G.C.L., Gabutero, L. & Timmins, R.J. (1995). Siburan – key area for birds on Mindoro. *Bull. Oriental Bird Club* **21**: 28–33.
- Brooks, T.M., Dutton, G.C.L., King, B. & Magsalay, P.M. (1996). An annotated check-list of the forest birds of Rajah Sikatuna National Park, Bohol, Philippines. *Forktail* **11**: 121–134.
- Brooks, T.M., Evans, T.D., Dutton, G.C.L., Anderson, G.Q.A., Asane, D.C., Timmins, R.J. & Toledo, A.G. (1992). The conservation status of the birds of Negros, Philippines. *Bird Conserv. Int.* **2**(4): 273–302.
- Brosset, A. (1974). La nidification des oiseaux en forêt gabonaise: architecture, situation des nids et prédation. *Terre et Vie* **28**: 479–510. In French.
- Brosset, A. (1989). Un cas d'association à bénéfice mutuel, celui de la pie-grèche *Lanius cabanisi* avec les bubalornis *Bubalornis niger*. *Rev. Écol. (Terre Vie)* **44**(1): 103–106. In French with English summary.
- Brosset, A. & Éraud, C. (1986). *Les Oiseaux des Régions Forestières du Nord-est du Gabon. Écologie et Comportement des Espèces*. Vol. 1. Société Nationale de Protection de la Nature, Paris. In French.
- Brown, B. & Child, P. (1975). Notes on a field trip to Fiji. *Notornis* **22**(1): 10–22.
- Brown, C.R., Tansley, S.A. & Craig, A.J.F.K. (2001). Genetic variation within and between flocks of Cape White-eyes, *Zosterops pallidus*. Page 245 in: Len, L. ed. (2000). *Proceedings of the Tenth Pan-African Ornithological Congress*. Kampala, Uganda. 3–8 September 2000. Ostrich Supplement **15**. BirdLife South Africa, Randburg, South Africa.
- Brown, E.D. & Hopkins, M.J.G. (1995). A test of pollinator specificity and morphological convergence between nectarivorous birds and rainforest tree flowers in New Guinea. *Oecologia (Berlin)* **103**: 89–100.
- Brown, E.D. & Hopkins, M.J.G. (1996). How New Guinea rainforest flower resources vary in time and space: implications for nectarivorous birds. *Austr. J. Ecol.* **21**(4): 363–378.
- Brown, E.D. & Hopkins, M.J.G. (2002). Tests of disperser specificity between frugivorous birds and rainforest fruits in New Guinea. *Emu* **102**(2): 137–146.
- Brown, E.M., Burbidge, A.H., Dell, J., Edinger, D., Hopper, S.D. & Wills, R.T. (1997). *Pollination in Western Australia: a Database of Animals Visiting Flowers*. Handbook **15**. Western Australian Naturalists' Club, Perth, Western Australia.
- Brown, J.C. (2003). *Taxonomic Revision and Biogeography of the Anthreptes (Aves: Nectariniidae) Complex from the Philippines: Description of a New Endemic Species (Anthreptes griseigularis), Description of two New Races and Nine New Island Records*. MSc Thesis, New Mexico State University, Las Cruces, New Mexico.
- Brown, K.J. & Downs, C.T. (2003). Digestive efficiency of a generalist avian feeder, the Cape White-eye (*Zosterops pallidus*). *Comp. Biochem. Physiol.* **134A**: 739–748.
- Brown, L.H. & Britton P.L. (1980). *The Breeding Seasons of East African Birds*. East African Natural History Society, Nairobi.
- Brown, M. (2005a). Cape Sugarbird *Promerops cafer*. Pp. 1002–1003 in: Hockey, P.A.R., Dean, W.R.J. & Ryan, P.G. eds. (2005). *Roberts Birds of Southern Africa*. 7th edition. The Trustees of the John Voelcker Bird Book Fund, Cape Town.
- Brown, M. (2005b). Gurney's Sugarbird *Promerops gurneyi*. Pp. 1001–1002 in: Hockey, P.A.R., Dean, W.R.J. & Ryan, P.G. eds. (2005). *Roberts Birds of Southern Africa*. 7th edition. The Trustees of the John Voelcker Bird Book Fund, Cape Town.
- Brown, M., Symes, C.T. & Downs, C.T. (2001). The successful release of wild-caught birds used in laboratory experiments. *Afring News* **30**(1): 42–43.
- Brown, P.B. (1989). The Forty-spotted Pardalote on Maria Island. *Tasmanian Bird Rep.* **18**: 4–13.
- Brown, P.B. & Rounsevell, D.E. (1986). The Forty-spotted Pardalote (*Pardalotus quadragintus*) on Bruny Island. *Tasmanian Bird Rep.* **15**: 25–31.
- Brown, R.J. & Brown, M.N. (1985). Banding Silvereyes in Western Australia. *Safring News* **14**: 3–6.
- Browne, R. (1990). Aggressive behaviour in wattletails. *Austr. Birds* **24**(1): 23–24.

- Burgess, J.P., Quinn, J.S., Sloane, S.A. & White, B.N. (1996). DNA fingerprinting reveals monogamy in the Bushitt: a cooperatively breeding species. *Auk* **113**(2): 511–516.
- Bruce, M.D. (1975). L'avifauna de Lifou (Archipel des Loyauté). *Alauda* **46**: 295–308. In French.
- Bruce, M.D. (1978). The Golden Honeyeater (*Cleptornis marchei*): notes on behaviour, vocalizations and taxonomic affinities. *Bonn. Zool. Beitr.* **29**: 441–445.
- Bruce, M.D. (1986). The birds of Wallacea: some opportunities for field study. *Bull. Oriental Bird Club* **3**: 23–26.
- Bruce, M.D. (1987). Additions to the birds of Wallacea. 1. Bird records from smaller islands in the Lesser Sundas. *Kukila* **3**(1/2): 38–44.
- Bruce, P.J. (1984). *The Song and Behaviour of the Yellow-throated Honeyeater Lichenostomus flavicollis (Vieillot 1817)*. BSc thesis, University of Tasmania, Sandy Bay, Tasmania.
- Bruce, P.J. (1988a). Spatial and individual variation in the songs of the Yellow-throated Honeyeater *Lichenostomus flavicollis*. *Emu* **88**(2): 65–69.
- Bruce, P.J. (1988b). The vocal repertoire of the Yellow-throated Honeyeater, *Lichenostomus flavicollis*. *Pap. Proc. Roy. Soc. Tasm.* **122**(2): 135–138.
- Bruce, P.J. (1988c). Breeding biology and behaviour of the Yellow-throated Honeyeater, *Lichenostomus flavicollis*. *Pap. Proc. Roy. Soc. Tasm.* **122**(2): 139–143.
- Bruce, P.J. (1989). *The Functional Significance of the Individual Variation in the Song of the Silvereye Zosterops lateralis chlorocephala*. PhD thesis, University of Queensland, Brisbane, Queensland.
- Bruce, P.J. & Kikkawa, J. (1988). A sexual difference in the contact calls of Silvereyes. *Emu* **88**: 188–190.
- Bruderer, B. (1991). Common egg-eater *Dasypeltis scabra* killed at Fiscal Shrike *Lanius collaris* nest. *Ostrich* **62**: 76–77.
- Bruderer, B. (1994). Numbers of Red-backed Shrikes (*Lanius collurio*) in different habitats of South Africa. *Bull. Brit. Orn. Club* **114**: 192–202.
- Bruderer, B. (1999). Three decades of tracking radar-studies on bird migration in Europe and the Middle East. Pp. 107–141 in: Leshem, Y., Mandelik, Y. & Shaintan-Baranes, J. eds. (1999). *Migrating Birds Know no Boundaries*. International Centre for the Study of Bird Migration, Latron, Israel.
- Bruderer, B. (2007). Notes on the moult of Red-backed Shrikes (*Lanius collurio*) in their non-breeding range. *J. Orn.* **148**(4): 557–561.
- Bruderer, B. & Boldt, A. (2001). Flight characteristics of birds: 1. Radar measurements of speeds. *Ibis* **143**: 178–204.
- Bruderer, B. & Bruderer, H. (1993). Distribution and habitat preference of Red-backed Shrikes *Lanius collurio* in Southern Africa. *Ostrich* **64**: 141–147.
- Bruderer, B. & Jenni, L. (1990). Migration across the Alps. Pp. 60–77 in: Gwinner (1990a).
- Brugiè, D. (1996). À propos des limites d'aires de distribution de la Pie-grièche grise *Lanius excubitor* et de la Pie-grièche méridionale *Lanius meridionalis* dans le sud du Massif Central. *Alauda* **64**(2): 275. In French.
- Bryant, C. (1928). Bird notes and birds' notes. *Emu* **28**: 62–65.
- Bryant, S.L. (1991). *The Forty-spotted Pardalote Recovery Plan: Management Phase*. Department of Parks, Wildlife and Heritage, Hobart, Tasmania.
- Bryant, S.L. (1998a). Status of Forty-spotted Pardalote colonies. *Tasmanian Bird Rep.* **26** (1997): 45–50.
- Bryant, S.L. (1998b). Forty-spotted Pardalote: big bird in a little package. A new colony for one of Tasmania's rarest birds. *Wingspan* **8**(3): 12–13, 15.
- Buchanan, B. (1997). Cooperation between honeyeater species. *West. Austr. Bird Notes* **81**: 1–2.
- Buchanan, D. & Steyn, P. (1964). The incubation and nestling periods of the White-breasted Sunbird, *C. talatala*, Smith. *Ostrich* **35**: 65.
- Buchanan, G.M., Butchart, S.H.M., Dutton, G.C.L., Pilgrim, J.D., Steininger, M.K., Bishop, K.D. & Mayaux, P. (2008). Using remote sensing to inform conservation status assessment: estimates of recent deforestation rates on New Britain and the impacts upon endemic birds. *Biol. Conserv.* **141**(1): 56–66.
- Buckingham, D.L., Dutton, G.C.L. & Newman, J.L. (1995). Birds of Manus, Kolombangara and Makira (San Cristobal) with notes on mammals and records from other Solomon Islands. Unpubl. report to the Cambridge Solomons Rainforest Project 1990.
- Budden, A.E. & Wright, J. (2000). Nestling diet, chick growth and breeding success in the Southern Grey Shrike (*Lanius meridionalis*). *Ring* **22**(1): 165–172.
- Budden, A.E. & Wright, J. (2001a). Begging in nestling birds. *Curr. Orn.* **16**: 83–118.
- Budden, A.E. & Wright, J. (2001b). Falling on deaf ears: the adaptive significance of begging in the absence of a parent. *Behav. Ecol. Sociobiol.* **49**: 474–481.
- Budden, A.E. & Wright, J. (2005). Learning during competitive positioning in the nest: do nestlings use ideal free "foraging" tactics? *Behav. Ecol. Sociobiol.* **58**: 227–236.
- Buden, D.W. (1996a). Reptiles, birds and mammals of Ant Atoll, eastern Caroline Islands. *Micronesica* **29**(1): 21–36.
- Buden, D.W. (1996b). Reptiles, birds and mammals of Pakin Atoll, eastern Caroline Islands. *Micronesica* **29**(1): 37–48.
- Buden, D.W. (1999). The birds of Sapwuhfik Atoll, with first record of the Grey Wagtail, *Motacilla cinerea*, from the Federated States of Micronesia. *Bull. Brit. Orn. Club* **119**(4): 261–270.
- Buden, D.W. (2000). A comparison of 1983 and 1994 bird surveys of Pohnpei, Federated States of Micronesia. *Wilson Bull.* **112**(3): 403–410.
- Buden, D.W. (2006). The birds of Satawan Atoll and the Mortlock Islands, Chuuk, including the first record of Tree Martin *Hirundo nigricans* in Micronesia. *Bull. Brit. Orn. Club* **126**(2): 137–152.
- Buffon, G.L. Comte de (1778). *Histoire Naturelle des Oiseaux*. Vol. 5. L'Imprimerie Royal, Paris. In French.
- Bull, P.C. (1958). The ecology of the Hutt Valley: birds of the Hutt Valley. *Proc. New Zealand Ecol. Soc.* **6**: 52–58.
- Bull, P.C., Gaze, P.D. & Robertson, C.J.R. (1985). *The Atlas of Bird Distribution in New Zealand*. Ornithological Society of New Zealand, Wellington, New Zealand.
- Buller, W.L. (1888). *A History of the Birds of New Zealand*. 2nd edition. Published privately, London.
- Bulman, C.M. (1981). *The Ecology and Behaviour of the Forty-spotted Pardalote Pardalotus quadragintus Gould (1838)*. BSc thesis, University of Tasmania, Hobart, Tasmania.
- Bulman, C.M., Rounsevell, D.E. & Woinarski, J.C.Z. (1986). The Forty-spotted Pardalote – an RAOU conservation statement. Pp. 1–8 in: Anon. (1986). *RAOU Conservation Statement No. 3*. RAOU Report 17. Royal Australasian Ornithologists Union, Melbourne, Victoria.
- Bunning, L.J. (1985). Some notes on the Cape White-eye in the Transvaal. *Safring News* **14**: 7–12.
- Burbidge, A.A. & Fuller, P.J. (1982). Banded Stilt breeding at Lake Barlee, Western Australia. *Emu* **82**: 212–216.
- Burbidge, A.A. & Fuller, P.J. (2007). Gibson Desert birds: responses to drought and plenty. *Emu* **107**(2): 126–134.
- Burbidge, A.H. (1985). Birds. Pp. 23–55 in: Anon. (1985). *Rotamah Island Bird Observatory Report 2: January 1982–June 1984*. RAOU Report 16. Royal Australasian Ornithologists Union, Melbourne, Victoria.
- Burbidge, A.H., Hopper, S.D. & Coates, D.J. (1979). Pollen loads on New Holland Honeyeaters at Qualup, Western Australia. *West. Austr. Nat.* **14**(5): 126–128.
- Burd, M. (1995). Pollinator behavioural responses to reward size in *Lobelia deckenii*: no escape from pollen limitation of seed set. *J. Ecol. (London)* **83**: 865–872.
- Burfield, I. & van Bommel, F. eds. (2004). *Birds in Europe: Population Estimates, Trends and Conservation Status*. BirdLife Conservation Series 12. BirdLife International, Cambridge, UK.
- Burger, A.E., Siegfried, W.R. & Frost, P.G.H. (1976). Nest site selection of the Cape Sugarbird. *Zool. Afr.* **11**: 127–158.
- Burger, L. (1987). A sunbird. *WBC News* **138**: 22–23.
- Burgess, W. (1947a). The Pied Honeyeater breeding in Victoria. *Emu* **46**(5): 392–393.
- Burgess, W. (1947b). Honeyeaters in the mallee. *Victorian Naturalist* **63**(10): 211–214.
- Burkovskiy, O.A. (1997). First record of nesting by the Penduline Tit *Remiz pendulinus consobrinus* (Swinhoe) in Russia (Aves: Paridae). *Zoosyst. Ross.* **6**: 317–319.
- Burleigh, T.D. (1972). *Birds of Idaho*. Caxton Printers, Caldwell, Idaho.
- Burnier, E. (1976). Une nouvelle espèce de l'avifaune paléarctique: la Sittelle kabyle, *Sitta ledanti*. *Nos Oiseaux* **33**: 337–340. In French.
- Burnside, F.L. (1987). Long-distance movements by Loggerhead Shrikes. *J. Field. Orn.* **58**: 62–65.
- Burrows, I. (1993). Some notes on the birds seen in the Turama River area, Gulf Province. *Muruk* **6**(1): 28–31.
- Burton, K.M. (1999). Use of barbed wire by Loggerhead Shrikes (*Lanius ludovicianus*) to manipulate nest materials. *Amer. Midl. Nat.* **142**: 198–199.
- Burton, T.C. (1996). Changes in the abundance of Silvereyes in a Central Victorian vineyard during the grape ripening period. *Corella* **20**(2): 61–66.
- Busbee, E.L. (1977). The effects of Dieldrin on the behavior of young Loggerhead Shrikes. *Auk* **94**: 28–35.
- Butchart, S.H.M. & Stattersfield, A.J. eds. (2004). *Threatened Birds of the World 2004*. CD-ROM. BirdLife International, Cambridge, UK.
- Butchart, S.H.M., Brooks, T.M., Davies, C.W.N., Dharmaputra, G., Dutton, G.C.L., Lowen, J.C. & Sahu, H. (1996). The conservation status of forest birds on Flores and Sumbawa, Indonesia. *Bird Conserv. Int.* **6**(4): 335–370.
- Butler, D. & Merton, D. (1992). *The Black Robin: Saving the World's Most Endangered Bird*. Oxford University Press, Auckland, New Zealand.
- Buttemer, W.A., Astheimer, L.B., Weathers, W.W. & Hayworth, A.M. (1987). Energy savings attending winter-nest use by Verdins (*Auriparus flaviceps*). *Auk* **104**(3): 531–535.
- Button, J.A. (1967). The birds of Ilaro. 2. Forest and savannah residents (Passerines). Part B: Campephagidae to Ploceidae. *Bull. Nigerian Orn. Soc.* **4**: 10–19.
- Buturlin, S.A. (1916). A short review of nutha[t]ches (Fam. Sittidae). *Trudy Imp. Petrograd. Obsh. Estest.* **44**: 144–173. In Russian with English summary.
- Butynski, T. (1994). Uluguru Violet-backed Sunbird *Anthreptes neglectus* at Tana, Kenya. *Scopas* **18**(1): 62–64.
- Cade, T.J. (1967). Ecological and behavioral aspects of predation by Northern Shrike. *Living Bird* **6**: 43–86.
- Cade, T.J. (1992). Hand-reared Loggerhead Shrikes breed in captivity. *Condor* **94**: 1027–1029.
- Cade, T.J. (1995). Shrikes as predators. *Proc. West. Found. Vert. Zool.* **6**: 1–5.
- Cade, T.J. & Woods, C.P. (1997). Changes in distribution and abundance of the Loggerhead Shrike. *Conserv. Biol.* **11**: 21–31.
- Cagnucci, G. (2004). Aspetti della riproduzione nel Codibugnoli, *Aegithalos caudatus*, in un'area campione dell'Appennino Umbro – Marchigiano (1971–2001). [Some aspects of the breeding of the Long-tailed Tit, *Aegithalos caudatus*, in a sample area of the Central Apennines]. *Uccelli d'Italia* **28**(1/2): 31–41. In Italian with English summary.
- Cain, A.J. (1954). *Animal Species and their Evolution*. Hutchinson, London.
- Cain, A.J. & Galbraith, I.C.J. (1956). Field notes on birds of the eastern Solomon Islands. [Part 2]. *Ibis* **98**(2): 262–295.
- Cain, A.J. & Galbraith, I.C.J. (1957). [Correspondence: birds of the Solomon Islands]. *Ibis* **99**: 128–130.
- Cairns, J. (1955). A miscellany of bird notes from Penang. *Malay. Nat. J.* **10**: 17–30.
- Caldwell, H.R. & Caldwell, J.C. (1931). *South China Birds*. Hester May Vanderburgh, Shanghai, China.
- Cale, P. (1994). Temporal changes in the foraging behaviour of insectivorous birds in a sclerophyll forest in Tasmania. *Emu* **94**(2): 116–126.
- Calif, K.M. (2000a). *The Role of Male Territory Size and Quality in Mating and Reproductive Success of Cape and Gurney's Sugarbirds*. MSc thesis, Departement Plant en Dierkunde, Universiteit van Stellenbosch, Matieland, South Africa.
- Calif, K.M. (2000b). Territoriality of Cape and Gurney's Sugarbirds, *Promerops cafer* and *Promerops gurneyi*. *Promerops* **241**: 8–9.
- Calif, K.M. & Downs, C.T. (2002). Breeding biology of Gurney's Sugarbird, *Promerops gurneyi*, in Qwaqwa National Park, eastern Free State. *Ostrich* **73**(1/2): 1–4.
- Calif, K.M., Downs, C.T. & Cherry, M.I. (2001) Territoriality and breeding success in Gurney's Sugarbirds (*Promerops gurneyi*). *Afr. Zool.* **36**: 189–195.
- Calif, K.M., Downs, C.T. & Cherry, M.I. (2003a). Territoriality and breeding success in the Cape Sugarbird (*Promerops cafer*). *Emu* **103**(1): 29–35.
- Calif, K.M., Downs, C.T. & Cherry, M.I. (2003b). Territoriality of Cape Sugarbirds (*Promerops cafer*) between and within breeding seasons. *Ostrich* **74**(1/2): 125–128.
- Calif, K.M., Downs, C.T. & Cherry, M.I. (2003c). Foraging and territorial behaviour of male Cape and Gurney's Sugarbirds (*Promerops cafer* and *Promerops gurneyi*). *Afr. Zool.* **38**(2): 297–304.
- Cambi, D. & Micheli, A. (1986). L'avifauna nidificante della "Corna di Savallo" (Prealpi Bresciane, Lombardia). Censimento ed ecologia. *Natura Bresciana* **22** (1985): 103–178. In Italian.
- Cameron, A.C. (1970). The vocabulary of the Noisy Miner, *Myzantha melanoccephala*. *Sunbird* **1**: 17–24.
- Campbell, A.G. (1903). The birds of King Island. *Emu* **2**: 203–210.
- Campbell, A.J. (1900). *Nests and Eggs of Australian Birds*. Published privately, Sheffield, UK.
- Campbell, A.J. (1907). Annotations. *Emu* **6**: 136–138.
- Campbell, A.J. & Barnard, H.G. (1917). Birds of the Rockingham Bay district, North Queensland. *Emu* **17**(1): 2–38.
- Campbell, B. & Lack, E. eds. (1985). *A Dictionary of Birds*. T.&A.D. Poyser, Calton, UK.
- Campbell, R. (1977). [Observations]. *Papua New Guinea Bird Soc. Newsl.* **138**: 6–7.
- Campbell, R.W., Dawe, N.K., McTaggart-Cowan, I., Cooper, J.M., Kaiser, G.W., McNall, M.C.E. & Smith, G.E.J. (1997). *The Birds of British Columbia*. Vol. 3. Passerines – flycatchers through vireos. University of British Columbia Press, Vancouver.
- Campos, F. & Lizarraga, A. (2000). The Red-backed Shrike (*Lanius collurio*) – an indicator of climate and vegetation type? *Ring* **22**(1): 59–64.
- Campos, F., Gutiérrez-Corcheró, Y.M.F. & Hernández, M.A. (2006). Nidificación del Alcaudón Real, *Lanius meridionalis*, en agrosistemas del norte de España. *Ecología* **20**: 225–232. In Spanish.
- Cane, W.P. & Carter, M.F. (1988). Significant range extension for *Nectarinia reichenbachii* in West Africa. *Bull. Brit. Orn. Club* **108**(2): 52–54.
- Capanna, E. & Geralico, C. (1982). Karyotype analysis in ornithological studies. 2. The chromosomes of four species of African birds (Nectarinidae, Ploceidae and Sturnidae). *Avocetta* **6**: 1–9.
- Carbone, C. & Owen, M. (1995). Differential migration of the sexes of Pochard *Aythya ferina*: results from a European survey. *Wildfowl* **46**: 99–108.
- Carey, G.J., Chalmers, M.L., Diskin, D.A., Kennerley, P.R., Leader, P.J., Leven, M.R., Lewthwaite, R.J., Melville, D.S., Turnbull, M. & Young, L. (2001). *The Avifauna of Hong Kong*. Hong Kong Birdwatching Society, Hong Kong.
- Carlson, A. (1983). Maximizing energy delivery to dependent young: a field experiment with Red-backed Shrikes (*Lanius collurio*). *J. Anim. Ecol.* **52**: 697–704.
- Carlson, A. (1985a). Central place of food caching: a field experiment with Red-backed Shrike (*Lanius collurio*). *Behav. Ecol. Sociobiol.* **16**: 317–322.
- Carlson, A. (1985b). Central place foraging in the Red-backed Shrike (*Lanius collurio* L.): allocation of prey between forager and sedentary consumer. *Anim. Behav.* **33**: 664–683.
- Carlson, A. (1989). Courtship feeding and clutch size in Red-backed Shrikes (*Lanius collurio*). *Amer. Nat.* **133**: 454–457.
- Carnaby, I.C. (1954). Nesting seasons of Western Australian birds. *West. Austr. Nat.* **4**(6): 149–156.
- Carpenter, F.L. (1978). A spectrum of nectar eater communities. *Amer. Zool.* **18**: 809–819.
- Carpenter, G. (1985). Bird notes. *South Austr. Orn. Assoc. Newsl.* **115**: 8–12.

Carpenter, G.A. & Matthew, J.S. (1986). The birds of Billiatt Conservation Park. *South Austr. Orn.* 30(2): 29–37.

Carpenter, G.A. & Matthew, J.S. (1997). Notes on some mallee birds of the far south-west of South Australia. *South Austr. Orn.* 32(7): 134–140.

Carrascal, L.M. & Telleria, J.L. (1989). Comportamiento de búsqueda del alimento y selección de especies arbóreas: análisis con el Agateador Común (*Certhia brachydactyla*) durante el invierno. *Ardeola* 36(2): 149–160. In Spanish with English summary.

Carrascal, L.M., Diaz, J.A., Huertas, D.L. & Mozetich, I. (2001). Behavioral thermoregulation by treecreepers: trade-off between saving energy and reducing crypsis. *Ecology* 82(6): 1642–1654.

Carroll, R.W. (1988). Birds of the Central African Republic. *Malimbus* 10: 177–200.

Carruthers, R.K. (1968). Flock association among Golden-backed Honeyeaters. *Austr. Bird Bander* 6: 11.

Carruthers, R.K. (1970). Analysis of Rufous-throated Honeyeater banding at Mount Isa. *Austr. Bird Bander* 8: 75–78.

Carruthers, R.K. (1972). The White-plumed Honeyeater in the Mount Isa district. *Austr. Bird Bander* 10(2): 27–30.

Carswell, M., Pomeroy, D., Reynolds, J. & Tushabe, H. (2005). *The Bird Atlas of Uganda*. British Ornithologists' Club & British Ornithologists' Union, Oxford, UK.

Carter, M. (1994). Birds of Australia's Christmas Island. *Wingspan* 13: 18–21.

Carter, M., O'Brien, R. & Macumber, N. (1997). Singing Starlings *Aplonis coratoroides* and other birds on Boigu Island, Torres Strait, Queensland. *Austr. Bird Watcher* 17(1): 20–24.

Carter, T. (1902). North-western notes. *Emu* 1: 126–128.

Carter, T. (1903). Birds occurring in the region of the North-West Cape. Part 2. *Emu* 3(2): 89–96.

Carter, T. (1910). Remarks on some birds of Western Australia. *Ibis Ser.* 9, no. 4: 647–658.

Carter, T. (1924). Birds of the Broome Hill district. *Emu* 23: 306–318.

Casotti, G. & Richardson, K.C. (1992). A stereological analysis of kidney structure of honeyeater birds (Meliphagidae) inhabiting either arid or wet environments. *J. Anat. (London)* 180: 281–288.

Casotti, G. & Richardson, K.C. (1993). A qualitative analysis of the kidney structure of Meliphagid honeyeaters from wet and arid environments. *J. Anat. (London)* 182: 239–247.

Cassels, M.L. (1961). Field notes on the nesting of the Brown Honeyeater. *Austr. Bird Watcher* 1(6): 174–176.

Castan, R. (1960). Les migrations pré et post-nuptiales des Pie-grièches à tête rousse *Lanius senator* et *Lanius senator badius* dans le Sud Tunisien (région de Gabès). *Alauda* 28: 129–142. In French.

Castro, I. & Robertson, A.W. (1997). Honeyeaters and the New Zealand forest flora: the utilization and profitability of small flowers. *New Zealand J. Ecol.* 21: 169–179.

Catibog-Sinha, C. (1982). The birds and mammals of MUFRC Experimental Forest. *Sylvatrop Phil. For. Res. J.* 7: 35–41.

Catry, P., Mellanby, R., Suleiman, K.A., Haji Salim, K., Hughes, M., McKean, M., Anderson, N., Constant, G., Heany, V., Martin, G., Armitage, M. & Wilson, M. (2000). Habitat selection by terrestrial birds on Pemba island (Tanzania), with particular reference to six endemic taxa. *Biol. Conserv.* 95(3): 259–267.

Catterall, C.P. (1989). The economics of winter fighting in Silvereyes. *Emu* 89: 173–176.

Catterall, C.P. (2004). Birds, garden plants and suburban bushlots: where good intentions meet unexpected outcomes. Pp. 21–31 in: Burgin, S. & Lunney, D. eds. (2004). *Urban Wildlife: More than Meets the Eye*. Royal Zoological Society of New South Wales, Sydney.

Catterall, C.P., Elgar, M.A. & Kikkawa, J. (1992). Vigilance does not covary with group size in an island population of Silvereyes (*Zosterops lateralis*). *Behav. Ecol.* 3: 207–210.

Catterall, C.P., Piper, S.D. & Goodall, K. (2002). Noisy Miner irruptions associated with land use by humans in south-east Queensland: causes, effects, and management implications. Pp. 117–127 in: Franks, A., Playford, J. & Shapcott, A. eds. (2002). *Landscape Health in Queensland*. Royal Society of Queensland, Brisbane.

Catterall, C.P., Wyatt, W.S. & Henderson, L.J. (1982). Food resources, territory density and reproductive success of an island Silvereye population *Zosterops lateralis*. *Ibis* 124: 405–421.

Catterall, M. (1997). *Results of the 1996 Bird Survey of Buton Island, Sulawesi, Indonesia*. Wallacea Development Institute & Ecosurveys Ltd, Jakarta & Spitsby.

Cayley, N.W. (1958). *What Bird is that?* 2nd edition. Angus & Robertson, Sydney.

Chabaud, A.G. (1979). *Chanderella inversa* n. sp., filaire parasite de nectariniides au Gabon. *Bull. Mus. Natl. Hist. Nat. Paris (Sect. A) Ser. 4, no. 2*: 295–297.

Chabot, A.A., Bird, D.M. & Titman, R.D. (1995). Habitat selection and reproductive biology of Loggerhead Shrikes in eastern Canada. *J. Raptor Res.* 29: 69.

Chabot, A.A., Titman, R.D. & Bird, D.M. (1995). Habitat selection and breeding biology of Loggerhead Shrikes in eastern Ontario and Quebec. *Proc. West. Found. Vert. Zool.* 6: 155–156.

Chabot, A.A., Titman, R.D. & Bird, D.M. (2001). Habitat use by Loggerhead Shrikes in Ontario and Quebec. *Can. J. Zool.* 79: 916–925.

Chacón, G. (1996). El Alcaudón Chico en la ribera del Cinca. *Quercus* 120: 32–33. In Spanish.

Chadder, W.J. (2004). An aberrant plumaged Olive Sunbird. *Honeyguide* 50(1): 55–56.

Chaffer, N. (1930). The Scarlet Honeyeater. *Emu* 29: 266–267.

Chaffer, N. (1931). The gorgeous Regent Honeyeater. *Emu* 31: 140–141.

Chaffer, N. (1933). Notes on the nesting of the White-eared Honeyeater. *Emu* 32: 270–273.

Challies, C.N. (1966). Notes on the birds of the Ruahine Ranges. *Notornis* 13(1): 18–26.

Chan, K. (1990). Habitat selection in the White-plumed Honeyeater and the Fuscous Honeyeater at an area of sympatry. *Austr. J. Ecol.* 15(2): 207–217.

Chan, K. (1994a). Migratory fattening in an Australian intracontinental migrant. *Condor* 96: 211–214.

Chan, K. (1994b). Winter body mass and overnight energetics of a south temperate passerine. *Auk* 111(3): 721–723.

Chan, K. (1994c). Nocturnal activity of caged resident and migrant Silvereyes (*Zosteropidae*: Aves). *Ethology* 96: 313–321.

Chan, K. (1995a). Comparative study of winter body composition of resident and migrant Grey-breasted Silvereyes. *Auk* 112(2): 421–428.

Chan, K. (1995b). Diurnal and nocturnal patterns of activity in resident and migrant Silvereyes *Zosterops lateralis*. *Emu* 95: 41–46.

Chan, K. (1995c). Bird community patterns in fragmented vegetation zones around streambeds of the Northern Tablelands, New South Wales. *Austr. Bird Watcher* 16(1): 11–20.

Chan, K. (1998). Notes on the Bar-breasted Honeyeater in the southernmost parts of its range. *Sunbird* 28: 50–52.

Chan, K. (2001). Partial migration in Australian landbirds: a review. *Emu* 101(4): 281–292.

Chan, K. & Kikkawa, J. (1997). A Silvereye dilemma: to migrate or not to migrate? *Emu* 97: 91–93.

Chan, K. & Sutton, P. (1993). Migratory behaviour of Silvereyes returning to Tasmania from southern Victoria. *Corolla* 17: 41–42.

Chandler, L.G. (1944). Birds and vineyards. *Emu* 44(2): 93–96.

Chapin, J.P. (1944). *Oriolus percivali* a valid race of *O. monacha*. *Auk* 61(2): 289–291.

Chapin, J.P. (1954). The birds of the Belgian Congo. Part 4. *Bull. Amer. Mus. Nat. Hist.* 75B: i–ix, 1–846.

Chapin, J.P. (1959). Breeding cycles of *Nectarinia purpureiventris* and some other Kivu birds. Pp. 223–229 in: Rowan, M.K. ed. (1959). *Proceedings of the First Pan-African Ornithological Congress. Os-trich* (Supplement 3). The South African Ornithological Society, Cape Town.

Chapin, R.T. (1978). Breeding behaviour of the Bronzy Sunbird *Nectarinia kilimensis*. *Bull. East Afr. Nat. Hist. Soc.* 9: 52–55.

Chaplin, S.B. (1982). The energetic significance of huddling behavior in Common Bushtits (*Psaltiriparus minimus*). *Auk* 99(3): 424–430.

Chapman, B.R. & Casto, S.D. (1972). Additional vertebrate prey of the Loggerhead Shrike. *Wilson Bull.* 84: 496–497.

Chappuis, C. (1970). La Vallée d'Avas en Thrace. *Nos Oiseaux* 30: 256–263. In French.

Chasen, F.N. (1931). Birds from Bintang Island in the Rhio Archipelago. *Bull. Raffles Mus. Singapore* 5: 114–120.

Chasen, F.N. (1933). Notes on the birds of Christmas Island, Indian Ocean. *Bull. Raffles Mus. Singapore* 8: 55–87.

Chasen, F.N. & Kloss, C.B. (1930). On a collection of birds from the lowlands and islands of North Borneo. *Bull. Raffles Mus. Singapore* 4: 1–112.

Chasen, N. & Hoogerwerf, A. (1941). The birds of the Netherlands Indian Mt. Leuser Expedition 1937 to North Sumatra. *Treubia* 18: 1–131.

Chaskda, A.A. & Mwansat, G.S. (2006). Implications of avian foraging on the reproductive ecology of the mistletoe *Tapinanthus globiferus* (Loranthaceae). *J. Orn.* 147(5) (Suppl. 1): 147.

Chatelanat, C.A. (1943). Les Tichodromes de Chillon. *Nos Oiseaux* 17: 263. In French.

Chatelanat, C.A. (1945). Calendrier ornithologique: Tichodrome *Tichodroma muraria* (L.). [Part 1]. *Nos Oiseaux* 18: 75. In French.

Chattopadhyay, S. (1980). Egg-bound death of a Purple-rumped Sunbird at Baj Baj, West Bengal. *J. Bombay Nat. Hist. Soc.* 77(2): 333.

Chavez-Ramirez, F., Gawlik, D.E., Prieto, F.G. & Slack, R.D. (1994). Effects of habitat structure on patch use by Loggerhead Shrikes wintering in a natural grassland. *Condor* 96: 228–231.

Cheke, A.S. (1987a). The ecology of the smaller landbirds of Mauritius. Pp. 151–207 in: Diamond, A.W. ed. (1987). *Studies of Mascarene Landbirds*. Cambridge University Press, Cambridge, UK.

Cheke, A.S. (1987b). The ecology of the surviving native land-birds of Réunion. Pp. 301–358 in: Diamond, A.W. ed. (1987). *Studies of Mascarene Landbirds*. Cambridge University Press, Cambridge, UK.

Cheke, A.S. & Diamond, A.W. (1986). Birds on Moheli and Grande Comore (Comoro Islands) in February 1975. *Bull. Brit. Orn. Club* 106: 138–148.

Cheke, R.A. (1971a). Feeding ecology and significance of interspecific territoriality of African montane sunbirds (Nectariniidae). *Rev. Zool. Bot. Afr.* 84: 50–64.

Cheke, R.A. (1971b). Temperature rhythms in African montane sunbirds. *Ibis* 113: 500–506.

Cheke, R.A. (1972). Birds of the Cherangani Montane forests and their parasites. *East Afr. Wildl. J.* 10: 245–249.

Cheke, R.A. (1976). Notes on a nesting Variable Sunbird. *Bull. Brit. Orn. Club* 96: 5–8.

Cheke, R.A. (1978). Records of birds and their parasites from the Cherangani Mountains, Kenya. *East Afr. Wildl. J.* 16: 61–64.

Cheke, R.A. (1999). Vocalisations of the Mouse-brown Sunbird *Anthreptes gabonicus*. *Malimbus* 21: 51.

Cheke, R.A. (2001). Confirmation of the position of the likely type-locality of *Chalcornis rubescens stangerii*. *Bull. Brit. Orn. Club* 121(1): 62–63.

Cheke, R.A. (2003). Sunbirds. Pp. 207–226 in: Hutchins, M., Jackson, J.A., Bock, W.J. & Olendorf, D. eds. (2003). *Grzimek's Animal Life Encyclopedia*. 2nd edition. Vol. 11. Birds IV. Gale Group, Farmington Hills, Michigan.

Cheke, R.A. & Cheke, A.S. (1998). Long-tailed Tits feeding on peanuts. *British Birds* 91(7): 286–287.

Cheke, R.A. & Mann, C.F. (2001). *Sunbirds: a Guide to the Sunbirds, Flowerpeckers, Spiderhunters and Sugarbirds of the World*. Christopher Helm, London.

Chemnick, J. & Melli, J. (1993). Bird notes from Long Island, Madang province. *Muruk* 6(1): 23.

Chemnick, J., Hicks, R. & Wahlberg, N. (1993). Nesting Brown-backed Honeyeaters *Ramsayornis modestus* with strange plumage. *Muruk* 6(1): 45.

Chen Fuguang, Lou Shiyong, Zheng Guangmei, Xu Weishu, Cai Qikai, Wang, T.Z. & Li Dehao (1998). *Fauna Sinica, Aves*. Vol. 9. Passeriformes, Bombycillidae–Prunellidae. Science Press, Beijing. In Chinese.

Chen Youling & Tang Zhaohe (1998). [A new record of bird *Remiz pendulinus* to Fujian province]. *Sichuan J. Zool.* 17(3): 121. In Chinese.

Chenaux-Repond, R. (1975). Ersatz sunbird's nest. *Honeyguide* no. 81 [vol. 20(2)]: 37.

Chenery, A. (1924). Some notes on birds seen during a holiday trip in south-west Queensland. *South Austr. Orn.* 7(7): 215–229.

Cheng Kwangmei & Wei Chaosheng (1973). On the breeding habits of the Red-tailed Shrike (*Lanius cristatus lucionensis* Linné). *Acta Zool. Sinica* 19(2): 182–189. In Chinese with English summary.

Cheng Tsohsin [=Zheng Zuoxin] (1976). *Distributional List of Chinese Birds*. Academia Sinica, Beijing. In Chinese with English summary.

Cheng Tsohsin [=Zheng Zuoxin] (1987). *A Synopsis of the Avifauna of China*. Science Press & Paul Parey, Beijing, Hamburg & Berlin. In English with Chinese index.

Cheng Tsohsin [=Zheng Zuoxin] (2000). *A Complete Checklist of Species and Subspecies of the Chinese Birds*. Science Press, Beijing.

Cheng Tsohsin [=Zheng Zuoxin] (2002). *The Keys to the Birds of China*. Science Press, Beijing.

Cheng Tsohsin [=Zheng Zuoxin] & Tan Yaokuang (1973). On the birds of Hainan. [Part] 2. *Acta Zool. Sinica* 19(4): 405–416. In Chinese with English summary.

Cheng Tsohsin [=Zheng Zuoxin], Li Dehao, Wang Xuxiang, Wang Ziyu, Jiang Zhihua & Lu Taichun (1983). [The Avifauna of Xizang]. Science Press & Academia Sinica, Beijing. In Chinese.

Cheng Tsohsin [=Zheng Zuoxin], Ting Wenning & Wang Tzeyu (1964). A new subspecies of the Velvet-fronted Nuthatch from Hainan – *Sitta frontalis chienfengensis* subsp. nov. *Acta Zootaxonomica Sinica* 1: 1–5. In Chinese with English summary.

Cheong Weng Chun (2005). Black-naped Oriole *Oriolus chinensis* – nest, Putrajaya Wetland, peninsular Malaysia. URL: http://orientalbirdimages.org/search.php?action=searchresult&Bird_ID=2268&Bird_Image_ID=10891&Bird_Family_ID=&p=24 (download 22 Juni 2008).

Cherel, Y. (1995). Nutrient reserve storage, energetics, and food-consumption during the prebreeding and premoulting foraging periods of King Penguins. *Polar Biol.* 15: 209–214.

Chesser, R.T. (1994). Migration in South America: an overview of the austral system. *Bird Conserv. Int.* 4: 91–107.

Chiba, H. (1990). [First breeding record of the Bull-headed Shrike from the Ogasawara Islands]. *Jap. J. Orn.* 38: 150–151. In Japanese.

Chien Yenwen & Cheng Tsohsin [=Zheng Zuoxin] (1960). Studies on the breeding behavior of some insect-eating birds in the fruit-producing district of Changle, Hopei province. [Part] 2. *Acta Zool. Sinica* 12(1): 139–148. In Chinese with English summary.

Child, P. (1984). Kingfisher taking a Silvereye. *Notornis* 31: 171.

Chisholm, A.H. (1966). Bird-notes from Eungella. *Emu* 65(3): 164.

Chisholm, A.H. (1968). "Family-planning" by birds. *Austr. Birds (J. NSW Field Orn. Club)* 3: 17–18.

Chittenden, H. (1995). On the nest of Neergaard's Sunbird. *Birding in SA* 47(3): 85.

Chong Lillian Tsin (1938). *Birds of Nanking and its Vicinity*. Part 1. Passeriformes. Contributions of the Biology Laboratory 12 (Zoology Series 9). The Science Society of China, Shanghai.

Choudhury, A. (1990). *Checklist of the Birds of Assam*. Sofia Press, Guwahati, India.

Choudhury, A. (2003). Birds of Eaglenest Wildlife Sanctuary and Sessa Orchid Sanctuary, Arunachal Pradesh, India. *Forktail* 19: 1–13.

Choudhury, A. (2004). Sighting of Wallcreeper *Tichodroma muraria* in Assam and Manipur. *J. Bombay Nat. Hist. Soc.* 101(3): 463.

Christidis, L. (1991). Molecular and biochemical evidence for the origins and evolutionary radiations of the Australasian avifauna. Pp. 392–397 in: Bell, B.D., Cossee, R.O., Flux, J.E.C., Heather, B.D., Hitchmough, R.A., Robertson, C.J.R. & Williams, M.J. eds. (1991). *Acta XY Congressus Internationalis Ornithologici*. New Zealand Ornithological Congress Trust Board, Wellington, New Zealand.

Christidis, L. (1995). Molecular assessment of the taxonomic and genetic status of the Black-eared Miner (*Manorina melanotis*). Report to Australian Nature Conservation Agency, Canberra. Unpubl.

- Christidis, L. & Boles, W.E. (1994). *The Taxonomy and Species of Birds of Australia and its Territories*.
¹ Royal Australasian Ornithologists Union Monograph 2. Royal Australasian Ornithologists Union, Melbourne, Victoria. 112 pp.
- Christidis, L. & Schodde, R. (1991). Relationships of Australo-Papuan songbirds – protein evidence. *Ibis* 133(3): 277–285.
- Christidis, L. & Schodde, R. (1993). Relationships and radiations in the meliphagine honeyeaters, *Meliphaga*, *Lichenostomus* and *Xanthotis* (Aves, Meliphagidae) – protein evidence and its integration with morphology and ecogeography. *Austr. J. Zool.* 41(3): 293–316.
- Christidis, L., Schodde, R. & Robinson, N.A. (1993). Affinities of the aberrant Australo-Papuan honeyeaters, *Toxorhamphus*, *Oedistoma*, *Timeliopsis* and *Epthianura*: protein evidence. *Austr. J. Zool.* 41(5): 423–432.
- Christy, M.T. (1995). Co-operative care in the Singing Honeyeater *Lichenostomus virescens*. *Corella* 19(4): 115–117.
- Christy, P. & Clarke, W.V. (1994). *Guide des Oiseaux de la Réserve de la Lopé*. Conservation et Utilisation Rationnelle Écosystèmes Forestiers d'Afrique Centrale, Libreville, Gabon. In French.
- Christy, P. & Clarke, W.V. (1998). *Guide des Oiseaux de São Tomé et Príncipe*. Conservation et Utilisation Rationnelle Écosystèmes Forestiers d'Afrique Centrale, São Tomé. In French with English and Portuguese introduction.
- Cibois, A. & Crafcraft, J. (2004). Assessing the passerine “tapestry”: phylogenetic relationships of the Muscicapoidae inferred from nuclear DNA sequences. *Mol. Phylog. Evol.* 32: 264–273.
- Cicero, C. (1993). Vulnerability of prey stimulates attacks by jays and shrikes on adult birds. *Western Birds* 24: 101–102.
- Clancey, P.A. (1948). A new race of the Woodchat Shrike (*Lanius senator* L.) from the island of Sicily. *Bull. Brit. Orn. Club* 68: 90–92.
- Clancey, P.A. (1952). A systematic account of the birds collected on the Natal Museum Expedition to the Lebombo Mountains and Tongaland, July, 1951. *Ann. Natal Mus.* 12: 227–274.
- Clancey, P.A. (1962). Miscellaneous taxonomic notes on African birds. 19. *Durban Mus. Novit.* 6: 181–194.
- Clancey, P.A. (1964). *The Birds of Natal and Zululand*. Oliver and Boyd, Edinburgh & London.
- Clancey, P.A. (1966). A catalogue of birds of the South African sub-region. Part 5: families Sturnidae – Fringillidae (concluded). *Durban Mus. Novit.* 7(13): 545–633.
- Clancey, P.A. (1967a). On variation in *Nectarinia talatala*. *Bull. Brit. Orn. Club* 87: 153–157.
- Clancey, P.A. (1967b). Taxonomy of the Southern African *Zosterops*. *Ibis* 109: 318–327.
- Clancey, P.A. (1968). The name of the Grey Sunbird. *Bull. Brit. Orn. Club* 88(8): 150–151.
- Clancey, P.A. (1970a). Miscellaneous taxonomic notes on African birds 28. *Durban Mus. Novit.* 8: 325–351.
- Clancey, P.A. (1970b). Miscellaneous taxonomic notes on African birds. 30. Three new subspecies from Angola and Botswana, and wintering *Hirundo rustica* in southern and eastern Africa. *Durban Mus. Novit.* 9: 1–11.
- Clancey, P.A. (1970c). Miscellaneous taxonomic notes on African birds. 31. A new isolate subspecies of *Nectarinia afra* (Linnaeus) from Moçambique. *Durban Mus. Novit.* 9: 25–28.
- Clancey, P.A. (1971). *A Handlist of the Birds of Southern Moçambique*. Instituto de Investigação Científica de Moçambique, Lourenço Marques [Maputo], Moçambique.
- Clancey, P.A. (1973). Miscellaneous taxonomic notes on African birds. 37[3]. An undescribed race of *Nectarinia mariquensis* (Smith) from the south-east African lowlands. *Durban Mus. Novit.* 10(1): 12–13.
- Clancey, P.A. (1975). Miscellaneous taxonomic notes on African birds. 43[5]. On the present nominate subspecies of *Nectarinia amethystina* (Shaw). *Durban Mus. Novit.* 11(1): 20–24.
- Clancey, P.A. (1978a). Miscellaneous taxonomic notes on African birds. 52[3]. On the southern and eastern races of *Nectarinia olivacea* (Smith), 1840. *Durban Mus. Novit.* 11(19): 317–327.
- Clancey, P.A. (1978b). Miscellaneous taxonomic notes on African birds. 52[4]. On the validity of *Nectarinia olivacea lowei* (Vincent), 1934. *Durban Mus. Novit.* 11(19): 327–330.
- Clancey, P.A. (1979a). Miscellaneous taxonomic notes on African birds. 53. The valid subspecific criteria and ranges of the two eastern races of *Nectarinia bifasciata* (Shaw). *Durban Mus. Novit.* 12(1): 15–17.
- Clancey, P.A. (1979b). Miscellaneous taxonomic notes on African birds. 54. On the validity of *Cinnyris mariquensis ovamboensis* Reichenow, 1904. *Durban Mus. Novit.* 12(4): 43–44.
- Clancey, P.A. (1980a). On the Lesser Grey Shrike *Lanius minor* in Southern Africa. *Durban Mus. Novit.* 12: 161–165.
- Clancey, P.A. (1980b). *Southern African Ornithological Society Checklist of Southern African Birds*. Southern African Ornithological Society, Johannesburg.
- Clancey, P.A. (1985). *The Rare Birds of Southern Africa*. Winchester Press, Johannesburg.
- Clancey, P.A. (1986). Miscellaneous taxonomic notes on African birds. 67. *Durban Mus. Novit.* 14: 7–27.
- Clancey, P.A. (1994a). The status of *Nectarinia olivacea* (Smith), 1840; a unitary species or two polytypic allopecies? *Gerrfaur* 82/83 (1992–93): 25–29.
- Clancey, P.A. (1994b). The type-locality of *Nectarinia senegalensis gutturalis* (Linnaeus), 1766. *Bull. Brit. Orn. Club* 114(4): 278–279.
- Clancey, P.A. (1996). *The Birds of Southern Mozambique*. 2nd revised edition. African Bird Book Publishing, Westville, KwaZulu-Natal, South Africa.
- Clancey, P.A. (1997). Variation in the Cape Penduline Tit *Anthoscopus minutus* of the southern Afrotropics. *Bull. Brit. Orn. Club* 117(1): 52–55.
- Clancey, P.A. & Irwin, M.P.S. (1978). Species limits in the *Nectarinia afra*/*Nectarinia chalybea* complex of African double-collared sunbirds. *Durban Mus. Novit.* 11: 331–351.
- Clancey, P.A. & Williams, J.G. (1957). The systematics of the Little Purple-banded Sunbird, *Cinnyris bifasciatus* (Shaw) with notes on its allies. *Durban Mus. Novit.* 5: 27–41.
- Clancey, P.A. & Winterbottom, J.M. (1961). On racial variation in *Zosterops pallida* Swainson, *sens. strict.* *Bull. Brit. Orn. Club* 81: 35–36.
- Clancy, G.P. (1982). Some records of the Olive-backed Oriole and Spangled Drongo mimicking other bird's calls. *Austr. Birds* 16(4): 62–63.
- Clancy, G.P. & Lane, S.G. (1994). A report on the banding of Blue-faced Honeyeaters *Entomyzon cyanotis* on the New South Wales north coast. *Corella* 18(1): 25–27.
- Clapp, G.E. (1979a). Selected unusual bird observations in Popondetta Town 1976–1979. Possible effects of large scale forest clearance for oil palm development in the Northern Province of Papua New Guinea. *Papua New Guinea Bird Soc. Newsl.* 158: 5–18.
- Clapp, G.E. (1979b). Preliminary report on the flycatcher *Microeca flavigaster* and the honeyeater *Melithreptus albobularis* found in *Eucalyptus* trees in the Northern Province of Papua New Guinea. *Papua New Guinea Bird Soc. Newsl.* 159: 6–8.
- Clapp, G.E. (1980a). First record of the nest and eggs of the Long-billed Honeyeater *Melilestes megarrhynchus*. *Papua New Guinea Bird Soc. Newsl.* 165/166: 33–35.
- Clapp, G.E. (1980b). Speculation on the occurrence of some birds in the Mula valley and Oro Bay/Pongani *Eucalyptus* and associated savannah areas of the Northern Province of Papua New Guinea: recent invaders or relict populations from the last glaciation. *Papua New Guinea Bird Soc. Newsl.* 173/174: 21–33.
- Clapp, G.E. (1981). Further selected unusual bird observations in Popondetta Town 1979–1980. Possible effects of large-scale forest clearance for oil palm development in the Oro Province of Papua New Guinea. *Papua New Guinea Bird Soc. Newsl.* 185/186: 13–27.
- Clapp, G.E. (1982a). Duetting in the New Guinea Friarbird *Philemon novaeguineae*. *Papua New Guinea Bird Soc. Newsl.* 189/190: 14–19.
- Clapp, G.E. (1982b). Helmeted Friarbird *Philemon buceroides* nesting in the same tree as the Brown Oriole. *Papua New Guinea Bird Soc. Newsl.* 193/194: 21–25.
- Clapp, G.E. (1986a). Second recorded instance of the Brown Oriole *Oriolus szalayi* nesting in the same tree as the Helmeted Friarbird *Philemon buceroides*. *Muruk* 1(1): 17–25.
- Clapp, G.E. (1986b). Birds of Mount Scratchley summit and environs: 3520 metres asl in south-eastern New Guinea. *Muruk* 1(3): 75–84.
- Clapp, G.E. (1987a). Birds of the lower Sibilum Mountains, Papua New Guinea. *Muruk* 2: 45–52.
- Clapp, G.E. (1987b). Kites and other birds feeding on caterpillar infestations in poinciana trees *Delonix regia* in Popondetta, Papua New Guinea. *Muruk* 2: 73–75.
- Clapp, G.E. (1990). Soft song vocal mimicry in the Brown Oriole *Oriolus szalayi* of New Guinea. *Muruk* 4(2): 53–59.
- Clapp, G.E. (1992). A second lowland population of the White-faced Robin *Tregellasia leucops*. *Muruk* 5(3): 136–138.
- Clapp, G.E. (1993). The nest and nestling of the Crested Berrypecker *Paramythia montium*. *Muruk* 6(1): 43.
- Clapp, G.E. (1996). Flower piercing by (presumed) honeyeaters in Papua New Guinea. *Muruk* 8(1): 33–34.
- Clapp, G.E. & Haera, B. (1982). Opportunistic stealing of prey by the Giant Frogmouth *Podargus papuensis* from the Helmeted Friarbird *Philemon novaeguineae*. *Papua New Guinea Bird Soc. Newsl.* 191/192: 38.
- Clapp, R.B. & Sibley, F.C. (1966). Notes on the birds of Tutuila, American Samoa. *Notornis* 13(3): 157–164.
- Clark, G.S., Nix, H.A. & Wilson, S.J. (1976). Status of birds of Canberra and district. *Canberra Bird Notes* 3(6): 6–15.
- Clarke, G. (1985). Bird observations from northwest Somalia. *Scopus* 9: 24–42.
- Clarke, M.F. (1984a). Co-operative breeding by the Australian Bell Miner *Manorina melanophrys* Latham: a test of kin selection theory. *Behav. Ecol. Sociobiol.* 14(2): 137–146.
- Clarke, M.F. (1984b). Interspecific aggression within the genus *Manorina*. *Emu* 84(2): 113–115.
- Clarke, M.F. (1987). *The Social Organisation of the Bell Miner*. *Manorina melanophrys*. PhD thesis, Department of Zoology, University of Melbourne, Melbourne, Victoria.
- Clarke, M.F. (1988). The reproductive behaviour of the Bell Miner *Manorina melanophrys*. *Emu* 88(2): 88–100.
- Clarke, M.F. (1989). The pattern of helping in the Bell Miner (*Manorina melanophrys*). *Ethology* 80: 292–306.
- Clarke, M.F. (1995). Co-operative breeding in Australasian birds: a review of hypotheses and evidence. *Corella* 19(3): 73–90.
- Clarke, M.F. (1997). A review of studies of the breeding biology of Australian birds from 1986–95: biases and consequences. *Emu* 97(4): 283–289.
- Clarke, M.F. (2007). Black-eared Miner: flagship species or waste of money? *Wingspan* 17(3): 28–33.
- Clarke, M.F. & Fitz-Gerald, G.F. (1994). Social organization of the cooperatively breeding Bell Miner *Manorina melanophrys*. *Emu* 94(2): 96–105.
- Clarke, M.F. & Heathcote, C.F. (1988). Methods for sexing and ageing the Bell Miner *Manorina melanophrys*. *Emu* 88(2): 118–121.
- Clarke, M.F. & Heathcote, C.F. (1990). Dispersal, survivorship and demography in the co-operatively breeding Bell Miner *Manorina melanophrys*. *Emu* 90(1): 15–23.
- Clarke, M.F. & Oldland, J.M. (2007). Penetration of remnant edges by Noisy Miners (*Manorina melanocephala*) and implications for habitat restoration. *Wildl. Res.* 34(4): 253–261.
- Clarke, M.F. & Schedvin, N. (1997). An experimental study of the translocation of Noisy Miners *Manorina melanocephala* and difficulties associated with dispersal. *Biol. Conserv.* 80: 161–167.
- Clarke, M.F. & Schedvin, N. (1999). Removal of Bell Miners (*Manorina melanophrys*) from *Eucalyptus radiata* forest and its effect on avian diversity, psyllids and tree health. *Biol. Conserv.* 88: 111–120.
- Clarke, M.F., Grey, M.J., Britton, D.R. & Loyn, R.H. (1995). *The Noisy Miner* *Manorina melanocephala* and *Rural Dieback in Remnant Eucalypt Woodlands*. RAOU Report 98. Royal Australasian Ornithologists Union, Melbourne, Victoria.
- Clarke, M.F., Schipper, C., Boulton, R. & Ewen, J. (2003). The social organization and breeding behaviour of the Yellow-faced Honeyeater *Lichenostomus chrysops* – a migratory passerine from the Southern Hemisphere. *Ibis* 145(4): 611–623.
- Clarke, M.F., Taylor, R., Oldland, J., Grey, M.J. & Dare, A. (2007). Challenges in managing miners. *Victorian Naturalist* 124(2): 102–105.
- Clarke, R.H. (1997). *The Social Behaviour of Breeding Crescent Honeyeaters*. Phylidonyris pyrrhoptera, at Wilsons Promontory. BSc thesis, La Trobe University (School of Zoology), Bundoora, Victoria.
- Clarke, R.H. (2004). The avifauna of northern Torres Strait: notes on a wet-season visit. *Austr. Field Orn.* 21: 49–66.
- Clarke, R.H. & Clarke, M.F. (1999). The social organization of a sexually dimorphic honeyeater: the Crescent Honeyeater *Phylidonyris pyrrhoptera*, at Wilsons Promontory, Victoria. *Austr. J. Ecol.* 24(6): 644–654.
- Clarke, R.H. & Clarke, M.F. (2000). The breeding biology of the Crescent Honeyeater *Phylidonyris pyrrhoptera* at Wilsons Promontory, Victoria. *Emu* 100(2): 115–124.
- Clarke, R.H., Boulton, R.L. & Clarke, M.F. (2002). Translocation of the socially complex Black-eared Miner *Manorina melanotis*: a trial using hard and soft release techniques. *Pacific Conserv. Biol.* 8(4): 223–234.
- Clarke, R.H., Boulton, R.L. & Clarke, M.F. (2005). Estimating population size of the Black-eared Miner, with an assessment of landscape-scale habitat requirements. *Pacific Conserv. Biol.* 11(3): 174–188.
- Clarke, R.H., Boulton, R.L., Ewen, J.G., Moysey, E. & Clarke, M.F. (2002). Methods for ageing and sexing the Black-eared Miner, *Manorina melanotis*, and the Yellow-throated Miner, *M. flavigula*. *Emu* 102(4): 339–344.
- Clarke, R.H., Gordon, I.R. & Clarke, M.F. (2001). Intraspecific phenotypic variability in the Black-eared Miner (*Manorina melanotis*): human facilitated introgression and the consequences for an endangered taxon. *Biol. Conserv.* 99: 145–155.
- Clarke, R.H., Oliver, D.L., Boulton, R.L., Cassey, P. & Clarke, M.F. (2003). Assessing programs for monitoring threatened species – a tale of three honeyeaters (Meliphagidae). *Wildl. Res.* 30(5): 427–435.
- Clarke, R.H., Schipper, C., Boulton, R.L., Ewen, J.G. & Clarke, M.F. (2003). Biometrics and sexing criteria of the Yellow-faced Honeyeater *Lichenostomus chrysops*. *Corella* 27(4): 106–108.
- Classen, R. (1987). Morphological adaptations for bird pollination in *Nicolaia elatior* (Jack) Horan (Zingiberaceae). *Gardens' Bull. (Singapore)* 40: 37–43.
- Clayton, M. (1981). Identification of wattlebills. *Canberra Bird Notes* 6(3): 82–83.
- Cleere, N. (2005). Short-toed Treecreeper foraging on ground. *British Birds* 98(7): 380.
- Clegg, S.M., Degnan, S.M., Kikkawa, J., Moritz, C., Estoup, A. & Owens, I.P.F. (2002). Genetic consequences of sequential founder events by an island-colonizing bird. *Proc. Natl. Acad. Sci. USA* 99(12): 8127–8132.
- Clegg, S.M., Degnan, S.M., Moritz, C., Estoup, A., Kikkawa, J. & Owens, I.P.F. (2002). Microevolution in island forms: the roles of drift and directional selection in morphological divergence of a passerine bird. *Evolution* 56(10): 2090–2099.
- Cleland, J.B. (1911). Examination of contents of stomachs and crops of Australian birds. *Emu* 11: 79–95.
- Cleland, J.B., Maiden, J.H., Froggatt, W.W., Ferguson, E.W. & Musson, C.T. (1918). The food of Australian birds. An investigation into the character of the stomach and crop contents. *Dept. Agric. NSW Sci. Bull.* 15: 1–112.
- Clement, P. (1995). Identification pitfalls and assessment problems. 17. Woodchat Shrike *Lanius senator*. *British Birds* 88: 291–295.
- Clement, P. & Worfolk, T. (1995). Southern and eastern Great Grey Shrikes in northwest Europe. *Birding World* 8(8): 300–309.
- Close, D.H. (1991). Mimicry by Mistletoebird. *South Austr. Orn.* 31(3): 74.
- Close, D.H. & Jaensch, R.P. (1984). Birds of the north-west of South Australia. *South Austr. Orn.* 29(4): 81–99.
- Close, D.H. & Teese, D. (1978). Yellow-tinted Honeyeater at Weipa. *Sunbird* 9: 59–60.
- Clout, M.N. & Gaze, P.D. (1984). Effects of plantation forestry on birds in New Zealand. *J. Appl. Ecol.* 21: 795–815.

Clunie / Craig

- Clunie, F. (1972). Lizard killing by the Fiji Wattled Honeyeater. *Notornis* **19**: 337.
- Clunie, F. (1984). *Birds of the Fiji Bush*. Fiji Museum, Suva, Fiji.
- Clunie, F. (1985). Notes on the bats and birds of Rotuma. *Domodomo* **3**: 153–160.
- Coate, K.H. (1985). Black Honeyeaters feeding on ash. *West. Austr. Nat.* **16**(2–3): 51–52.
- Coate, K.H. (1987). Another sighting of Black Honeyeaters eating ash. *West. Austr. Nat.* **17**(1): 23–24.
- Coate, K.H. (2003). Observations of nesting Brown Honeyeaters *Lichmera indistincta* at Willetton, Western Australia. *Austr. Field Orn.* **20**(4): 142–146.
- Coate, K.H., Johnstone, R.E. & Lodge, G.A. (1998). Birds of the Gardner and Denison Ranges, and Lake Willson area south-east Kimberley, Western Australia. *West. Austr. Nat.* **22**(1): 25–54.
- Coates, B.J. (1973). Birds observed on Mt Albert Edward, Papua. *Papua New Guinea Bird Soc. Newsl.* **84**: 3–7.
- Coates, B.J. (1990). *The Birds of Papua New Guinea, Including the Bismarck Archipelago and Bougainville*. Vol. 2. Passerines. Dove Publications, Alderley, Queensland.
- Coates, B.J. & Bishop, K.D. (1997). *A Guide to the Birds of Wallacea: Sulawesi, The Moluccas and Lesser Sunda Islands, Indonesia*. Dove Publications, Alderley, Queensland.
- Coates, B.J. & Lindgren, E. (1978). *Ok Tedi Birds. Report of a Preliminary Survey of the Avifauna of the Ok Tedi Area, Western Province, Papua New Guinea*. Ok Tedi Environmental Task Force, Ok Tedi Development Co. & Office of the Department of Environment and Conservation, Port Moresby, Papua New Guinea.
- Coates, B.J. & Peckover, W.S. (2001). *Birds of New Guinea and the Bismarck Archipelago: a Photographic Guide*. Dove Publications, Alderley, Queensland.
- Coates, B.J. & Swainson, G.W. (1978). Notes on the birds of Wuvulu Island. *Papua New Guinea Bird Soc. Newsl.* **145**: 7–10.
- Cochran, T. (1995). A small but beautiful bird: the Forty-spotted Pardalote. Recovery programme in Tasmania. *Bird Obs. Nunawading* **755**: 2–3.
- Cochran, W.W., Mouritsen, H. & Wikelski, M. (2004). Migrating songbirds recalibrate their magnetic compass daily from twilight cues. *Science (Washington, D.C.)* **304**: 405–408.
- Cockburn, A. (1998). Evolution of helping behavior in cooperatively breeding birds. *Ann. Rev. Ecol. Evol. Syst.* **29**: 141–177.
- Cody, M.L. (1991a). Honeyeater plucks koala for nest material. *Emu* **91**(2): 125–126.
- Cody, M.L. (1991b). Distributional notes from southwest and northeast Australia. *Sunbird* **21**(1): 1–9.
- Coe, M.J. (1961). Notes on *Nectarinia johnstoni* on Mt. Kenya. *Ostrich* **32**: 101–103.
- Coe, M.J. (1967). *The Ecology of the Alpine Zone of Mount Kenya*. W. Junk, The Hague, The Netherlands.
- Coez, J.H. & Giliomee, J.H. (1985). Insects in association with the inflorescences of *Protea repens* (Proteaceae). *J. Entomol. Soc. Southern Afr.* **48**: 303–314.
- Coez, J.H. & Middelmann, M.C. (1997). SWOT analysis of the fynbos industry in South Africa with special reference to research. *Acta Horticulturæ* **453**: 145–152.
- Cohen, C. & Winter, D. (1992). Cape White-eye, Fiscal Shrike mimicking other birds. *Promerops* **202**: 9.
- Colahan, B.D. (1981). Anting in the Cape White-eye. *Ostrich* **52**: 186.
- Cole, D.T. (1992). Whitebellied Sunbirds take to nesting cereumly. *Babbler (Botswana)* **23**: 33–35.
- Colebrook-Robjent, J.F.R. (1990). The nest and eggs of Bannerman's Blue-headed Sunbird *Nectarinia bannermani*. *Bull. Brit. Orn. Club* **110**(1): 13–14.
- Coleman, A. (1974). Honeyeaters of Toongabbie and Quarry Creek Reserve, Northmead. *Austr. Birds (J. NSW Field Orn. Club)* **8**: 79–80.
- Coles, D. (1976a). New species for Baiyer River Bird Sanctuary. Black Honeyeater *Myzomela nigrita*. *Papua New Guinea Bird Soc. Newsl.* **121**: 12.
- Coles, D. (1976b). High mountain observations during a trip to Mt. Wilhelm. *Papua New Guinea Bird Soc. Newsl.* **121**: 13–14.
- Coles, T. (1995). Mt. Gahavisuka Provincial Park: a check list of birds. *Murak* **7**(3): 97–104.
- Collar, N.J. (1975). Golden Orioles diving into water. *British Birds* **68**: 245–246.
- Collar, N.J. (1998a). Bill morphology in the identification of Isabela Orioles *Oriolus isabellae*. *Forktail* **14**: 82–84.
- Collar, N.J. (1998b). Extinction by assumption; or, the Romeo error on Cebu. *Oryx* **32**(4): 239–244.
- Collar, N.J. & Andrew, P. (1988). *Birds to Watch: the ICBP World Checklist of Threatened Birds*. ICBP Technical Publication **8**. International Council for Bird Preservation, Cambridge, UK.
- Collar, N.J. & Stuart, S.N. (1985). *Threatened Birds of Africa and Related Islands: The ICBP IUCN Red Data Book*. Part 1. 3rd edition. International Council for Bird Preservation & International Union for Conservation of Nature and Natural Resources, Cambridge, UK.
- Collar, N.J. & Stuart, S.N. (1988). *Key Forests for Threatened Birds in Africa*. International Council for Bird Preservation, Cambridge, UK.
- Collar, N.J., Andreev, A.V., Chan, S., Crosby, M.J., Subramanya, S. & Tobias, J.A. eds. (2001). *Threatened Birds of Asia: the BirdLife International Red Data Book*. Part B. BirdLife International, Cambridge, UK.
- Collar, N.J., Crosby, M.J. & Stattersfield, A.J. (1994). *Birds to Watch 2: the World List of Threatened Birds*. BirdLife Conservation Series **4**. BirdLife International, Cambridge, UK.
- Collar, N.J., Mallari, N.A.D. & Tabaranza, B.R. (1999). *Threatened Birds of the Philippines*. BirdLife International, Haribon Foundation & Bookmark, Makati City & Manila.
- Collins, B.G. (1980). Seasonal variations in the abundance and food preferences of honeyeaters (Meliphagidae) at Wongamine, Western Australia. *West. Austr. Nat.* **14**(8): 207–212.
- Collins, B.G. (1983a). Seasonal variation in the energetics of territorial Cape Sugarbirds. *Ostrich* **54**(2): 121–125.
- Collins, B.G. (1983b). Pollination of *Mimetes hirtus* (Proteaceae) by Cape Sugarbirds and Orange-breasted Sunbirds. *J. South Afr. Bot.* **49**: 125–142.
- Collins, B.G. (1983c). A first approximation of the energetics of Cape Sugarbirds (*Promerops cafer*) and Orange-breasted Sunbirds (*Nectarinia violacea*). *South Afr. J. Zool.* **18**(4): 363–369.
- Collins, B.G. (1985). Energetics of foraging and resource selection by honeyeaters in forest and woodland habitats of Western Australia. *New Zealand J. Zool.* **12**(4): 577–587.
- Collins, B.G. & Briffa, P. (1982). Seasonal variation of abundance and foraging of three species of Australian honeyeaters. *Austr. Wildl. Res.* **9**(3): 557–569.
- Collins, B.G. & Briffa, P. (1983). Seasonal and diurnal variations in the energetics and foraging activities of the Brown Honeyeater, *Lichmera indistincta*. *Austr. J. Ecol.* **8**(2): 103–111.
- Collins, B.G. & Clow, H. (1978). Feeding behaviour and energetics of the Western Spinebill, *Acanthorhynchus superciliosus* (Aves: Meliphagidae). *Austr. J. Zool.* **26**(2): 269–277.
- Collins, B.G. & McNee, S. (1991). Resource partitioning within Australian nectarivorous bird communities. Pp. 1166–1174 in: Bell, B.D. ed. (1992). *Acta XX Congressus Internationalis Ornithologici*. New Zealand Ornithological Trust Board, Wellington, New Zealand.
- Collins, B.G. & Morellini, P.C. (1979). The influence of nectar concentration and time of day upon energy intake and expenditure by the Singing Honeyeater *Meliphaga virescens*. *Physiol. Zool.* **52**: 165–175.
- Collins, B.G. & Newland, C. (1986). Honeyeater population changes in relation to food availability in the Jarrah forest of Western Australia. *Austr. J. Ecol.* **11**(1): 63–76.
- Collins, B.G. & Paton, D.C. (1989). Consequences of differences in body mass, wing length and leg morphology for nectar-feeding birds. *Austr. J. Ecol.* **14**(3): 269–289.
- Collins, B.G. & Rebelo, T. (1987). Pollination biology of the Proteaceae in Australia and Southern Africa. *Austr. J. Ecol.* **12**(4): 387–421.
- Collins, B.G. & Spice, J. (1986). Honeyeaters and the pollination biology of *Banksia prionotes* (Proteaceae). *Austr. J. Bot.* **34**: 175–185.
- Collins, B.G., Briffa, P. & Newland, C. (1984). Temporal changes in abundance and resource utilization by honeyeaters at Wongamine Nature Reserve. *Emu* **84**(3): 159–166.
- Collins, B.G., Cary, G. & Packard, G. (1980). Energy assimilation, expenditure and storage by the Brown Honeyeater *Lichmera indistincta*. *J. Comp. Physiol.* **137**(2): 157–163.
- Collins, B.G., Cary, G. & Payne, S. (1980). Metabolism, thermoregulation and evaporative water loss in two species of Australian nectar-feeding birds (family Meliphagidae). *Comp. Biochem. Physiol. Part A Physiol.* **67**(4): 629–635.
- Collins, B.G., Grey, J. & McNee, S. (1990). Foraging and nectar use in nectarivorous bird communities. Pp. 110–122 in: Morrison, M.L., Ralph, J.J., Verner, J. & Jehl, J.R. eds. (1990). *Avian Foraging: Theory, Methodology, and Applications*. Studies in Avian Biology **13**. Cooper Ornithological Society, Los Angeles, California.
- Collins, J.A. (1996). *Breeding and Wintering Ecology of the Loggerhead Shrike in South Illinois*. MSc thesis, Southern Illinois University, Carbondale, Illinois.
- Collins, P. (1995). *The Birds of Broome*. Broome Bird Observatory, Broome, Western Australia.
- Collison, F.L. (1959). Observations on Regent Honeyeaters. *South Austr. Orn.* **23**: 30–31.
- Collister, D.M. & De Smet, K. (1997). Breeding and natal dispersal in the Loggerhead Shrike. *J. Field Orn.* **68**: 273–282.
- Collister, D.M. & Henry, J.D. (1995). Preservation of Loggerhead Shrike (*Lanius ludovicianus*) habitat in southeastern Alberta. *Proc. West. Found. Vert. Zool.* **6**: 280–282.
- Collister, D.M. & Wicklum, D. (1996). Intraspecific variation in Loggerhead Shrikes: sexual dimorphism and implication for subspecies classification. *Auk* **113**: 221–223.
- Colston, P.R. (1974). Meliphagidae – honeyeaters. Pp. 284–319 in: Hall, B.P. ed. (1974). *Birds of the Harold Hall Australian Expeditions 1962–70*. Trustees of the British Museum (Natural History), London.
- Colston, P.R. & Curry-Lindahl, K. (1986). *The Birds of Mount Nimba, Liberia*. British Museum (Natural History) Publication **982**. British Museum (Natural History), London.
- Compton, S.G., Craig, A.J.F.K. & Waters, I.W.R. (1996). Seed dispersal in an African fig tree: birds as high quantity, low quality dispersers? *J. Biogeogr.* **23**: 553–563.
- Comrie-Smith, E. (1930). Late broods. *Emu* **30**: 68–69.
- Congreve, D.P. & Congreve, P. (1985). Birds. Pp. 20–42 in: Anon. (1985). *Eyre Bird Observatory Report No. 3, 1981–1983*. RAOU Report **9**. Royal Australasian Ornithologists Union, Melbourne, Victoria.
- Conole, L. (1997). Trip report: Java and Bali (Indonesia), December 22, 1996–January 16, 1997. URL: <http://www.camacdonald.com/birding/tripreports/JavaBali96.html> (download 15 October 2007).
- Conrad, K.F., Clarke, M.F., Robertson, R.J. & Boag, P.T. (1998). Paternity and the relatedness of helpers in the cooperatively breeding Bell Miner. *Condor* **100**(2): 343–349.
- Coomans de Ruiter, L. (1936). Over ooruitjes en Vischuijen. *Tropische Natuur* **1936** (Jubileum-Uitgave): 74–76. In Dutch.
- Coomans de Ruiter, L. (1950). Vogels van het Quarles-Gebergte (ZW. Centraal Celebes). *Ardea* **38**(1/2): 40–64, plate 1. In Dutch.
- Coomans de Ruiter, L. (1951). Vogels van het dal van de Bodjo-rivier (Zuid-Celebes). *Ardea* **39**(4): 261–318, pls. 4–8. In Dutch.
- Coomans de Ruiter, L. & Maurenbrecher, L.L.A. (1948). Stadsvogels van Makassar (Zuid-Celebes). *Ardea* **36**: 163–198. In Dutch.
- Cooney, S.J.N., Watson, D.M. & Young, J. (2006). Mistletoe nesting in Australian birds: a review. *Emu* **106**(1): 1–12.
- Cooper, G. (1991). Plain Flowerpecker at Ho Sheung Heung. The first record for Hong Kong. *Hong Kong Bird Rep.* **1990/1991**: 117–118.
- Cooper, J. (1971a). The breeding of the Fiscal Shrike in Southern Africa. *Ostrich* **42**: 166–174.
- Cooper, J. (1971b). Post-nesting development in the Fiscal Shrike. *Ostrich* **42**: 175–178.
- Cooper, K. (1969). The Golden Oriole at Cowies Hill. *Albatross* **168**: 6.
- Cooper, N.K. (1995). Vertebrate fauna of an isolated bushland reserve (No 18325) in Inner Perth. *West. Austr. Nat.* **20**(1): 21–28.
- Cooper, R.M. (1986). A preliminary list of the birds of Werrikimbe National Park, New South Wales. *Austr. Birds* **20**(2): 40–44.
- Cooper, R.M. & McAllan, I.A.W. (1995). *The Birds of Western New South Wales: a Preliminary Atlas*. New South Wales Bird Atlasers, Albury, New South Wales.
- Cooper, R.P. (1960). The Crescent Honeyeater. *Austr. Bird Watcher* **1**(3): 70–76.
- Cooper, R.P. (1961). Field notes on the nesting of the Red-tipped Pardalotes. *Emu* **61**(1): 1–6, pls. 1–2.
- Cooper, R.P. (1967). Is the Helmeted Honeyeater doomed? *Austr. Bird Watcher* **3**(1): 1–14.
- Cooper, R.P. (1970). Additional records of birds from Wilson's Promontory. *Austr. Bird Watcher* **3**: 239–245.
- Cooper, R.P. (1974). The avifauna of Wilson's Promontory. Part 1. *Austr. Bird Watcher* **5**(5): 137–174.
- Cooper, R.P. (1975a). The avifauna of Wilson's Promontory. Part 6. B. Passerines. *Austr. Bird Watcher* **6**(3): 87–102.
- Cooper, R.P. (1975b). The avifauna of Wilson's Promontory. Part 7. B. Passerines. *Austr. Bird Watcher* **6**(4): 103–116.
- Cooper, R.P. (1975c). *Wilson's Promontory National Park and its Avifauna*. Bird Observers Club, Melbourne, Victoria.
- Cordeiro, N.J. (1998). A preliminary survey of the montane avifauna of Mt. Nilo, East Usambaras, Tanzania. *Scopis* **20**: 1–18.
- Corlett, R. (1998). Frugivory and seed dispersal by birds in Hong Kong shrubland. *Forktail* **13**: 23–27.
- Corti, U.A. (1952). *Die Vogelwelt der schweizerischen Nordalpenzone*. Bischofberger & Co., Chur, Switzerland. In German.
- Corti, U.A. (1959). *Die Brutvögel der deutschen und österreichischen Alpenzone – Die Vogelwelt der Alpen*. Vol. 5. Bischofberger & Co., Chur, Switzerland. In German.
- Courtney, J. & Marchant, S. (1971). Breeding details of some common birds in south-eastern Australia. *Emu* **71**(3): 121–133.
- Cowan, P.J. (2006). Arid-land birds and the nomadism concept. *Bull. Brit. Orn. Club* **126**(1): 55–59.
- Cowles, G.S. (1967). The Grey Honeyeater (*Lacustroica whitei*). A new record for South Australia. *South Austr. Orn.* **24**(8): 147.
- Cowles, G.S. (1974). Dicaeidae – flower-peckers. Pp. 274–281 in: Hall, B.P. ed. (1974). *Birds of the Harold Hall Australian Expeditions 1962–70*. Trustees of the British Museum (Natural History), London.
- Cowles, R.B. (1936). Observations on the Amethyst Sunbird, *Chalcornis amethystina amethystina* (Shaw). *Auk* **53**: 28–30.
- Cowling, R.M. ed. (1992). *The Ecology of Fynbos – Nutrients, Fire and Diversity*. Oxford University Press, Cape Town.
- Cox, J.A. & Slater, G.L. (2007). Cooperative breeding in the Brown-headed Nuthatch. *Wilson J. Orn.* **119**(1): 1–8.
- Cox, J.B. & Pedler, L.P. (1977). Birds recorded during three visits to the far north-east of South Australia. *South Austr. Orn.* **27**(7): 231–250.
- Cox, T. (1987). Breeding record of the Black Honeyeater at Port Neill, Eyre Peninsula. *South Austr. Orn.* **30**(3): 76.
- Cracraft, J. & Feinstein, J. (2000). What is not a bird of paradise? Molecular and morphological evidence places *Macgregoria* in the Meliphagidae and the Cnemophilinae near the base of the corvid tree. *Proc. Royal Soc. London (Ser. B Biol. Sci.)* **267**: 233–241.
- Craig, A.J.F.K. & Hulley, P.E. (1996). Supplementary head molt in Cape White-eyes: a consequence of nectar feeding? *J. Field Orn.* **67**(3): 358–359.
- Craig, A.J.F.K. & Simon, C. (1991). Sunbird and sugarbird seasons. *Safring News* **20**(1/2): 9–12.
- Craig, J.L. (1984). Wing noises, wing slots, and aggression in New Zealand honeyeaters (Aves: Meliphagidae). *New Zealand J. Zool.* **11**(2): 195–199.
- Craig, J.L. (1985). Status and foraging in New Zealand honeyeaters. *New Zealand J. Zool.* **12**(4): 589–597.
- Craig, J.L. & Douglas, M.E. (1984a). Temporal partitioning of a nectar resource in relation to competitive asymmetries. *Anim. Behav.* **32**: 624–625.

Craig, J.L. & Douglas, M.E. (1984b). Bellbirds in Auckland and Northland. *Notornis* **31**(1): 82–86.

Craig, J.L. & Douglas, M.E. (1986). Resource distribution, aggressive asymmetries and variable access to resources in the nectar feeding Bellbird. *Behav. Ecol. Sociobiol.* **18**: 231–240.

Craig, J.L., Douglas, M.E., Stewart, A.M. & Veitch, C.R. (1981). Specific and sexual differences in body measurements of New Zealand honeyeaters. *Notornis* **28**(2): 121–128.

Craig, J.L., Stewart, A.M. & Douglas, M.E. (1981). The foraging of New Zealand honeyeaters. *New Zealand J. Zool.* **8**: 87–91.

Craig, P. ed. (2005). Natural history guide to American Samoa. 2nd edition. National Park of American Samoa, Pago Pago. URL: <http://www.nps.gov/npsa/naturescience/natlhistguide.htm> (download 27 March 2007).

Craig, R.B. (1978). An analysis of the predatory behavior of the Loggerhead Shrike. *Auk* **95**: 221–234.

Craig, R.J. (1989). Observations on the foraging ecology and social behavior of the Bridled White-eye. *Condor* **91**: 187–192.

Craig, R.J. (1990). Foraging behavior and microhabitat use of two species of white-eyes (Zosteropidae) on Saipan. *Auk* **107**: 500–505.

Craig, R.J. (1996). Seasonal population surveys and natural history of a Micronesian bird community. *Wilson Bull.* **108**: 246–267.

Craig, R.J. (1999). Conservation of endangered white-eyes (Zosteropidae) in the tropical Pacific. *Bird Conserv. Res. Contrib.* **1**: 1–8.

Craig, R.J. (2002). Aspects of flocking behavior in an endemic Pacific island white-eye. *J. Field Orn.* **73**: 70–73.

Craig, R.J. & Beal, K.G. (2001). Microhabitat partitioning among small passerines in a Pacific island bird community. *Wilson Bull.* **113**: 317–326.

Craig, R.J. & Taisacan, E. (1994). Notes on the ecology and population decline of the Rota Bridled White-eye. *Wilson Bull.* **106**: 165–169.

Cramp, S. ed. (1980). *Handbook of the Birds of Europe, the Middle East and North Africa: the Birds of the Western Palearctic*. Vol. 2. Hawks to bustards. Oxford University Press, Oxford, UK.

Cramp, S. & Perrins, C.M. eds. (1993). *Handbook of the Birds of Europe, the Middle East and North Africa. The Birds of the Western Palearctic*. Vol. 7. Flycatchers to shrikes. Oxford University Press, Oxford & New York.

Crawford, D.N. (1972). Birds of Darwin area, with some records from other parts of Northern Territory. *Emu* **72**(4): 131–148.

Cresswell, W., Irwin, M., Jensen, M., Mee, A., Mellanby, R., McKean, M. & Milne, L. (1997). Population estimates and distribution changes of landbirds on Silhouette Island, Seychelles. *Ostrich* **68**: 50–57.

Creutz, G. (1988). Pirol (*Oriolus oriolus*) sucht Nahrung auf dem Erdboden. *Orn. Mitt.* **40**: 103–104. In German.

Crewe, M. (2007). Some observations on Wallcreeper nest material. *British Birds* **100**: 444–445.

Crocq, C. (2003). Notes sur la frugivorie chez la Mésange à longue queue *Aegithalos caudatus*. Comparaison avec la frugivorie chez divers paridés. *Aulauda* **71**(3): 357–361. In French with English summary.

Crome, F.H.J. (1973). The relationship of the Helmeted and Yellow-tufted Honeyeaters. *Emu* **73**(1): 12–18.

Crome, F.H.J. (1978). Foraging ecology of an assemblage of birds in lowland rainforest in Northern Queensland. *Austr. J. Ecol.* **3**(2): 195–212.

Crook, J. (1960). *The Present Status of Certain Rare Land-birds of the Seychelles Islands*. Seychelles Government Bulletin [unnumbered]. Department of Environment, Victoria, Seychelles. 5 pp.

Crosby, M. (1991). Silver Oriole. *Bull. Oriental Bird Club* **14**: 32–35.

Crouther, M.M. (1985). Some breeding records of the Common Koel *Eudynamys scolopacea*. *Austr. Bird Watcher* **11**(2): 49–56.

de la Cruz, C. & de Lope, F. (1985). Reproduction de la Pie-grièche méridionale (*Lanius excubitor meridionalis*) dans le Sud-Ouest de la Péninsule Ibérique. *Gerfaut* **75**(2): 199–209. In French.

Cityroky, P. (1987). Ornithological observations in Iraq. *Beitr. Vogelkd.* **33**(3/4): 141–204.

Cuddy, D. (1995). Protection and restoration of breeding habitat for the Loggerhead Shrike in Ontario, Canada. *Proc. West. Found. Vert. Zool.* **6**: 283–286.

Cuisin, M. (1987). Note sur le comportement et la reproduction du Grimpereaux brachydactyles (*Certhia brachydactyla* C. L. Brehm). *Oiseau et RFO* **57**(3): 181–193. In French with English summary.

Cuisin, M. (1993). Note sur le régime alimentaire des jeunes Grimpereaux brachydactyles (*Certhia brachydactyla* C. L. Brehm). *Oiseau et RFO* **63**(1): 1–13. In French with English summary.

Cunningham, J.M. (1966). The egg of the Long-tailed Cuckoo. *Notornis* **13**(3): 149.

Cunningham, K.G. (1979). *Bioenergetics of the Loggerhead Shrike: Relation between Lifestyle and Metabolism*. MSc thesis, University of California, Irvine, California.

Cunningham, P. (2000). Nest construction and building material used by Purple Sunbird in the UAE. *Phoenix* **17**: 12–13.

Cunningham-van Someren, G.R. (1996). Active anting by weavers and sunbirds at Karen, Kenya. *Ostrich* **67**(3/4): 165.

Curio, E. (1994). Ornithological observations during a (preliminary) Philippines conservation expedition in 1993. *Ökol. Vögel* **16**(2): 613–631.

Curio, E., Diesmos, A.C., Mallari, N.A.D. & Altamirano, R.A.N. (1996). The Mindoro Scarlet-collared Flowerpecker *Dicaeum retrocinctum* – an alleged single island endemic. *J. Orn.* **137**(3): 361–365.

Curio, E., Hornbuckle, J., de Soye, Y., Aston, P. & Lastimoza, L.L. (2001). New bird records for the island of Panay, Philippines, including the first record of the Asian Stubtail *Urosphena squameiceps* for the Philippines. *Bull. Brit. Orn. Club* **121**: 183–197.

Curry, P.J. & Menckhorst, P.W. (1979). Breeding records of the Grey Honeyeater in the Upper Lyons River district. *West. Austr. Nat.* **14**(6): 162–163.

Curry-Lindahl, K. (1958). Internal timer and spring migration in an equatorial migrant, the Yellow Wag-tail (*Motacilla flava*). *Ark. Zool.* **11**: 541–557.

Curry-Lindahl, K. (1963). Molt, body weights, gonadal development and migration in *Motacilla flava*. Pp. 960–973 in: Sibley, C.G. ed. (1963). *Proceedings XIII. International Ornithological Congress, Ithaca, 17–24 June 1962*. American Ornithologists' Union, Baton Rouge, Louisiana.

Curry-Lindahl, K. (1975). *Fåglar över Land och Hav. En Global Översikt av Fåglarnas Flyttning*. Albert Bonniers Förlag, Stockholm. In Swedish [English translation (1984). *Birds over Land and Sea*. Mysl, Moscow].

Cyrus, D. (1989). Unusual plumage of Whitebellied Sunbird confusing birders? *Bokmakierie* **41**: 10.

Cyrus, D. & Robson, N.F. (1980). *Bird Atlas of Natal*. University of Natal Press, Pietermaritzburg, South Africa.

Dagley, J.R. (1994). Golden Orioles in East Anglia and their conservation. *British Birds* **87**: 205–219.

Daniel, M.J. (1982). Tui feeding on sandhoppers. *Notornis* **29**(3): 180.

Daniels, C.L. (1987). *The Feeding Ecology of Nectarivorous Birds in the Natal Drakensberg*. MSc thesis, University of Natal, Pietermaritzburg, South Africa.

Daniels, C.L., Downs, C.T. & Maclean, G.L. (2001). Arthropods in the diet of nectarivorous sunbirds (Passeriformes: Nectariniidae) and sugarbirds (Passeriformes: Promeropidae). *Durban Mus. Novit.* **26**: 45–48.

Danielsen, F. & Heegaard, M. (1995). The birds of Bukit Tigapuluh, southern Riau, Sumatra. *Kukila* **7**(2): 99–120.

Danielsen, F., Balete, D.S., Christensen, T.D., Heegaard, M., Jakobson, O.F., Jensen, A., Lund, T. & Poulsen, M.K. (1994). *Conservation of Biological Diversity in the Sierra Madre Mountains of Isabela and Southern Cagayan Province, the Philippines*. Department of Environment and Natural Resources & BirdLife International, Manila & Copenhagen.

Darolová, A. & Kristofík, J. (1993). Größen- und Formvariabilität bei Nestern der Beutelmeise (*Remiz pendulinus* Linnaeus, 1758). Size and form variability of the nests of Penduline Tit (*Remiz pendulinus* Linnaeus, 1758). *Biologia (Bratislava)* **48**(5): 593–597. In German with English summary.

Darolová, A., Hoi, H. & Schleicher, B. (1997). The effect of ectoparasite nest load on the breeding biology of the Penduline Tit *Remiz pendulinus*. *Ibis* **139**(1): 115–120.

Das, A.R.K. (1963). On the honey-sucking habits of the Purple Sunbird *Nectarinia asiatica* (Latham). *Pavo* **1**: 60–65.

Dathe, H. (1961). Ein im Flug badender Pirol. *Orn. Mitt.* **13**: 12. In German.

Daunicht, W.D. (1991). Unterscheidungsmerkmale im Großgefieder von Wald- *Certhia familiaris* und Gartenbaumläufer *C. brachydactyla*. *Limicola* **5**: 49–64.

Davey, J.K.A. & Davey, L. (1990). Wintering Coppery Sunbirds in Harare. *Honeyguide* **36**: 42.

David, N. & Gosselin, M. (2002a). Gender agreement of avian species names. *Bull. Brit. Orn. Club* **122**(1): 14–49.

David, N. & Gosselin, M. (2002b). The grammatical gender of avian genera. *Bull. Brit. Orn. Club* **122**(4): 257–282.

Davidar, P. (1985a). Ecological interactions between mistletoes and their avian pollinators in South India. *J. Bombay Nat. Hist. Soc.* **82**(1): 45–60.

Davidar, P. (1985b). Feeding territories of the Small Sunbird (*Nectarinia minima* Sykes). *J. Bomb. Nat. Hist. Soc.* **82**(1): 204–206.

Davidar, P., Voganand, T.R.K., Ganesh, T. & Joshi, N. (1996). An assessment of common and rare forest bird species of the Andaman Islands. *Forktail* **12**: 135–142.

David-Beaulieu, A. (1939). Les oiseaux de la région de Pleiku (Hauts Plateaux du Sud-Annam). [Part 2]. *Oiseau et RFO (Nouv. Sér.)* **9**: 163–182. In French.

David-Beaulieu, A. (1944). *Les Oiseaux du Tranninh*. L'École Supérieure des Sciences de l'Université Indochinoise, Hanoi. In French.

David-Beaulieu, A. (1948). Note sur quelques oiseaux nouveaux pour le Tranninh et même pour l'Indochine. *Oiseau et RFO (Nouv. Sér.)* **18**: 133–140. In French.

David-Beaulieu, A. (1950). Les oiseaux de la province de Savannakhet (Bas-Laos). [Part 3]. *Oiseau et RFO (Nouv. Sér.)* **20**: 9–50. In French.

Davidson, D.A.G. (1945). *Loranthus* attacks in sal plantations. *Indian Forester* **71**: 181–182.

Davidson, I.R. (1992). Regent Honeyeaters feeding on mealy bug honeydew. *Austr. Bird Watcher* **14**(5): 193–194.

Davidson, P. ed. (1998). *A Wildlife and Habitat Survey of Nam Et and Phou Louey National Biodiversity Conservation Areas, Houaphanh Province, Lao PDR*. Wildlife Conservation Society, Vientiane.

Davidson, P.J. & Stones, T. (1993). Birding in the Sula Islands. *Bull. Oriental Bird Club* **18**: 59–63.

Davidson, P.J., Stones, T. & Lucking, R. (1995). The conservation status of key bird species on Taliabu and the Sula Islands, Indonesia. *Bird Conserv. Int.* **5**: 1–20.

Davies, S.J.J.F. (1982). Counting bush birds at Eyre. Pp. 43–49 in: Anon. (1982). *Eyre Bird Observatory Report 1979–1981*. RAOU Report 3. Royal Australasian Ornithologists Union, Melbourne, Victoria.

Davies, S.J.J.F. & Chapman, G.S. (1975). The status of birds on Peron Peninsula and Dirk Hartog Island, Shark Bay, WA. *Emu* **75**(2): 55–61.

Davies, S.J.J.F., Bamford, M. & Bamford, M. (1988). *The Night Parrot: a Search in the Lake Disappointment Area, September 1987*. RAOU Report 49. Royal Australasian Ornithologists Union, Melbourne, Victoria.

Davis, C.M. (1979). A nesting study of the Brown Creeper. *Living Bird* **17** (1978): 237–263.

Davis, J. (1993). Handraising of Mistletoe Birds. A partial success. *Austr. Avicult.* **47**(2): 25–26.

Davis, J.A. (2005). Density and population estimates of Amani Sunbird *Antheptes pallidigaster* in Kenya's Arabuko-Sokoke Forest. *Bird Conserv. Int.* **15**(1): 53–62.

Davis, W.E. & Recher, H.F. (1993a). Notes on the breeding biology of the Regent Honeyeater. *Corella* **17**(1): 1–4.

Davis, W.E. & Recher, H.F. (1993b). Aggression by honeyeaters and its consequences for nesting Striated Thornbills *Acanthiza lineata*. *Corella* **17**(1): 25–27.

Davis, W.E. & Recher, H.F. (2002a). Mixed-species foraging flocks in winter at Dryandra State Forest, Western Australia. *Corella* **26**(3): 70–73.

Davis, W.E. & Recher, H.F. (2002b). Winter mixed-species foraging flocks in *Acacia* woodlands of Western Australia. *Corella* **26**(3): 74–78.

Davidson, G.W.H. (1992). *Birds of Mount Kinabalu, Borneo*. Natural History Publications (Borneo) & Koktas Sabah Berhad, Kota Kinabalu & Ranau.

Davidson, G.W.H. (1997a). Bird observations in the Muratus Mountains, Kalimantan Selatan. *Kukila* **9**: 114–121.

Davidson, G.W.H. (1997b). Bird observations on Pulau Laut, South Kalimantan. *Kukila* **9**: 122–125.

Davidson, G.W.H. (2000). Notes on the taxonomy of some Bornean birds. *Sarawak Mus. J.* **54**(75) (1999): 289–299.

Davidson, G.W.H. & Chew, Y.F. (1996). *A Photographic Guide to Birds of Borneo*. New Holland, London.

Dawson, D.G. (1964). Heaphy Track survey. *Notornis* **11**(2): 127–129.

Dawson, D.G., Dilks, P.J., Gaze, P.D., McBurney, J.G.R. & Wilson, P.R. (1978). Seasonal differences in bird counts in forests near Reefton, South Island, New Zealand. *Notornis* **25**(4): 257–278.

Dawson, P., Dawson, D., Reynolds, I. & Reynolds, S. (1991). Notes on the birds of Logan Reserve, southeast Queensland, 1967–1990. *Sunbird* **21**(4): 93–111.

Day, T.D. (1995). Bird species composition and abundance in relation to native plants in urban gardens, Hamilton, New Zealand. *Notornis* **42**(3): 175–186.

De Franceschi, P. (1983). Picchio Muraiolo – *Tichodroma muraria*. Pp. 134–136 in: Brichetti, P. ed. (1983). *Atlante degli Uccelli Nidificanti sulle Alpi Italiane*. Vol. 2. Rivista Italiana di Ornitologia **53**. Gruppo Ricerca Avifauna Nidificante, Milan. In Italian.

De Vis, C.W. (1897). Diagnoses of thirty-six new or little-known birds from British New Guinea. *Ibis Ser.* **7**, no. 3: 371–392.

Dean, S. (1990). Composition and seasonality of mixed-species flocks of insectivorous birds. *Notornis* **37**(1): 27–36.

Dean, W.R.J. (1985). Oriole (1). Pp. 411–412 in: Campbell & Lack (1985).

Dean, W.R.J. (2000). *The Birds of Angola: an Annotated Checklist*. British Ornithologists' Union Checklist **18**. British Ornithologists' Union, Tring, UK.

Dean, W.R.J. (2005). *Nomadic Desert Birds*. Springer, London.

Deceuninck, B. & Vansteennwegen, C. (1994). Movements of Long-tailed Tits (*Aegithalos caudatus europaeus* L.) ringed in Belgium. *Gerfaut* **84**: 7–13.

Deditius, K. (1887). Przewalsky's neue Vogelarten Centralasiens. Vortrag des Ehrenmitgliedes der Akademie N.M. Przewalsky in der Sitzung der physikalisch-mathematischen Abtheilung in St. Petersburg vom 1–13. Januar, 1887. *J. Orn.* **35**(3): 274–285. In German.

Deditius, K. (1897). Die Vögel der westchinesischen Provinz Gan-su. Aus dem russischen Originalwerke des Reisenden M. Beresowski und seines Mitarbeiter V. Bianchi. *J. Orn.* **45**(1): 57–75. In German.

Dee, T.J. (1986). *The Endemic Birds of Madagascar*. International Council for Bird Preservation, Cambridge, UK.

Degabriele, R., Tenison, K. & Wood, H. (1979). The avian community associated with *Eucalyptus microcarpa*. *Emu* **79**(2): 87–89.

Degen, A.A., Pinshow, B., Yosef, R., Kam, M. & Nagy, K.A. (1992). Energetics in Northern Shrikes: nestling growth rate and field metabolic rates of adults. *Ecology* **73**: 2273–2283.

DeGeus, D.W. & Best, L.B. (1991). Brown-headed Crowsbirds parasitize Loggerhead Shrikes: first records for family Laniidae. *Wilson Bull.* **103**: 504–506.

Degnan, S.M. (1993a). The perils of single gene trees – mitochondrial versus single-copy nuclear DNA variation in white-eyes (Aves: Zosteropidae). *Mol. Ecol.* **2**: 219–225.

Degnan / Donaghho

- Degnan, S.M. (1993b). Genetic variability and population differentiation inferred from DNA fingerprinting in Silvereyes (Aves: Zosteropidae). *Evolution* **47**: 1105–1117.
- Degnan, S.M. & Moritz, C. (1992). Phylogeography of mitochondrial DNA in two species of white-eyes in Australia. *Auk* **109**: 800–811.
- Degnan, S.M., Robertson, B.C., Clegg, S.M. & Moritz, C.C. (1999). Microsatellite primers for studies of gene flow and mating systems in white-eyes (*Zosterops*). *Mol. Ecol.* **8**: 159–160.
- Dehn, M. & Christiansen, L. (2001). Altitudinal distributions of congeneric montane forest bird species along an elevational gradient in the Rwenzori Mountains National Park, Western Uganda. *Scopus* **22**: 29–35.
- Deignan, H.G. (1938). A new nuthatch from Yunnan. *Smithsonian Misc. Coll.* **97**(9): 1–2.
- Deignan, H.G. (1945). The birds of Northern Thailand. *US Natl. Mus. Bull.* **186**: i–v, 1–616, pls. 1–9.
- Deignan, H.G. (1957). A trio of new birds from tropical Asia. *Proc. Biol. Soc. Washington* **70**: 43–44.
- Deignan, H.G. (1958). The systematic position of the bird genus *Apalopteron*. *Proc. US Natl. Mus.* **108**: 133–136.
- Deignan, H.G. (1960). Remarks on the flowerpecker *Dicaeum agile* (Tickell). *Bull. Brit. Orn. Club* **80**: 142–144.
- Deignan, H.G. (1963). Checklist of the birds of Thailand. *US Natl. Mus. Bull.* **226**: 1–263.
- Deignan, H.G. (1964). Birds of the Arnhem Land Expedition. Pp. 345–426 in: Specht, R.L. ed. (1964). *Records of the American-Australian Scientific Expedition to Arnhem Land*. Part 4. Zoology. Melbourne University Press, Melbourne, Victoria.
- Delacour, J. (1929). On the birds collected during the forth expedition to French Indo-China. Part 2. *Ibis Ser.* **12**, no. 5(3): 403–429, pls. 7–9.
- Delacour, J. (1930). On the birds collected during the fifth expedition to French Indo-China. *Ibis Ser.* **12**, no. 6(4): 564–599, pls. 22–24.
- Delacour, J. (1944). A revision of the family Nectariniidae (sunbirds). *Zoologica* **29**(4): 17–38.
- Delacour, J. (1947). *Birds of Malaysia*. Macmillan, New York.
- Delacour, J. (1966). *Guide des Oiseaux de la Nouvelle-Calédonie et de ses Dépendances*. Éditions Delachaux & Niestlé, Neuchâtel, Suisse. In French.
- Delacour, J. & Greenway, J.C. (1939). Seven new races from Indo-China. *Bull. Brit. Orn. Club* **59**: 130–134.
- Delacour, J. & Greenway, J.C. (1940). VIIe expédition ornithologique en Indochine française. *Oiseau et RFO (Nouv. Sér.)* **10**(1/2): 1–77, [pls. 1–12]. In French.
- Delacour, J. & Jabouille, P. (1927). *Recherches Ornithologiques dans les Provinces du Traminh (Laos) de Thua-Thien et de Kontoum (Annam) et quelques autres Régions de l'Indochine Française*. Société Nationale d'Acclimatation de France, Paris. In French.
- Delacour, J. & Jabouille, P. (1929) On the birds collected during the fourth expedition to French Indo-China. Part 2. *Ibis Ser.* **12**, no. 5(3): 403–429.
- Delacour, J. & Jabouille, P. (1930). Description de trente oiseaux de L'Indochine française. *Oiseau et RFO* **11**(7): 393–408. In French.
- Delacour, J. & Jabouille, P. (1931). *Les Oiseaux de l'Indochine Française*. Vol. 4. Exposition Coloniale Internationale, Paris. In French.
- Delacour, J. & Mayr, E. (1945). Notes on the taxonomy of the birds of the Philippines. *Zoologica* **30**(3): 105–117.
- Delacour, J. & Mayr, E. (1946). *Birds of the Philippines*. Macmillan, New York.
- Delin, H. & Svensson, L. (1988). *Photographic Guide to the Birds of Britain and Europe*. Hamlyn, London.
- Dell, J. (1978). Birds of Kodj Kodjin and Durokoppin Reserves. *Records West. Austr. Mus.* **7** (Suppl.): 55–68.
- Dell, J. (1984). Notes on distribution and seasonal movement of the Striated Pardalote in Western Australia. *West. Austr. Nat.* **16**(1): 15–17.
- Dellinger, R.M. & Haeflner, S. (1991). An overview of captive sunbird maintenance, care and propagation. *Amer. Assoc. Zool. Parks Aquariums Reg. Conf. Proc.* **1991**: 391–398.
- Dementiev, G.P., Gladkov, N.A., Sudilovskaya, A.M., Spangenberg, E.P., Boeme, L.B., Volchanetskii, I.B., Voynstvenskii, M.A., Gorchakovskaya, N.N., Korelov, M.N. & Rustamov, A.K. (1954a). *Ptitsy Sovetskogo Soyuza*. [The Birds of the Soviet Union]. Vol. 5. Sovetskaya Nauka, Moscow. In Russian.
- Dementiev, G.P., Gladkov, N.A., Sudilovskaya, A.M., Spangenberg, E.P., Boeme, L.B., Volchanetskii, I.B., Voynstvenskii, M.A., Gorchakovskaya, N.N., Korelov, M.N. & Rustamov, A.K. (1954b). *Ptitsy Sovetskogo Soyuza*. [The Birds of the Soviet Union]. Vol. 6. Sovetskaya Nauka, Moscow. In Russian.
- Dementiev, G.P., Gladkov, N.A., Sudilovskaya, A.M., Spangenberg, E.P., Boeme, L.B., Volchanetskii, I.B., Voynstvenskii, M.A., Gorchakovskaya, N.N., Korelov, M.N. & Rustamov, A.K. (1968). *Birds of the Soviet Union*. Vol. 6. Israel Program for Scientific Translations, Jerusalem.
- Dementiev, G.P., Gladkov, N.A., Sudilovskaya, A.M., Spangenberg, E.P., Boeme, L.B., Volchanetskii, I.B., Voynstvenskii, M.A., Gorchakovskaya, N.N., Korelov, M.N. & Rustamov, A.K. (1970). *Birds of the Soviet Union*. Vol. 5. Israel Program for Scientific Translations, Jerusalem.
- Demey, R. (1986). Two new species for Ivory Coast. *Malimbus* **8**: 44.
- Demey, R. & Fishpool, L.D.C. (2008). The birds of Mont Sangbé National Park, Ivory Coast. Unpubl.
- Demey, R. & Njabo, K.Y. (2001). A new sight record in Cameroon of the distinctive race *crossensis* of Green-throated Sunbird *Nectarinia rubescens*. *Malimbus* **23**(1): 66–67.
- Desai, J.H. & Malhotra, A.K. (1986). Breeding biology of Bay-backed Shrike (*Lanius vittatus*) at National Zoological Park, New Delhi. *J. Bombay Nat. Hist. Soc.* **83**: 200–202.
- DeSante, D.F. & Pyle, P. (1986). *Distributional Checklist of North American Birds*. Vol. 1. United States and Canada. Artemisia, Lee Vining, California.
- Desfaves, M. & Praz, J.C. (1978). Notes on habitat and distribution of montane birds in southern Iran. *Bonn. Zool. Beitr.* **29**: 18–37.
- Desmet, J.F. (1981). Cas de grégairisme hivernal exceptionnel chez le Tichodrome, *Tichodroma muraria*, en Haute-Savoie. *Nos Oiseaux* **36**(1): 36. In French.
- Dettmann, B. (1995). Use of the Jolly-Seber model to detect variation in survival, population size and recruitment of Bridled Honeyeaters at Paluma, Queensland. *Corella* **19**(2): 61–67.
- Devereux, C.L., Slotow, R. & Perrin, M.R. (2000a). Fiscal Shrike (*Lanius collaris*) foraging behaviour in natural and human-modified habitats. *Ring* **22**(1): 27–35.
- Devereux, C.L., Slotow, R. & Perrin, M.R. (2000b). Territoriality and habitat use of Fiscal Shrikes (*Lanius collaris*) in South Africa. *Ring* **22**(1): 95–104.
- Dharmakumarasinghi, R.S. (1954). *Birds of Saurashtra, India: with Additional Notes on the Birds of Kutch and Gujerat*. Times of India Press, Bombay & Dil Bahar, India.
- Dhondt, A. (1976). Bird observations in Western Samoa. *Notornis* **23**(1): 29–43.
- Diamond, A.W. (1984). Biogeography of Seychelles land birds. Pp. 487–504 in: Stoddart (1984).
- Diamond, A.W. ed. (1987). *Studies of Mascarene Landbirds*. Cambridge University Press, Cambridge, UK.
- Diamond, A.W. & Keith, G.S. (1980). Avifaunas of Kenya forest islands. *Scopus* **4**: 49–55.
- Diamond, J.M. (1967). New subspecies and records of birds from the Karimui Basin, New Guinea. *Amer. Mus. Novit.* **2284**: 1–17.
- Diamond, J.M. (1969). Preliminary results of an ornithological exploration of the North Coastal Range, New Guinea. *Amer. Mus. Novit.* **2362**: 1–57.
- Diamond, J.M. (1970). Ecological consequences of island colonisation by southwest Pacific birds. 1. Types of niche shifts. *Proc. Natl. Acad. Sci. USA* **67**: 529–536.
- Diamond, J.M. (1971). Bird records from West New Britain. *Condor* **73**: 481–483.
- Diamond, J.M. (1972a). *Avifauna of the Eastern Highlands of New Guinea*. Publications of the Nuttall Ornithological Club **12**. Cambridge, Massachusetts. Vii, 438 pp.
- Diamond, J.M. (1972b). Further examples of dual singing by southwest Pacific birds. *Auk* **89**: 180–183.
- Diamond, J.M. (1973). Distributional ecology of New Guinea birds: recent ecological and biogeographical theories can be tested on the bird communities of New Guinea. *Science (Washington, D.C.)* **179**: 759–769.
- Diamond, J.M. (1975a). Distributional ecology and habits of some Bougainville birds (Solomon Islands). *Condor* **77**: 14–23.
- Diamond, J.M. (1975b). Assembly of species communities. Pp. 342–444 in: Cody, M.L. & Diamond, J.M. eds. (1975). *Ecology and Evolution of Communities*. Harvard University Press, Cambridge, Massachusetts.
- Diamond, J.M. (1976). Preliminary results of an ornithological exploration of the islands of Vitiaz and Dampier Straits, Papua New Guinea. *Emu* **76**: 1–7.
- Diamond, J.M. (1982). Mimicry of friarbirds by orioles. *Auk* **99**(2): 187–196.
- Diamond, J.M. (1985). New distributional records and taxa from the outlying mountain ranges of New Guinea. *Emu* **85**: 65–91.
- Diamond, J.M. (1987). Flocks of brown and black New Guinean birds: a bicoloured mixed-species foraging association. *Emu* **87**: 201–211.
- Diamond, J.M. (1991). The avifaunas of Rennell and Bellona Islands. Pp. 127–168 in: Wolff, T. ed. (1991). *The Natural History of Rennell Island*. Vol. 8. Zoology. Danish Science Press, Copenhagen.
- Diamond, J.M. (1998). Geographic variation in vocalisations of the white-eye superspecies *Zosterops (griseotinctus)* in the New Georgia group. *Emu* **98**: 70–74.
- Diamond, J.M. (2002). Dispersal, mimicry, and geographic variation in Northern Melanesian birds. *Pacific Sci.* **56**(1): 1–22.
- Diamond, J.M. & Bishop, K.D. (1994). New records and observations from the Aru Islands, New Guinea region. *Emu* **94**(1): 41–45.
- Diamond, J.M. & LeCroy, M. (1979). Birds of Karkar and Bagabag Islands, New Guinea. *Bull. Amer. Mus. Nat. Hist.* **164**(4): 469–531.
- Diamond, J.M. & Marshall, A.G. (1976). The origin of the New Hebridean avifauna. *Emu* **76**: 187–200.
- Diamond, J.M. & Marshall, A.G. (1977a). Niche shifts in New Hebridean birds. *Emu* **77**: 61–72.
- Diamond, J.M. & Marshall, A.G. (1977b). Distributional ecology of New Hebridean birds: a species kaleidoscope. *J. Anim. Ecol.* **46**(3): 703–727.
- Diamond, J.M. & Terborgh, J.W. (1968). Dual singing by New Guinea birds. *Auk* **85**: 62–82.
- Diamond, J.M., Pimm, S.L., Gilpin, M.E. & LeCroy, M. (1989). Rapid evolution of character displacement in myzomelid honeyeaters. *Amer. Naturalist* **134**(5): 675–708.
- Dicapi, C. & Maestri, F. (2004). Deposizione accertata di Cuculo, *Cuculus canorus*, in un nido di Picchio Muraiolo, *Tichodroma muraria*. *Riv. Ital. Orn.* **74**(2): 154–155. In Italian.
- Dickinson, E.C. (1970). Notes upon a collection of birds from Indochina. *Ibis* **112**(4): 481–487.
- Dickinson, E.C. (2000). Systematic notes on Asian birds. 7. Black-naped Oriole *Oriolus chinensis* Linnaeus, 1766: some old nomenclatural issues explained. *Zool. Verhand. Leiden* **331**: 131–139.
- Dickinson, E.C. ed. (2003). *The Howard and Moore Complete Checklist of the Birds of the World*. 3rd revised and enlarged edition. Christopher Helm, London.
- Dickinson, E.C. (2004). Systematic notes on Asian birds. 42. A preliminary review of the Oriolidae. *Zool. Verhand. Leiden* **350**: 47–63.
- Dickinson, E.C. (2006). Systematic notes on Asian birds. 62. A preliminary review of the Sittidae. *Zool. Meded. Leiden* **80**(5): 225–240.
- Dickinson, E.C. & Chaiyaphun, S. (1973). Notes on Thai birds. 3. Selected records from Northern Thailand. *Nat. Hist. Bull. Siam Soc.* **24**(3/4): 431–438.
- Dickinson, E.C. & Kennedy, R.S. (2000). Systematic notes on Asian birds. 6. A re-examination of the application of the name *Oriolus steerii* Sharpe, 1877. *Zool. Verhand. Leiden* **331**: 127–130.
- Dickinson, E.C., Kennedy, R.S. & Parkes, K.C. (1991). *The Birds of the Philippines. An Annotated Check-list*. British Ornithologists' Union Check-list **12**. British Ornithologists' Union, Tring, UK.
- Dickinson, E.C., Loskot, V.M., Morioka, H., Somadikarta, S. & van den Elzen, R. (2006a). Systematic notes on Asian birds. 50. Types of the Aegithalidae, Remizidae and Paridae. *Zool. Meded. Leiden* **80**(5): 65–111.
- Dickinson, E.C., Loskot, V.M., Morioka, H., Somadikarta, S. & van den Elzen, R. (2006b). Systematic notes on Asian birds. 66. Types of the Sittidae and Certhiidae. *Zool. Meded. Leiden* **80**(5): 287–310.
- Dickson, W. & Scott, B. (1998). Birderime and Golden Orioles. *British Birds* **91**: 450–451.
- Diehl, B. (1972). Izmenienije chemiczeskovo sostava i kalorijnosti tiela ptencov zulana (*Lanius collurio* L.) [Changes in the gross chemical composition and energy content of nestling Red-backed Shrikes (*Lanius collurio*)]. *Bull. Acad. Polon. Sci. (Ser. Sci. Biol.)* **12**: 837–843. In Polish with English summary.
- Diehl, B. (1995). A long-term population study of *Lanius collurio* in a heterogeneous and changing habitat. *Proc. West. Found. Vert. Zool.* **6**(1): 157–162.
- Diehl, B. & Myrcha, A. (1973). Bioenergetics of nestling Red-backed Shrikes (*Lanius collurio*). *Condor* **75**: 259–264.
- van Diek, H., Felix, R., Hornman, M., Meininger, P.L., Willems, F. & Zekhuis, M. (2004). Bird counting in Iran in January 2004. *Dutch Birding* **26**: 287–296.
- Diesselhorst, G. (1968). Beiträge zur Ökologie der Vögel Zentral- und Ost-Nepals. Pp. 1–417 in: Hellmich, W. ed. (1968). *Khumbu Himal*. Vol. 2. Universitätsverlag Wagner, Innsbruck & Munich. In German.
- Dilks, P. (2004). Population status, breeding and ecology of Chatham Island Tui (*Prosthemadera novaeseelandiae chathamensis*). *Notornis* **51**(4): 217–226.
- Dillingham, I.H. (1984). The record of the Angola White-bellied Sunbird *Nectarinia oustaleti* from Kigoma in western Tanzania. *Scopus* **8**: 80.
- Dinesen, L., Lehnberg, T., Rahner, M.C. & Fjeldså, J. (2001). Conservation priorities for the forests of the Udzungwa Mountains, Tanzania, based on primates, duikers and birds. *Biol. Conserv.* **99**: 223–236.
- Dinesen, L., Lehnberg, T., Svendsen, J.O. & Hansen, L.A. (1993). Range extensions and other notes on some restricted-range forest birds from west Kilombero in the Udzungwa Mountains. *Scopus* **17**: 48–59.
- Dingle, H. (2004). The Australo-Papuan bird migration system: another consequence of Wallace's Line. *Emu* **104**(2): 95–108.
- Disney, H.J. de S. & Stokes, A. (1976). Birds in pine and native forests. *Emu* **76**(3): 133–138.
- Dittami, J.P. & Knauer, B. (1986). Seasonal organization of breeding and molting in the Fiscal Shrike (*Lanius collaris*). *J. Orn.* **127**: 79–84.
- Docters van Leeuwen, H. (1929). Beitrag zur Kenntnis der Avifauna der mitteljavanischen Vulkane Soembing und Sindoro. *Trembia* **10**: 439–446. In German.
- Docters van Leeuwen, W.M. (1931). Vogelbesuch an den Blüten von einigen *Erythrina*-Arten auf Java. *Ann. Jardin Bot. Buitenzorg* **42**: 57–95. In German.
- Docters van Leeuwen, W.M. (1933). Biology of plants and animals occurring in the higher parts of Mount Pangrango-Gedeh in West-Java. *Verh. Kon. Nederl. Akad. Wetenschappen Afd. Natuurk. (2 Sec.)* **31**: 1–278.
- Docters van Leeuwen, W.M. (1954). On the biology of some Javanese Loranthaceae and the role birds play in their life-history. *Beaufortia* **4**: 105–207.
- Dodsworth, P.T.L. (1910). Notes relating to the distribution, habits, and nidification of *Certhia himalayana*, Vigors (the Himalayan Tree-creeper), in and around Simla and the adjacent ranges. *J. Bombay Nat. Hist. Soc.* **20**: 463–467.
- Dohmann, M. (1980). Geschlechtsdimorphes Schwanzzeichnungsmuster bei Raubwürgern *Lanius excubitor* sp. Mit verhaltensökologischen und phylogenetischen Anmerkungen. *Ökol. Vögel* **2**(2): 151–175. In German with English summary.
- Dohrn, H. (1866). Synopsis of the birds of Ilha do Principe, with some remarks on their habits, and descriptions of new species. *Proc. Zool. Soc. London* **1866**(2): 324–332.
- Dolgushin, I.A., Korelov, M.N., Kuz'mina, M.A., Gavrilov, Z.I., Kovshar, A.F. & Borodikhin, I.F. (1972). *Ptitsy Kazakhstana*. [The Birds of Kazakhstan]. Vol. 4. Nauka, Kazakhskaya SSR, Alma-Ata, Kazakhstan. In Russian.
- Dolnik, V.R. & Blyumental, T.I. (1967). Autumnal premigratory and migratory periods in the Chaffinch *Fringilla coelebs* and some other temperate zone passerine birds. *Condor* **69**: 435–468.
- Donaghho, W. (1950). Observations of some birds of Guadalcanal and Tulagi. *Condor* **52**: 127–132.

- Donald, P.F. (2007). Adult sex ratios in wild bird populations. *Ibis* **149**(4): 671–692.
- Dorka, V. (1966). Das jahres- und tageszeitliche Zugmuster von Kurz- und Langstreckenziehern nach Beobachtungen auf den Alpenpässen Cou/Bretolet (Wallis). *Orn. Beob.* **63**: 165–223. In German.
- Dorka, V. (1973). Ankunft, Wegzug und Ortstreue des Mauerläufers (*Tichodroma muraria*) in einem brutgebieternen Überwinterungsgebiet. *Anz. Orn. Ges. Bayern* **12**: 95–99. In German.
- Dorka, V. (1976). Beobachtungsnotizen zum Nestbau- und Lautverhalten eines Pyrenäen-Mauerläufers *Tichodroma muraria*. *Anz. Orn. Ges. Bayern* **15**: 202–215. In German.
- Dornak, L.L., Burt, D.B., Coble, D.W. & Conner, R.N. (2004). Relationships between habitat and snag characteristics and the reproductive success of the Brown-headed Nuthatch (*Sitta pusilla*) in eastern Texas. *Southeast. Nat.* **3**(4): 683–694.
- Dorning, H. (1954). Eine wenig bekannte Badeweise des Pirols. *Orn. Beob.* **51**: 228–229. In German.
- Doughty, C., Day, N. & Plant, A. (1999). *Birds of the Solomons, Vanuatu and New Caledonia*. Christopher Helm & A&C Black, London.
- Doumandji, S. & Kisserli, O. (1993). Paramètres écologiques de la Sittelle kabyle *Sitta ledanti*, en chénaie mixte dans le Parc National de Taza (Algérie). *Alauda* **61**(4): 264–265. In French.
- Dove, H.S. (1907). The White-eye. *Emu* **6**: 138–141.
- Dove, H.S. (1911). Nesting of the Red Wattle-bird (*Acanthochaera carunculata*). *Emu* **11**(1): 43–44.
- Dove, H.S. (1916). Some Tasmanian birds' nests. *Emu* **15**(4): 234–243.
- Dove, H.S. (1917). Nesting of the Yellow-throated Honey-eater (*Ptilotis flavigula*) in northern Tasmania. *Emu* **17**(1): 53–55.
- Dove, H.S. (1935). Noisy invaders. *Emu* **34**: 309.
- Dow, D.D. (1970). Communal behaviour of nesting Noisy Miners. *Emu* **70**(3): 131–134.
- Dow, D.D. (1971a). Australia's Noisy Miner. *Fauna* **3**: 24–31.
- Dow, D.D. (1971b). The Spiny-cheeked Honeyeater as a vocal mimic. *Sunbird* **2**(4): 72–74.
- Dow, D.D. (1972). Hybridization in the avian genus *Myzantha*. *Mem. Queensland Mus.* **16**(2): 265–269.
- Dow, D.D. (1973). Sex ratios and oral flange characteristics of selected genera of Australian honeyeaters in museum collections. *Emu* **73**(2): 41–50.
- Dow, D.D. (1975). Displays of the honeyeater *Manorina melanocephala*. *Zeitschr. Tierpsychol.* **38**: 70–96.
- Dow, D.D. (1977a). Indiscriminate interspecific aggression leading to almost sole occupancy of space by a single species of bird. *Emu* **77**(3): 115–121.
- Dow, D.D. (1977b). Reproductive behaviour of the Noisy Miner, a communally breeding honeyeater. *Living Bird* **16**: 163–185.
- Dow, D.D. (1978). Breeding biology and development of the young of *Manorina melanocephala*, a communally breeding honeyeater. *Emu* **78**(4): 207–222.
- Dow, D.D. (1979a). The influence of nests on the social behaviour of males in *Manorina melanocephala*, a communally breeding honeyeater. *Emu* **79**(2): 71–83.
- Dow, D.D. (1979b). Agonistic and spacing behaviour of the Noisy Miner *Manorina melanocephala*, a communally breeding honeyeater. *Ibis* **121**: 423–436.
- Dow, D.D. (1980a). Systems and strategies of communal breeding in Australian birds. Pp. 875–881 in: Frith, H.J. & Calaby, J.H. eds. (1976). *Proceedings of the 16th International Ornithological Congress, 1974, Canberra*. Australian Academy of Science, Canberra.
- Dow, D.D. (1980b). Communally breeding Australian birds with an analysis of distribution and environmental factors. *Emu* **80**(3): 121–140.
- Dow, D.D. & Whitmore, M.J. (1990). Noisy Miners: variations on the theme of communality. Pp. 561–592 in: Stacey, P.B. & Koenig, W.D. eds. (1990). *Cooperative Breeding in Birds: Long-term Studies of Ecology and Behaviour*. Cambridge University Press, Cambridge, UK.
- Dowling, B., Seebeck, J.H. & Lowe, K.W. (1994). *Cats and Wildlife: Results of a Survey of Wildlife Admitted to Shelters and Animal Welfare Agencies in Victoria*. Arthur Rylah Institute for Environmental Research Technical Report 134. Department of Conservation and Natural Resources, East Melbourne, Victoria.
- Downs, C.T. (1997). Sugar digestion efficiencies of Gurney's Sugarbirds, Malachite Sunbirds, and Black Sunbirds. *Physiol. Zool.* **70**(1): 93–99.
- Downs, C.T. (2000). Ingestion patterns and daily energy intake on a sugary diet: the Red Lory *Eos bornea* and the Malachite Sunbird *Nectarinia famosa*. *Ibis* **142**(3): 359–364.
- Downs, C.T. (2004). Some preliminary results of studies of the bill and tongue morphology of Gurney's Sugarbird and some Southern African sunbirds. *Ostrich* **75**(3): 169–175.
- Downs, C.T. & Brown, M. (2002). Nocturnal heterothermy and torpor in the Malachite Sunbird (*Nectarinia famosa*). *Auk* **119**(1): 251–260.
- Downs, C.T. & Perrin, M.R. (1996). Sugar preferences of some Southern African nectarivorous birds. *Ibis* **138**(3): 455–459.
- Downs, T. (1946). Birds on Tinian in the Marianas. *Trans. Kansas Acad. Sci.* **49**: 87–106.
- Dowsett, R.J. (1971). The Lesser Grey Shrike in Africa. *Ostrich* **42**: 259–270.
- Dowsett, R.J. (1977a). Marico Sunbird in Southern Province. *Bull. Zambian Orn. Soc.* **9**(1): 30–31.
- Dowsett, R.J. (1977b). Notes on the distribution of the Red-and-Blue Sunbird. *Bull. Zambian Orn. Soc.* **9**(2): 64–65.
- Dowsett, R.J. (1983). Diurnal weight variation in some montane birds in south central Africa. *Ostrich* **54**: 126–128.
- Dowsett, R.J. (1985). Notes on white-eyes in the Cape Province and south-central Africa. *Safring News* **14**: 13–18.
- Dowsett, R.J. & Dowsett-Lemaire, F. (1984). Breeding and moult cycles of some montane forest birds in south-central Africa. *Rev. Écol. (Terre Vie)* **39**: 89–112.
- Dowsett, R.J. & Dowsett-Lemaire, F. (1993). A contribution to the distribution and taxonomy of Afrotropical and Malagasy birds. *Tauraco Res. Rep.* **5**: 1–389.
- Dowsett, R.J. & Dowsett-Lemaire, F. (2005a). Additions to the avifauna of Mali. *Bull. Afr. Bird Club* **12**: 119–124.
- Dowsett, R.J. & Dowsett-Lemaire, F. (2005b). The avifauna of the dry evergreen forests of Mali. *Malimbus* **27**: 77–111.
- Dowsett, R.J. & Forbes-Watson, A.D. (1993). *Checklist of Birds of the Afrotropical and Malagasy Regions*. Vol. 1. Species limits and distribution. Tauraco Press, Liège, Belgium.
- Dowsett, R.J. & Prigogine, A. (1974). *L'Avifaune des Monts Marungu / The Avifauna of the Marungu Highlands*. Exploration hydrobiologique du Bassin du Lac Bangweolo et du Luapula **19**. Cercle Hydrobiologique de Bruxelles, Brussels. In English with French summary.
- Dowsett, R.J., Aspinwall, D.R. & Dowsett-Lemaire, F. (2008). *The Birds of Zambia*. Tauraco Press & Aves, Liège, Belgium.
- Dowsett, R.J., Dowsett-Lemaire, F. & Bulens, P. (1993). Additions and corrections to the avifauna of Congo. *Malimbus* **15**: 68–80.
- Dowsett-Lemaire, F. (1979). Red-and-blue Sunbird (*Anthreptes anchietae*) in Kasempa district. *Bull. Zambian Orn. Soc.* **11**(1): 33.
- Dowsett-Lemaire, F. (1988). On the breeding behaviour of three montane sunbirds *Nectarinia* spp. in northern Malawi. *Scopus* **11**: 79–86.
- Dowsett-Lemaire, F. (1989a). Food plants and the annual cycle in a montane community of sunbirds (*Nectarinia* spp.) in northern Malawi. *Tauraco Res. Rep.* **1**: 167–185.
- Dowsett-Lemaire, F. (1989b). Ecological and biogeographical aspects of forest bird communities in Malawi. *Scopus* **13**: 1–80.
- Dowsett-Lemaire, F. (1990). Enquête faunistique et floristique dans la forêt de Nyungwe, Rwanda. *Tauraco Res. Rep.* **3**: 31–85. In French.
- Dowsett-Lemaire, F. (1996). Avian frugivore assemblages at three small-fruited tree species in the forests of northern Congo. *Ostrich* **67**: 88–89.
- Dowsett-Lemaire, F. & Dowsett, R.J. (1991). The avifauna of the Kouilou basin in Congo. Pp. 189–239 in: Dowsett, R.J. & Dowsett-Lemaire, F. eds. (1991). *Flora et Faune du Bassin du Kouilou (Congo) et leur Exploitation*. Tauraco Research Report **4**. Tauraco Press, Liège, Belgium. In French and English.
- Dowsett-Lemaire, F. & Dowsett, R.J. (2006). *The Birds of Malawi: an Atlas and Handbook*. Tauraco Press & Aves, Liège, Belgium.
- Dowsett-Lemaire, F. & Dowsett, R.J. (2007). The avifauna of the proposed Kyabobo National Park in eastern Ghana. *Malimbus* **29**: 61–88.
- Doyle, E.E. (1933). Breeding of the White-eye (*Zosterops palpebrosa* Temm.). *J. Bombay Nat. Hist. Soc.* **36**: 504–505.
- Draffan, R.D.W., Garnett, S.T. & Malone, G.J. (1983). Birds of the Torres Strait: an annotated list and biogeographical analysis. *Emu* **83**(4): 207–234.
- Draffen, B. (1977). List of some birds seen at Ogeranang Airstrip 1600 metres Pindiu sub-district 18–19.5.77. *Papua New Guinea Bird Soc. Newsl.* **133**: 9.
- Drahos, N. (2006). *Who Really Killed the Birds of Guam?* (*An Illustrated Monograph of Guam's Birds*). Published privately, Aurora, New York.
- Drake, V.A. (1979). Birds and bird names from Waraber Island, Torres Strait. *Sunbird* **10**: 10–17.
- Dranzoo, C. (1997). The survival of understorey birds in the tropical rainforest of Ziika, Uganda. *Ostrich* **68**: 68–71.
- Drent, R., Both, C., Green, M., Madsen, J. & Piersma, T. (2003). Payoffs and penalties of competing migratory schedules. *Oikos* **103**: 274–292.
- Dresser, H.E. & Morgan, E.D. (1899). On new species of birds obtained in Kan-su by M. Berezovsky. *Ibis Ser. 7, no. 5*: 270–276.
- Driscoll, P.V. (1977). Comparison of bird counts from pine forests and indigenous vegetation. *Austr. Wildl. Res.* **4**(3): 281–288.
- Driskell, A.C. & Christidis, L. (2004). Phylogeny and evolution of the Australo-Papuan honeyeaters (Passeriformes, Meliphagidae). *Mol. Phylog. Evol.* **31**(3): 943–960.
- Driskell, A.C., Christidis, L., Gill, B.J., Boles, W.E., Barker, F.K. & Longmore, N.W. (2007). A new endemic family of New Zealand passerine birds: adding heat to a biodiversity hotspot. *Austr. J. Zool.* **55**(2): 73–78.
- Dubois, P.J., Le Maréchal, P., Oliosio, G. & Yéson, P. (2000). *Inventaire des Oiseaux de France. Avifaune de la France Métropolitaine*. Nathan, Paris. In French.
- Duckworth, J.W. & Hedges, S. (1998). Bird records from Cambodia in 1997, including records of sixteen species new for the country. *Forktail* **14**: 29–36.
- Duckworth, J.W., Davidson, P., Evans, T.D., Round, P.D. & Timmins, R.J. (2002). Bird records from Laos, principally the upper Lao/Thai Mekong and Xiangkhouang province, in 1998–2000. *Forktail* **18**: 11–44.
- Duckworth, J.W., Tizard, R.J., Timmins, R.J., Thewlis, R.M., Robichaud, W.G. & Evans, T.D. (1998). Bird records from Laos, October 1994–August 1995. *Forktail* **13**: 33–68.
- Duckworth, J.W., Wilkinson, R.J., Tizard, R.J., Kelsh, R.N., Irvin, S.A., Evans, M.I. & Orrell, T.D. (1996). Bird records from Similajau National Park, Sarawak. *Forktail* **12**: 159–196.
- Dufourny, H. (2006). First record of Long-tailed Shrike *Lanius schach* for Jordan. *Sandgrouse* **28**(1): 73–76.
- Dunajewski, A. (1934). Die eurasiatischen Formen der Gattung *Sitta* Linn. *Acta Orn. Mus. Zool. Polonici* **1**: 181–251. In German.
- Dunajewski, A. (1939). Gliederung und Verbreitung des Formenkreises *Lanius schach*. *J. Orn.* **87**: 28–53. In German.
- Dunkerley, G.M. (1989). *The Fuscous Honeyeater: Food Resources and the Bird Community*. PhD thesis, University of New England, Armidale, New South Wales.
- Dunn, R. (1989). Wild birds of Melbourne Zoo. *Austr. Bird Watcher* **13**(2): 44–49.
- Dunning, J.B. ed. (1993). *CRC Handbook of Avian Body Masses*. CRC Press, Boca Raton, Florida.
- Dunning, J.B. ed. (2008). *CRC Handbook of Avian Body Masses*. 2nd edition. CRC Press, Boca Raton, London & New York.
- Dupond, C. (1997). Oiseaux. Résultats Scientifiques du Voyage aux Indes Orientales Néerlandaises de L.L. A.A. RR. le Prince et la Princesse Léopold de Belgique. *Mém. Musée Roy. Hist. Nat. Belgique (Sér. Hors)* **54**(1): 1–64, map. In French.
- Dupond, C. (1942). Contribution à l'étude de la faune ornithologique des Îles Philippines et des Indes Orientales Néerlandaises. *Verh. Kon. Natuurhist. Mus. België Ser. 2, no. 23*: 1–153. In French.
- Durand, A.L. (1972). Landbirds over the North Atlantic: unpublished records 1961–65 and thoughts a decade later. *British Birds* **65**: 428–442.
- Durango, S. (1955). Till kändnaden om sommargyllingens, *Oriolus oriolus* L., ekologi. *Särtryck Svensk Faun. Revy* **2**: 47–55. In Swedish.
- Durrant, B. & MacRae, I. eds. (1994). *Birds of Bribie Island, Punicestone Passage and Environs*. Bribie Island Environment Protection Association, Bribie Island, Queensland.
- Durrer, H. & Vögler, W. (1962). Schillerfarben der Nektarvögel (Nectariniidae). *Rev. Suisse Zool.* **69**(4): 801–814, pls. 1–4. In German.
- Dutson, G.C.L. (1993). Rediscovery of the Cebu Flowerpecker *Dicaeum quadricolor* confirmed. *Bull. Oriental Bird Club* **17**: 14.
- Dutson, G.C.L. (1995). The birds of Salayar and the Flores Sea islands. *Kukila* **7**(2): 129–141.
- Dutson, G.C.L. (1997a). Interesting sightings from the Bismarcks. *Papua New Guinea Bird Soc. Newsl.* **291**: 2–3.
- Dutson, G.C.L. (1997b). Red Data bird: Cebu Flowerpecker. *World Birdwatch* **19**(1): 20–21.
- Dutson, G.C.L. (2001). New distributional ranges for Melanesian birds. *Emu* **101**(3): 237–248.
- Dutson, G.C.L. (2007a). Notes on some Meliphagidae from the Bismarck Archipelago and the Solomon Islands. Unpubl.
- Dutson, G.C.L. (2007b). Notes on some Zosteropidae from the Bismarck Archipelago and the Solomon Islands. Unpubl.
- Dutson, G.C.L., Evans, T.D., Brooks, T.M., Asane, D.C., Timmins, R.J. & Toledo, A. (1992). Conservation status of birds on Mindoro, Philippines. *Bird Conserv. Int.* **2**: 303–325.
- Dutson, G.C.L., Magsalay, P.M. & Timmins, R.J. (1993). The rediscovery of the Cebu Flowerpecker *Dicaeum quadricolor*, with notes on other forest birds on Cebu, Philippines. *Bird Conserv. Int.* **3**(3): 235–243.
- Duyck, B.E., McNair, D.B. & Nicholson, C.P. (1991). Dirt-storing behaviour by White-breasted Nuthatches. *Wilson Bull.* **103**: 308–309.
- Dvorak, M., Ranner, A. & Berg, H.M. (1993). *Atlas der Brutvögel Österreichs. Ergebnisse der Brutvogelkartierung 1981–1985 der Österreichischen Gesellschaft für Vogelkunde*. Umweltbundesamt, Vienna. In German.
- Dymond, N. (1988). Birds. Pp. 13–66 in: Anon. (1988). *Eyre Bird Observatory Report 4 1984/1985*. RAOU Report **38**. Royal Australasian Ornithologists Union, Melbourne, Victoria.
- Dymond, N. (1994). A survey of the birds of Nias island, Sumatra. *Kukila* **7**(1): 10–27.
- Dymond, N. (2003). Observation of White-cheeked Tits *Aegithalos leucogenys* in Himachal Pradesh, India and a review of the species's status in the Indian Himalayas. *Bull. Oriental Bird Club* **38**: 69–70.
- Dzhanybaev, A.D. (1991). [Population of White-browed Tit-warbler in the Almaty Nature Reserve]. Pp. 219–222 in: Kovshar, A.F. ed. (1991). *[Rare Species of Birds and Mammals of Kazakhstan (Material to the Second Edition of the Red Data Book of Kazakhstan)]*. Gilim, Alma-Ata. In Russian.
- Eames, J.C., Steinheimer, F.D. & Ros Bansok (2002). A collection of birds from the Cardamom Mountains, Cambodia, including a new subspecies of *Arborophila cambodiana*. *Forktail* **18**: 67–86.
- Earlé, R.A. (1981a). Weights of Southern African sunbirds (Aves: Nectariniidae). *Durban Mus. Novit.* **13**(3): 21–40.
- Earlé, R.A. (1981b). Factors governing avian breeding in *Acacia* savanna Pietermaritzburg, South Africa. 2. Intrinsic factors. *Ostrich* **52**: 74–83.

- Earlé, R.A. (1981c). Factors governing avian breeding in *Acacia* savanna Pietermaritzburg, South Africa. 3. Breeding success, recruitment and clutch size. *Ostrich* **52**: 235–243.
- Earlé, R.A. (1982). Aspects of the breeding biology and ecology of the White-bellied Sunbird *Nectarinia talatala*. *Ostrich* **53**: 65–73.
- Earlé, R.A., Bennett, G.F., du Toit, H., de Swardt, D.H. & Herholdt, J.J. (1991). Regional and seasonal distribution of avian blood parasites from northern South Africa. *South Afr. J. Wildl. Res.* **21**: 47–53.
- East, R. & Williams, G.R. (1984). Island biogeography and the conservation of New Zealand's indigenous forest-dwelling avifauna. *New Zealand J. Ecol.* **7**: 27–35.
- Eastwood, C. (1989a). Notes on the birds of Dorobisoro. Central Province. *Muruk* **4**(1): 18–20.
- Eastwood, C. (1989b). Recent observations July–September 1988. *Muruk* **4**(1): 25–37.
- Eastwood, C. (1995a). Manus – a trip report. *Muruk* **7**(2): 53–55.
- Eastwood, C. (1995b). Birds of Wild Dog, East New Britain. *Muruk* **7**(3): 104–106.
- Eastwood, C. (1996a). A trip to Irian Jaya. *Muruk* **8**(1): 12–23.
- Eastwood, C. (1996b). Kavieng, Djaul Island & Mussau Island, New Ireland – a trip report. *Muruk* **8**(1): 28–32.
- Eastwood, C. (1997). Trip reports: 1. West New Britain 12–15 December 1997. *Papua New Guinea Bird Soc. Newslett.* **291**: 4–7.
- Eastwood, C. & Gregory, P. (1995). Interesting sightings during 1993 & 1994. *Muruk* **7**(3): 128–142.
- Eastwood, C., Salvadori, T. & Richardson, I. (1997). Kimbe, New Britain: 27th March–1st April. *Papua New Guinea Bird Soc. Newslett.* **290**: 4–6.
- Ebbinge, B.S. & Spaans, B.N. (1995). The importance of body reserves accumulated in spring staging areas in the temperate zone for breeding in Dark-bellied Brent Geese *Branta b. bernicla* in the high arctic. *J. Avian Biol.* **26**: 105–113.
- Eccles, S.D. (1985). Reichenbach's Sunbird *Nectarinia reichenbachii* new to Ivory Coast. *Malimbus* **7**: 140.
- Eccles, S.D. (1988). The birds of São Tomé – record of a visit, April 1987 with notes on the rediscovery of Bocage's Longbill. *Malimbus* **10**(2): 207–217.
- Eck, S. (1971). Ein Würger-Bastard im Elbtal bei Pirna. *Zool. Abh. Staatl. Mus. Tierk. Dresden* **32**: 1–4. In German.
- Eck, S. (1974). *Katalog der ornithologischen Sammlung des Staatlichen Museums für Tierkunde Dresden*. Zool. Abh. Mus. Tierk. 33. Dresden, Germany.
- Eck, S. (1975). Unvollständige Handschwingenmauser eines jungen *Lanius souzae*. *Beitr. Vogelkd.* **21**(6): 479–480. In German.
- Eck, S. (1976). Die Vögel der Banggai-Inseln, insbesondere Pelengs (Aves). *Zool. Abh. Staatl. Mus. Tierk. Dresden* **34**(5): 53–100. In German.
- Eck, S. (1990). Die systematische Stellung von *Lanius excubitor meridionalis* Temminck, 1820. *Zool. Abh. Staatl. Mus. Tierk. Dresden* **46**(2): 57–61. In German with English summary.
- Eck, S. (1995). Ergänzungen zu Morphologie und Systematik der *Speirops*-Arten (Zosteropidae). *Mitt. Zool. Mus. Berlin* **71** (Suppl. *Ann. Orn.* **19**): 101–107. In German with English summary.
- Eck, S. & Martens, J. (2006). Systematic notes on Asian birds. 49. A preliminary review of the Aegithalidae, Remizidae and Paridae. *Zool. Meded. Leiden* **80**(5): 1–63.
- Eddinger, C.R. (1967). Feeding helpers among immature white-eyes. *Condor* **69**: 530–531.
- Eddinger, C.R. (1970). The white-eye as an interspecific feeding helper. *Condor* **72**: 240.
- Eddy, R.J. (1961). Twenty years of Painted Honeyeaters. *Austr. Bird Watcher* **1**(5): 122–128.
- Edgar, A.T. (1933). Notes on the nidification of some Perak birds. *Bull. Raffles Mus. Singapore* **8**: 121–162.
- Edgar, A.T. (1947). Notes on Malayan birds. *Malay. Nat. J.* **2**: 1–19.
- Edgar, A.T. (1978). Field study course, Bay of Plenty, January 1978. *Notornis* **25**(4): 279–289.
- Edgington, J.M. & Edgington, M.A. (1983). Habitat partitioning and antagonistic behaviour among the birds of a West African scrub and plantation plot. *Ibis* **125**: 74–89.
- Edwards, S.J. (1988). Unusual behaviour of Scarlet-chested Sunbird. *Honeyguide* **34**: 132.
- van Eerden, M.R., Zylstra, M. & Loonen, M.J.J.E. (1991). Individual patterns of staging during autumn migration in relation to body condition in Greylag Geese *Anser anser* in the Netherlands. *Ardea* **79**: 261–264.
- Egan, K.H. (1997). Seasonal changes in the pollen sampled from nectarivorous birds visiting an open forest at Menai, New South Wales. *Corella* **21**(3): 83–87.
- Egan, K.H., Farrell, J.R. & Pepper-Edwards, D.L. (1997). Historical and seasonal changes in the community of forest birds at Longneck Lagoon Nature Reserve, Scheyville, New South Wales. *Corella* **21**(1): 1–16.
- Eguchi, K. (1993). Temporal changes in food resources, parental feeding and breeding success of Heron Island Silvereyes, *Zosterops lateralis chlorocephala*. *Ecol. Res.* **8**: 319–327.
- Eguchi, K., Yamagishi, S. & Randrianasolo, V. (1993). The composition and foraging behaviour of mixed-species flocks of forest-living birds in Madagascar. *Ibis* **135**(1): 91–96.
- Eisentraut, M. (1963). *Die Wirbeltiere des Kamerungebietes*. Paul Parey, Hamburg & Berlin. In German.
- Eisentraut, M. (1965). Über einige Vogelrassen von der Insel Fernando Poo. *J. Orn.* **106**(2): 218–219. In German.
- Eisentraut, M. (1968). Beitrag zur Vogelfauna von Fernando Poo und Westkamerun. *Bonn. Zool. Beitr.* **19**: 49–68. In German.
- Eisentraut, M. (1973). *Die Wirbeltierfauna von Fernando Po und Westkamerun*. Bonner Zoologische Monographien 3. Museum Alexander Koenig, Bonn. In German.
- Eisikowitch, D. & Nahari, N. (1982). Discrimination of *Malvaviscus arborus* flowers by the sunbird *Nectarinia osea*. *Acta Bot. Neerl.* **31**: 55–58.
- Ekstrom, J.M.M., Jones, J.P.G., Willis, J., Tobias, J., Dutson, G.C.L. & Barré, N. (2002). New information on the distribution, status and conservation of terrestrial bird species in Grande Terre, New Caledonia. *Emu* **102**: 197–207.
- Ekstrom, J.M.M., Tobias, J. & Robinson, J. (1998). Forests at the edge of Lore Lindu National Park, Central Sulawesi. *Bull. Oriental Bird Club* **28**: 37–39.
- Elgood, J.H. (1979). Weights and perching habits of birds at Port Moresby, Papua, New Guinea. *Bull. Brit. Orn. Club* **94**: 135–138.
- Elgood, J.H. (1982). *The Birds of Nigeria*. British Ornithologists' Union Check-list 4. British Ornithologists' Union, Tring, UK.
- Elgood, J.H., Fry, C.H. & Dowsett, R.J. (1973). African migrants in Nigeria. *Ibis* **115**: 375–411.
- Elgood, J.H., Heigham, J.B., Moore, A.M., Nason, A.M., Sharland, R.E. & Skinner, N.J. (1994). *The Birds of Nigeria: an Annotated Check-list*. 2nd edition. British Ornithologists' Union Check-list 4. British Ornithologists' Union, Tring, UK.
- Elias, D. (1970). Wallcreeper in Cyprus. *British Birds* **63**: 393–394.
- Elias, G. & Ferreira, L.F. (1994). Nidificação do Chapim-de-faces-pretas *Remiz pendulinus* em Portugal. *Airo* **5**(1): 27–29. In Portuguese with English summary.
- Ellenberg, H. (1986). Warum gehen Neuntöter (*Lanius collurio*) in Mitteleuropa im Bestand zurück? Überlegungen zu den Auswirkungen von Pestiziden sowie zu den Landschaftsveränderungen im Winterquartier und im Brutgebiet. *Corax* **12**: 34–46. In German.
- Ellenberger, P.M. (1951). Notes on some birds of the Ndanga (Zaka) district of Southern Rhodesia. *Ostrich* **22**: 17–24.
- Elliott, C.C.H., Watter, M., Underhill, L.G., Pringle, J.S. & Dick, W.J.A. (1976). The migration system of the Curlew Sandpiper *Calidris ferruginea* in Africa. *Ostrich* **47**: 191–213.
- Elliott, M.W. (1916). Bird life at Dumbleyung, W.A. *Emu* **15**(3): 179–182.
- van der Elst, D., Lafontaine, R.M. & Lafontaine, D. (1990). Rapport de la commission d'homologation année 1989. *Aves* **27**: 83–94. In French.
- Elsworth, S. (1997). Observations of Black-chinned Honeyeaters breeding in the Hackham area during July/August 1994. *South Austr. Orn.* **32**: 170.
- Ely, C.A. (1971). Pelagic observations of the Japanese White-eye in the central Pacific. *Condor* **73**: 122–123.
- van den Elzen, R. (1975). Zur Kenntnis der Avifauna Kameruns. *Bonn. Zool. Beitr.* **26**: 49–75. In German.
- van den Elzen, R. & van den Elzen, P. (1983). Der Kap-Honigfresser (*Promerops cafer* Linné, 1758). *Trochilus* **44**(4): 101–105. In German.
- Emison, W.B. & Porter, J.W. (1978). Summer surveys of birds in the Mt Cobberas–Snowy River area of Victoria, Australia. *Emu* **78**(3): 126–136.
- Emison, W.B., Beardsell, C.M., Norman, F.I., Loyn, R.H. & Bennett, S.C. (1987). *Atlas of Victorian Birds*. Department Conservation Forests and Lands (Victoria) and Royal Australasian Ornithologists Union, Melbourne, Victoria.
- Emlen, S.T. (1967a). Migratory orientation in the Indigo Bunting, *Passerina cyanea*. Part 1: evidence for use of celestial cues. *Auk* **84**: 309–342.
- Emlen, S.T. (1967b). Migratory orientation in the Indigo Bunting, *Passerina cyanea*. Part 2: mechanism of celestial orientation. *Auk* **84**: 463–489.
- Emlen, S.T. (1975). Migration: orientation and navigation. Pp. 129–219 in: Farner, D.S., King, J.R. & Parkes, K.C. eds. (1975). *Avian Biology*. Vol. 5. Academic Press, London.
- Enemar, A. & Nilsson, J.A. (2008). Early onset of reduced reproductive performance with age in the Treecreeper (*Certhia familiaris*). *J. Orn.* **149**(1): 117–121.
- Enemar, A. (1997). The egg size variation of the Treecreeper *Certhia familiaris* in south-western Sweden. *Ornis Svecica* **7**(3/4): 107–120. In English with Swedish summary.
- Engbring, J. (1983). Avifauna of the Southwest Islands of Palau. *Atoll Res. Bull.* **267**: 1–22.
- Engbring, J. (1988). *Field Guide to the Birds of Palau*. Conservation Office, Republic of Palau, Koror, Palau.
- Engbring, J. (1992). *A 1991 Survey of the Forest Birds of the Republic of Palau*. United States Fish and Wildlife Service, Honolulu, Hawaii.
- Engbring, J. & Ramsey, F.L. (1984). *Distribution and Abundance of the Forest Birds of Guam: Results of a 1981 Survey*. United States Fish and Wildlife Service, Washington, D.C. & Honolulu.
- Engbring, J. & Ramsey, F.L. (1989). *A 1986 Survey of the Forest Birds of American Samoa*. United States Fish and Wildlife Service, Honolulu, Hawaii.
- Engbring, J., Ramsey, F.L. & Wildman, V.J. (1986). *Micronesian Forest Bird Survey, 1982: Saipan, Tinian, Aguijan, and Rota*. United States Fish and Wildlife Service, Washington, D.C. & Honolulu.
- Engbring, J., Ramsey, F.L. & Wildman, V.J. (1990). *Micronesian Forest Bird Surveys, the Federated States: Pohnpei, Kosrae, Chuuk, and Yap*. United States Fish and Wildlife Service, Washington, D.C. & Honolulu.
- Engelbach, P. (1932). Les oiseaux du Laos méridional. *Oiseau et RFO (Nouv. Sér.)* **2**: 439–498. In French.
- England, D. (1971a). Breeding the Great Grey Shrike (*Lanius excubitor*). *Avicult. Mag.* **77**(1): 1–9.
- England, D. (1971b). Breeding the Rufous-backed Shrike (*Lanius schach*). *Avicult. Mag.* **77**(6): 219–223.
- Enoksson, B. (1990a). Time budgets of Nuthatches *Sitta europaea* with supplementary food. *Ibis* **132**(4): 575–583.
- Enoksson, B. (1990b). Autumn territories and population regulation in the Nuthatch *Sitta europaea*: an experimental study. *J. Anim. Ecol.* **59**: 1047–1062.
- Enoksson, B. & Nilsson, S.G. (1983). Territory size and population density in relation to food supply in the Nuthatch *Sitta europaea* (Aves). *J. Anim. Ecol.* **52**: 927–935.
- Er, K.B.H. (1997). Effects of eucalypt dieback on bird species diversity in remnants of native woodlands. *Corella* **21**(4): 101–111.
- Er, K.B.H. & Tidemann, C.R. (1996). Importance of yellow box-blakely's red gum woodland remnants in maintaining bird species diversity: inferences from seasonal data. *Corella* **20**(4): 117–128.
- Er, K.B.H., Wong, T.H. & Tidemann, C.R. (1998). An analysis of the occurrence of terrestrial bird species in the lowland yellow box-blakely's red gum woodland remnants of the Australian Capital Territory. *Austr. Bird Watcher* **17**(8): 370–382.
- Érard, C. (1979). What in reality is *Anthreptes pujoli* Berlioz? *Bull. Brit. Orn. Club* **99**(4): 142–143.
- Érard, C. & Étiéopcar, R.D. (1970). Contribution à l'étude des oiseaux de l'Iran. (Résultats de la Mission en Iran 1967). *Mém. Mus. Natl. Hist. Nat. Sér. A* **66**: 1–146, pls. 1–6. In French.
- Erdman, T.C. (1970). Current Migrant Shrike status in Wisconsin. *Passenger Pigeon* **32**: 144–150.
- Erfteimeijer, P., Allen, G., Zuwendra & Kosamah, S. (1991). Birds of the Bintuni Bay region, Irian Jaya. *Kukila* **5**(2): 85–98.
- Ericson, P.G.P., Christidis, L., Cooper, A., Irestedt, M., Jackson, J., Johansson, U.S. & Norman, J.A. (2002). A Gondwanan origin of passerine birds supported by DNA sequences of the endemic New Zealand wrens. *Proc. Royal Soc. London (Ser. B Biol. Sci.)* **269**: 235–241.
- Ericson, P.G.P., Christidis, L., Irestedt, M. & Norman, J.A. (2002). Systematic affinities of the lyrebirds (Passeriformes: *Menura*), with a novel classification of the major groups of passerine birds. *Mol. Phylog. Evol.* **25**: 53–62.
- Ericson, P.G.P., Johansson, U.S. & Parsons, T.J. (2000). Major divisions in oscines revealed by insertions in the nuclear gene c-myc: a novel gene in avian phylogenetics. *Auk* **117**(4): 1069–1078.
- Eriksen, H., Eriksen, J., Al-Saadi, S. & Sargeant, D.E. (2001). The discovery of Oriental White-eye *Zosterops palpebrosa* in Arabia. *Sandgrouse* **23**: 130–133.
- Eriksen, J. ed. (1998). *Breeding Bird Atlas of Oman*. Oman Bird Records Committee, Muscat, Oman.
- Eriksen, J., Sargeant, D.E. & Victor, R. (2003). *Oman Bird List*. 6th edition. Centre for Environmental Studies and Research & Sultan Qaboos University, Muscat, Oman.
- Erlanger, C. von (1901). Einige neue Arten aus Nordostafrika. *Orn. Monatsber.* **9**: 181–183. In German.
- Erokhov, S.N. & Belyalov, O.V. (2004). [Counts of wintering birds at lakes and reservoirs in southern Kazakhstan in the winter of 2003]. *Kazakh. Orn. Byull.* **2003**: 109–111. In Russian.
- Erttzo, J. (1995). A small collection of birds from the Philippines, with notes on body mass, distribution, and habitat. *Nemouria* **40**: 12.
- Ervin, S. (1974). *Flock Integrity, Pair Maintenance, and the Occurrence of Supernumerary Birds in the Bushtit* *Psaltriparus minimus*. PhD thesis, University of California at Santa Barbara, Santa Barbara, California.
- Ervin, S. (1975). Iris coloration in young Bushtits. *Condor* **77**(1): 90–91.
- Ervin, S. (1977a). Flock size, composition, and behaviour in a population of Bushtits. *Bird-Banding* **48**(3): 97–109.
- Ervin, S. (1977b). Nest appropriation and mate replacement in the Bushtit. *Auk* **94**(3): 598–599.
- Ervin, S. (1978). Bushtit helpers: accident or altruism. *Bird Behaviour* **1**(3): 93–97.
- Esely, J.D. & Bollinger, E.K. (2003). Patterns of impaling in a migratory population of the Loggerhead Shrike. *Prairie Nat.* **35**: 1–8.
- Estoup, A. & Clegg, S.M. (2003). Bayesian inferences on the recent island colonization history by the bird *Zosterops lateralis lateralis*. *Mol. Ecol.* **12**(3): 657–674.
- Étiéopcar, R.D. & Hùe, F. (1964). *Les Oiseaux du Nord de l'Afrique de la Mer Rouge aux Canaries*. Éditions N. Boubee & Cie, Paris. In French.
- Étiéopcar, R.D. & Hùe, F. (1983). *Les Oiseaux de Chine, de Mongolie et de Corée*. Passereaux. Société Nouvelle des Éditions Boubee, Paris. In French.
- Etterson, M.A. (2003). Conspecific attraction in Loggerhead Shrikes: implications for habitat conservation and reintroduction. *Biol. Conserv.* **114**: 199–205.
- Evans, D.J. (1992). A Nile Valley Sunbird nest in Egypt. *Bull. Orn. Soc. Middle East* **28**: 24.
- Evans, D.J. & Dijkstra, K.D. (1993). The birds of Gezira, Egypt. *Bull. Orn. Soc. Middle East* **30**: 20–25.
- Evans, M.I. ed. (1994). *Important Bird Areas of the Middle East*. BirdLife Conservation Series 2. BirdLife International, Cambridge, UK.
- Evans, M.R. (1991). The size of adornments of male Scarlet-tufted Malachite Sunbirds varies with environment conditions as predicted by handicap theories. *Anim. Behav.* **42**: 797–804.
- Evans, M.R. (1996). Nectar and flower production of *Lobelia telekii* inflorescences, and their influence on territorial behaviour of the Scarlet-tufted Malachite Sunbird (*Nectarinia johnstoni*). *Biol. J. Linn. Soc.* **57**: 89–105.

- Evans, M.R. (2003). Survival of male Scarlet-tufted Malachite Sunbirds (*Nectarinia johnstoni*) on Mount Kenya and the influence of ornamentation. *Biol. J. Linn. Soc.* **80**(1): 125–133.
- Evans, M.R. & Barnard, P. (1995). Variable sexual ornaments in Scarlet-tufted Malachite Sunbirds (*Nectarinia johnstoni*) on Mount Kenya. *Biol. J. Linn. Soc.* **54**: 371–381.
- Evans, M.R. & Hatchwell, B.J. (1992a). An experimental study of male adornment in the Scarlet-tufted Malachite Sunbird. 1. The role of pectoral tufts in territorial defence. *Behav. Ecol. Sociobiol.* **29**: 413–419.
- Evans, M.R. & Hatchwell, B.J. (1992b). An experimental study of male adornment in the Scarlet-tufted Malachite Sunbird. 2. The role of the elongated tail in mate choice and experimental evidence for a handicap. *Behav. Ecol. Sociobiol.* **29**: 421–427.
- Evans, M.R. & Thomas, A.L.R. (1992). The aerodynamic and mechanical effects of elongated tails in the Scarlet-tufted Malachite Sunbird: measuring the cost of a handicap. *Anim. Behav.* **43**(2): 337–347.
- Evans, P.R. (1966). Migration and orientation of passerine night migrants in northeast England. *J. Zool., London* **150**: 319–369.
- Evans, R., Catterall, C.P. & Brumm, G.V. (1997). The habitat value of extremely small bushland remnants to birds in Brisbane. *Sunbird* **27**: 38–44.
- Evans, S.M., Fletcher, F.J.C., Loader, P.J. & Rooksby, F.G. (1992). Habitat exploitation by landbirds in the changing Western Samoan environment. *Bird Conserv. Int.* **2**: 123–129.
- Evans, T.D. (1996). Note on the field identification of Uluguru Violet-backed Sunbird *Anthreptes neglectus*. *Bull. Afr. Bird Club* **3**(1): 38–39.
- Evans, T.D. (1997). Records of birds from the forests of the East Usambara lowlands, Tanzania, August 1994–February 1995. *Scopus* **19**(2): 92–108.
- Evans, T.D. (2001). Ornithological records from Savannakhet province, Lao PDR, January–July 1997. *Forktail* **17**: 21–28.
- Evans, T.D. & Anderson, G.Q.A. (1993a). Results of an ornithological survey in the Ukaguru and East Usambara Mountains, Tanzania. *Scopus* **17**: 40–47.
- Evans, T.D. & Anderson, G.Q.A. (1993b). Notes on Moreau's Sunbird *Nectarinia moreaui*. *Scopus* **17**: 63–64.
- Evans, T.D. & Timmins, R.J. (1998). Records of birds from Laos during January–July 1994. *Forktail* **13**: 69–96.
- Evans, T.D., Dutson, G.C.L. & Brooks, T.M. (1993). *Cambridge Philippines Rainforest Project 1991: Final Report*. Study Report **54**. BirdLife International, Cambridge, UK.
- Evans, T.D., Towill, H.C., Timmins, R.J., Thewlis, R.M., Stones, A.J., Robichaud, W.G. & Barzen, J. (2000). Ornithological records from the lowlands of southern Laos during December 1995–September 1996, including areas on the Thai and Cambodian borders. *Forktail* **16**: 29–52.
- Eve, R. & Guigüe, A.M. (1996). *Birds of Thailand*. Times Editions, Singapore.
- Ewen, J.G., Clarke, R.H., Moysey, E., Boulton, R., Crozier, R.H. & Clarke, M.F. (2001). Primary sex ratio bias in an endangered cooperatively breeding bird, the Black-eared Miner, and its implications for conservation. *Biol. Conserv.* **101**: 137–145.
- Ewen, J.G., Crozier, R.H., Cassey, P., Ward-Smith, T., Painter, J.N., Robertson, R.J., Jones, D.A. & Clarke, M.F. (2003). Facultative control of offspring sex in the cooperatively breeding Bell Miner, *Manorina melanophrys*. *Behavioural Ecology* **14**(2): 157–164.
- Ewen, J.G., Flux, I. & Ericson, P.G.P. (2006). Systematic affinities of two enigmatic New Zealand passerines of high conservation priority, the Hihi or Stitchbird *Notiomystis cincta* and the Kokako *Callaeas cinerea*. *Mol. Phylogen. Evol.* **40**(1): 281–284.
- Eyckerman, R. & Cuvelier, D. (1982). The moult of some bird species on Mount Cameroon. *Malimbus* **4**(1): 1–4.
- Eyster, M.B. (1954). Quantitative measurement of the influence of photoperiod, temperature and season on the activity of captive songbirds. *Ecol. Monogr.* **24**: 1–28.
- Falla, R.A., Sibson, R.B. & Turbott, E.G. (1981). *The New Guide to the Birds of New Zealand and Outlying Islands*. Revised edition. Collins, Auckland & London.
- Fancy, S.G. & Sneltinger, T.J. (1996). *Potential Reasons for the Decline of the Bridled White-eye Population on Rota, Mariana Islands*. United States Fish and Wildlife Service, Honolulu, Hawaii.
- Fancy, S.G., Craig, R.J. & Kessler, C.W. (1999). Forest bird and fruit bat populations on Sarigan, Mariana Islands. *Micronesia* **31**(2): 247–254.
- Farmer, D., Catterall, C.P. & Piper, S.D. (2004). Abundance patterns across months and locations, and their differences between migrant and resident landbirds in lowland subtropical eucalypt forest. *Emu* **104**(3): 283–296.
- Farner, D.S. & Follett, B.K. (1966). Light and other environmental factors affecting avian reproduction. *J. Anim. Sci. (USA)* **25**: 90–105.
- Farquhar, M.R., Lorenz, B., Rayner, J.L. & Craig, A.J.F.K. (1996). Feather ultrastructure and skeletal morphology as taxonomic characters in African sunbirds (Nectariniidae) and sugarbirds (Promeropidae). *J. Afr. Zool.* **110**: 321–331.
- Farrell, J.R. & Hardy, J.W. (1993). Survival, seasonal abundance, sex ratio and diet of Eastern Spinebills *Acanthorhynchus tenuirostris* in the Blue Mountains, New South Wales. *Corella* **17**(2): 33–40.
- Farrow, D. (2008). Cambodia 16 February–1 March 2008 tour report. URL: <http://www.birdquest.co.uk/pdfs/report/CAMBODIA%20REP%2008.pdf> (download 18 April 2008).
- Favaloro, N.J. (1966). Honeyeaters of the Sunset Country. *Proc. Royal Soc. Victoria* **79**: 621–626.
- Feare, C.J. (1975). Observations on the Seychelles White-eye *Zosterops modesta*. *Auk* **92**: 615–618.
- Feearney, N. (1956). Bird notes from Sydney. *Emu* **56**(3): 194–196.
- Feehan, J. (1985). Explosive flower opening in ornithophily: a study of pollination mechanisms in some Central African Loranthaceae. *Bot. J. Linn. Soc.* **90**: 129–144.
- Fegley, S.M. (1988). Feeding behaviour of Bellbirds (*Anthornis melanura*) in a native and an introduced forest. *Notornis* **35**(3): 244–245.
- Fegley, S.M. & McLean, I.G. (1987). Habitat relationships of forest birds in Hanmer Forest Park. *Mauri Ora* **14**: 15–23.
- Feige, K.D. (1986). *Der Pirol Oriolus oriolus*. Die Neue Brehm-Bücherei **578**. A. Ziemsen, Wittenberg Lutherstadt, Germany. In German.
- Feige, K.D. (1995). *Der Pirol Oriolus oriolus*. Westarp Wissenschaften, Magdeburg, Germany. In German.
- Feiler, A. & Nadler, T. (1992). Über evolutive Beziehungen zwischen den Brillenvögeln der Gattung *Speirops* (Aves, Zosteropidae) von West-Kamerun und den Inseln im Golf von Guinea. *Bonn. Zool. Beitr.* **43**: 423–432. In German.
- Feldheim, K.A., McFarlane, M.L. & Bowie, R.C.K. (2006). Isolation of highly polymorphic autosomal microsatellite loci and a sex-linked locus from sugarbirds. *Mol. Ecol. Notes* **6**(4): 1019–1021.
- Ferguson-Lees, I.J. (1965). Studies of less familiar birds 137 – Woodchat Shrike. *British Birds* **58**: 461–464.
- Ferguson-Lees, I.J. (1985). Treecreeper (1). Pp. 607–608 in: Campbell & Lack (1985).
- Fesenko, G.V. & Bokotey, A.A. (2002). [*Birds of Ukraine: a Field Guide*]. Ukrainian Society for the Protection of Birds, Kiev. In Ukrainian.
- du Feu, C. (2002). Eurasian Treecreeper (Treecreeper) *Certhia familiaris*. Pp. 609–611 in: Wernham, C., Toms, M., Marchant, J., Clark, J., Siriwardena, G. & Baillie, S. eds. (2002). *The Migration Atlas – Movements of the Birds of Britain and Ireland*. T&A Poyser, London.
- Fiebig, J. (1992). Beobachtungen am Chinesenkleiber (*Sitta villosa* Verreaux) in Nordkorea und Nordostchina. *Mitt. Zool. Mus. Berlin* **68** (Suppl. Ann. Orn. **16**): 135–155. In German with English summary.
- Fiebig, J. (1995). Dreijährige ornithologische Studien in Nordkorea. Nachtrag zum 1. Teil (Non-Passerres) und 2. Teil Passeriformes. *Mitt. Zool. Mus. Berlin* **71** (Suppl. Ann. Orn. **19**): 43–99. In German with English summary.
- Field, F. (1922). Notes on the nesting of the Himalayan Tree-creeper (*Certhia himalayana*). *J. Bombay Nat. Hist. Soc.* **28**: 1138–1139.
- Field, G.D. (1971). Juvenile plumage of the Upper Guinea race of the Collared Sunbird *Anthreptes collaris subcollaris*. *Ibis* **113**: 366–367.
- Fielding, P. (1977). Birds of the far west coast of Tasmania. *Tasmanian Nat.* **44** (1976): 12–16.
- Fielding, P. (1979). Avifauna of Tasmanian orchards (Part 2). *Tasmanian Nat.* **57**: 1–7.
- Filardi, C.E. & Moyle, R.G. (2005). Single origin of a Pan-Pacific bird group and upstream colonization of Australasia. *Nature (London)* **438**: 216–219.
- Filewood, L.W.C. (1969). Other observations. [Woitape–Avios–Murray Pass area, Mt. Albert Edward]. *Papua New Guinea Bird Soc. Newsl.* **42**: 2–4.
- Filewood, L.W.C. (1970). Observations (Bougainville). *Papua New Guinea Bird Soc. Newsl.* **54**: 3.
- Filewood, L.W.C., Layton, W.A. & Dyson, W.D. (1972). List of birds noted at Tapini 30/1–1/2 1972. *Papua New Guinea Bird Soc. Newsl.* **75**: 2–3.
- Finch, B.W. (1978). Observations and bird notes – in the Central Province. *Papua New Guinea Bird Soc. Newsl.* **141**: 7.
- Finch, B.W. (1979). An ornithological survey in the Efogi area. *Papua New Guinea Bird Soc. Newsl.* **160**: 2–14.
- Finch, B.W. (1980a). A supplementary visit to Efogi: 12th–13th January 1980. *Papua New Guinea Bird Soc. Newsl.* **163/164**: 23–29.
- Finch, B.W. (1980b). Annotated check list of the birds of the area along the Hiritano Highway, Kuriva as far as Hisiu. *Papua New Guinea Bird Soc. Newsl.* **169/170**: 6–46.
- Finch, B.W. (1981a). Efogi revisited: 14th–17th May 1981. *Papua New Guinea Bird Soc. Newsl.* **179/180**: 25–36.
- Finch, B.W. (1981b). Mountain White-eyes *Zosterops novaeguineae* associating with Black-fronted White-eyes *Zosterops atrifrons* at Owner's Corner, Central Province. *Papua New Guinea Bird Soc. Newsl.* **181/182**: 23.
- Finch, B.W. (1981c). Some observations in the Madang province. *Papua New Guinea Bird Soc. Newsl.* **183/184**: 7–29.
- Finch, B.W. (1982a). Sight record of the Obscure Berrypecker *Melanocharis arfakianus* [sic] near Ower's Corner, Central Province. *Papua New Guinea Bird Soc. Newsl.* **187/188**: 11–12.
- Finch, B.W. (1982b). Christmas at Bensbach. *Papua New Guinea Bird Soc. Newsl.* **189/190**: 20–43.
- Finch, B.W. (1983). Birds of the Vanapa-Veimaui Kanosia-Cape Suckling regions. Part 3. *Papua New Guinea Bird Soc. Newsl.* **199/200**: 17–41.
- Finch, B.W. (1985). Noteworthy observations in Papua New Guinea and Solomons. *Papua New Guinea Bird Soc. Newsl.* **215**: 7–15.
- Finch, B.W. & McKean, J.L. (1987). Some notes on the birds of the Bismarcks. *Muruk* **2**(1): 3–27.
- Finsch, O. (1880). Beobachtungen über die Vögel der Insel Ponapé (Carolinen). *J. Orn.* **28**: 283–296. In German.
- Finsch, O. (1898). Systematische Uebersicht der Vögel der Südwest-Inseln. *Notes Mus. Leyden* **12**: 225–309, pls. 3–5. In German.
- Finsch, O. (1901). Zosteropidae. Issue **15** in: Schulze, F.E. ed. (1901). *Das Tierreich*. R. Friedländer und Sohn, Berlin. In German.
- Fischer, J.H., Munro, U. & Phillips, J.B. (2003). Magnetic navigation by an avian migrant? Pp. 423–432 in: Berthold et al. (2003).
- Fischer, W. (2006). Der Samstirnkleiber. *Gefiederte Welt* **130**(10): 294–297. In German.
- Fisher, A.M. (2001). Avifauna changes along a *Eucalyptus* regeneration gradient. *Emu* **101**(1): 25–31.
- Fisher, C.D., Lindgren, E. & Dawson, W.R. (1972). Drinking patterns and behavior of Australian desert birds in relation to their ecology and abundance. *Condor* **74**(2): 111–136.
- Fisher, C.T. & Longmore, N.W. (1995). Edgar Layard and Charles Pearce's Fijian bird types in the Macleay and Australian Museums, Sydney, with comments on specimens in museums in Britain. *Bull. Brit. Orn. Club* **115**(4): 244–260.
- Fisher, H.I. (1950). The birds of Yap, western Caroline Islands. *Pacific Sci.* **4**: 55–62.
- Fisher, H.I. (1951). The avifauna of Niihau island, Hawaiian Archipelago. *Condor* **53**: 31–42.
- Fisher, K. & Fisher, L. (1996). Comparative measurements of the Graceful and Yellow-spotted Honeyeaters. *Corella* **20**(3): 102–103.
- Fishpool, L.D.C. & Evans, M.I. eds. (2001). *Important Bird Areas in Africa and Associated Islands: Priority Sites for Conservation*. BirdLife Conservation Series **11**. Pisces Publications & BirdLife International, Newbury & Cambridge.
- Fitzgerald, B.M., Robertson, H.A. & Whitaker, A.H. (1989). Vertical distribution of birds mist-netted in a mixed lowland forest in New Zealand. *Notornis* **36**(4): 311–321.
- Fitzsimons, J.A. (2003). Purple Swamphen *Porphyrio porphyrio* killing a Noisy Miner *Manorina melanoccephala* nestling. *Corella* **27**(3): 90.
- Fjeldsæ, J. (1999). The impact of human forest disturbance on the endemic avifauna of the Udzungwa Mountains, Tanzania. *Bird Conserv. Int.* **9**: 47–62.
- Fjeldsæ, J. & Bowie, R.C.K. (2006). Diversification of African sunbirds (Nectariniidae) in space and time: linking ecological and historical processes. *J. Orn.* **147**(5) (Suppl. 1): 32.
- Fjeldsæ, J., Howell, K. & Andersen, M. (1997). An ornithological visit to the Rubeho Mountains, Tanzania. *Scopus* **19**: 73–82.
- Flade, M. & Franz, D. (1993). *Remiz pendulinus* (Linnaeus 1758) – Beutelmeise. Pp. 998–1068 in: Glutz von Blotzheim & Bauer (1993).
- Flade, M., Franz, D. & Helbig, A. (1986). Die Ausbreitung der Beutelmeise (*Remiz pendulinus*) an ihrer nordwestlichen Verbreitungsgrenze bis 1985. *J. Orn.* **127**(3): 261–287. In German with English summary.
- Fleming, C.A. (1939). Birds of the Chatham Islands. Part 2. *Emu* **38**(5): 492–509.
- Fleming, C.A. (1943). Notes on the life history of the Silvereye, based on colour banding. *Emu* **42**: 193–217.
- Fleming, R.L. (1968). Winter observations on the ecology and distribution of birds on the Kosi-Gandak Watershed Ridge, central Nepal. *Pavo* **6**(1/2): 1–11.
- Fleming, R.L. & Traylor, M.A. (1964). Further notes on Nepal birds. *Feldiana Zool.* **35**(9): 493–558.
- Fleming, R.L. & Traylor, M.A. (1968). Distributional notes on Nepal birds. *Feldiana Zool.* **53**(3): 145–203.
- Fleming, R.L., Fleming, R.L. Jr. & Bangdel, L.S. (1976). *Birds of Nepal with Reference to Kashmir and Sikkim*. Published privately, Kathmandu.
- Fleming, R.L., Fleming, R.L. Jr. & Bangdel, L.S. (1984). *Birds of Nepal with Reference to Kashmir and Sikkim*. 3rd edition. Nature Himalayas & Avalok, Kathmandu.
- Fletcher, B.S. (2000a). Birds seen in the Bismarck and Admiralty Islands from 22 Oct–7 Nov 1996. *Muruk* **8**(2): 45–60.
- Fletcher, B.S. (2000b). Birds recorded in the Kau Wildlife Area at Baitabag and the adjacent coastal strip, Madang province, May–November 1996. *Muruk* **8**(2): 76–89.
- Fletcher, J.A. (1910). Cleveland (Tas.) notes. *Emu* **9**(4): 251–252.
- Fletcher, J.A. (1911). Honey-eaters of the Cleveland district, Tasmania. *Emu* **11**(2): 105–109.
- Fletcher, J.A. (1924). Birds of the steppes. *Emu* **24**: 107–117.
- Fletcher, T.B. & Inglis, C.M. (1936). *Birds of an Indian Garden*. 2nd edition. Thacker, Spink & Co, Calcutta & Simla.
- Flickinger, E.L. (1995). Loggerhead Shrike fatalities on a highway in Texas. *Proc. West. Found. Vert. Zool.* **6**: 67–69.
- Flint, P.R. & Stewart, P.F. (1992). *The Birds of Cyprus: an Annotated Check-list*. 2nd edition. British Ornithologists' Union Checklist 6. British Ornithologists' Union, Tring, UK.
- Flint, V.E., Boehme, R.L., Kostin, Y.V. & Kuznetsov, A.A. (1984). *A Field Guide to the Birds of the USSR including Eastern Europe and Central Asia*. Princeton University Press, Princeton, New Jersey.
- Florence, R. (2005). Bell-miner-associated dieback: an ecological perspective. *Austr. Forestry* **68**(4): 263–266.
- Fogden, M.P.L. (1965). Borneo bird notes, 1963–1965. *Sarawak Mus. J.* **12**(25/26): 395–414.

Fogden / Freifeld

- Fogden, M.P.L. (1966). Borneo bird notes, 1965–1966. *Sarawak Mus. J.* **14**(28/29): 308–319.
- Follet, B. (1990). Lesser Doublecollared Sunbird rearing Klaas's Cuckoo. *Promerops* **196**: 13–14.
- Forbes, H.O. (1903). *The Natural History of Socotra and Abd el Kuri*. Henry Young & Sons, Liverpool, UK.
- Forbes-Watson, A.D. (1969). Notes on birds observed in the Comoros on behalf of the Smithsonian Institution. *Atoll Res. Bull.* **128**: 1–23.
- Ford, H.A. (1976). The honeyeaters of Kangaroo Island. *South Austr. Orn.* **27**(4): 134–138.
- Ford, H.A. (1977). The ecology of honeyeaters in South Australia. *South Austr. Orn.* **27**(6): 199–203.
- Ford, H.A. (1978). The Black Honeyeater: nomad or migrant. *South Austr. Orn.* **27**(8): 263–269.
- Ford, H.A. (1979). Interspecific competition in Australian honeyeaters – depletion of common resources. *Austr. J. Ecol.* **4**(2): 145–164.
- Ford, H.A. (1980). Breeding and moult in honeyeaters (Aves: Meliphagidae) near Adelaide, South Australia. *Austr. Wildl. Res.* **7**(3): 453–463.
- Ford, H.A. (1981a). Territorial behaviour in an Australian nectar-feeding bird. *Austr. J. Ecol.* **6**(2): 131–134.
- Ford, H.A. (1981b). A comment on the relationships between miners *Manorina* spp. in South Australia. *Emu* **81**(4): 247–250.
- Ford, H.A. (1983). Relation between number of honeyeaters and intensity of flowering near Adelaide, South Australia. *Corella* **7**(2): 25–31.
- Ford, H.A. (1985a). A synthesis of the foraging ecology and behaviour of birds in eucalypt forests and woodlands. Pp. 249–254 in: Keast *et al.* (1985).
- Ford, H.A. (1985b). The bird community in eucalypt woodland and eucalypt dieback in the Northern Tablelands of New South Wales. Pp. 333–340 in: Keast *et al.* (1985).
- Ford, H.A. (1989). *Ecology of Birds, an Australasian Perspective*. Australian Ecology Series. Surrey Beatty & Sons, Chipping Norton, New South Wales.
- Ford, H.A. (1991). Coping with an erratic nectar source – Eastern Spinebills *Acanthorhynchus tenuirostris* at New England National Park. *Emu* **91**(1): 53–56.
- Ford, H.A. (1992). Striped Honeyeater *Plectorhyncha lanceolata* using feet to hold down prey. *Austr. Bird Watcher* **14**(5): 190.
- Ford, H.A. (1995). Plain Sunbird *Anthreptes simplex* feeding on arils of *Acacia* seeds. *Forktail* **10**: 181–182.
- Ford, H.A. (1998a). Faithfulness to breeding site and birthplace in Noisy Friarbirds *Philemon corniculatus*. *Emu* **98**(4): 269–275.
- Ford, H.A. (1998b). Biparental care in the Brown Honeyeater *Lichmera indistincta*. *Austr. Bird Watcher* **17**(6): 308–309.
- Ford, H.A. (1999). Nest site selection and breeding success in large Australian honeyeaters: are there benefits from being different? *Emu* **99**(2): 91–99.
- Ford, H.A. & Bell, H. (1981). Density of birds in eucalypt woodland affected to varying degrees by dieback. *Emu* **81**(4): 202–208.
- Ford, H.A. & Debus, S. (1994). Aggressive behaviour of Red Wattlebirds *Anthochaera carunculata* and Noisy Friarbirds *Philemon corniculatus*. *Corella* **18**(5): 141–147.
- Ford, H.A. & Forde, N. (1976). Birds as possible pollinators of *Acacia pycnantha*. *Austr. J. Bot.* **24**(6): 793–795.
- Ford, H.A. & Paton, D.C. (1975). Impoverishment of the avifauna of Kangaroo Island. *Emu* **75**(3): 155–156.
- Ford, H.A. & Paton, D.C. (1976a). Resource partitioning and competition in honeyeaters of the genus *Meliphaga*. *Austr. J. Ecol.* **1**(4): 281–287.
- Ford, H.A. & Paton, D.C. (1976b). The value of insects and nectar to honeyeaters. *Emu* **76**(2): 83–84.
- Ford, H.A. & Paton, D.C. (1976c). Birds of Para Wirra Recreation Park: changes in status over 10 years. *South Austr. Orn.* **27**(3): 88–95.
- Ford, H.A. & Paton, D.C. (1977). The comparative ecology of ten species of honeyeaters in South Australia. *Austr. J. Ecol.* **2**(4): 399–407.
- Ford, H.A. & Paton, D.C. (1982). Partitioning of nectar sources in an Australian honeyeater community. *Austr. J. Ecol.* **7**(2): 149–159.
- Ford, H.A. & Paton, D.C. (1985). Habitat selection in Australian honeyeaters, with special reference to nectar productivity. Pp. 367–388 in: Cody, M.L. ed. (1985). *Habitat Selection in Birds*. Academic Press, London.
- Ford, H.A. & Paton, D.C. eds. (1986). *The Dynamic Partnership: Birds and Plants in Southern Australia*. The Flora and Fauna of South Australia Handbooks Committee, South Australian Government & Government Printer, Adelaide, South Australia.
- Ford, H.A. & Pursey, J.F. (1982). Status and feeding of the Eastern Spinebill *Acanthorhynchus tenuirostris* at New England National Park, north-eastern NSW. *Emu* **82**(4): 203–211.
- Ford, H.A. & Trémont, S. (2000). Life history characteristics of two Australian honeyeaters (Meliphagidae). *Austr. J. Zool.* **48**(1): 21–32.
- Ford, H.A., Bridges, L. & Noske, S. (1985). Density of birds in eucalypt woodland near Armidale, north-eastern New South Wales. *Corella* **9**(4): 97–107.
- Ford, H.A., Davis, W.E., Debus, S., Ley, A., Recher, H. & Williams, B. (1993). Foraging and aggressive behaviour of the Regent Honeyeater *Xanthomyza phrygia* in northern New South Wales. *Emu* **93**(4): 277–281.
- Ford, H.A., Geering, D. & Ley, A.J. (2000). Radio-tracking trials with Regent Honeyeaters *Xanthomyza phrygia* and other honeyeaters. *Corella* **24**(3): 25–29.
- Ford, H.A., Huddy, L. & Bell, H. (1990). Seasonal changes in foraging behaviour of three passerines in Australian *Eucalyptus* woodland. *Studies Avian Biol.* **13**: 245–253.
- Ford, H.A., Noske, S. & Bridges, L. (1986). Foraging of birds in eucalypt woodland in north-eastern New South Wales. *Emu* **86**(3): 168–179.
- Ford, H.W. (1908). Bird notes from Marong (Bendigo district) from 1904 to 1907. *Emu* **8**(1): 26–31.
- Ford, J.R. (1971). Distribution, ecology and taxonomy of some Western Australian passerine birds. *Emu* **71**(3): 103–120.
- Ford, J.R. (1974). Speciation in Australian birds adapted to arid habitats. *Emu* **74**(3): 161–168.
- Ford, J.R. (1975). Systematics and hybridization of figbirds *Sphecotheres*. *Emu* **75**(4): 163–171.
- Ford, J.R. (1978a). Geographical isolation and morphological and habitat differentiation between birds of the Kimberley and the Northern Territory. *Emu* **78**(1): 25–35.
- Ford, J.R. (1978b). Intergradation between the Varied and Mangrove Honeyeaters. *Emu* **78**(2): 71–74.
- Ford, J.R. (1982). Origin, evolution and speciation of birds specialized to mangroves in Australia. *Emu* **82**(1): 12–23.
- Ford, J.R. (1983a). Hybrid phenotypes in male Figbirds *Sphecotheres viridis* in Queensland. *Emu* **82**(3): 126–130.
- Ford, J.R. (1983b). Taxonomic notes on some mangrove-inhabiting birds in Australia. *Records West. Austr. Mus.* **10**(4): 381–415.
- Ford, J.R. (1986). Avian hybridization and allopatry in the region of the Einasleigh Uplands and Burdekin-Lynd Divide, north-eastern Queensland. *Emu* **86**(2): 87–110.
- Ford, J.R. (1987a). Minor isolates and minor geographical barriers in avian speciation in continental Australia. *Emu* **87**(2): 90–102.
- Ford, J.R. (1987b). Hybrid zones in Australian birds. *Emu* **87**(3): 158–178.
- Ford, J.R. (1987c). Notes on Kimberley Birds. *West. Austr. Nat.* **16**(8): 181–184.
- Ford, J.R. (1988). Distributional notes on North Queensland birds. *Emu* **88**(1): 50–53.
- Ford, J.R. & Parker, S.A. (1974). Distribution and taxonomy of some birds from south-western Queensland. *Emu* **74**(3): 177–194.
- Ford, J.R. & Sedgwick, E.H. (1967). Bird distribution in the Nullarbor Plain and Great Victoria Desert region, Western Australia. *Emu* **67**(2): 99–124.
- Ford, J.R. & Stone, P.S. (1957). Birds of the Kellerberrin/Kwoylin district, Western Australia. *Emu* **57**(1): 9–21.
- Ford, J.R., Greensmith, A. & Reid, N. (1980). Notes on the distribution of Queensland birds. *Sunbird* **11**(3/4): 58–70.
- Forde, N. (1986). Relationships between birds and fruits in temperate Australia. Pp. 42–58 in: Ford & Paton (1986).
- Formon, A. (1987). Statut de la Mésange rémiz *Remiz pendulinus* en France – reproduction et hivernage. *Trajhasse* **16**: 13–28. In French with English summary.
- Fornasari, L., Bottoni, L., Sacchi, N. & Massa, R. (1994). Home range overlapping and socio-economic relationship in the Red-backed Shrike. *Ethology, Ecology & Evolution* **6**: 169–177.
- Fornasari, L., Bottoni, L., Schwabl, H. & Massa, R. (1992). Testosterone in the breeding cycle of the male Red-backed Shrike *Lanius collurio*. *Ethology, Ecology & Evolution* **4**: 193–196.
- Forshaw, J.M. & Muller, K.A. (1978). Annotated list of birds observed at Iron Range, Cape York Peninsula, Queensland, during October, 1974. *Austr. Bird Watcher* **7**(6): 171–194.
- Forth, G. (1992). The pigeon and the friarbird: the mythical origin of death and daylight in eastern Indonesia. *Anthropos* **87**: 432–441.
- Fosse, A. (1992). Algerian Nuthatch plumages. *Birding World* **5**: 234.
- Fosse, A. & Vaillant, G. (1982). À propos de la couleur de la calotte chez la Sittelle kabyle (*Sitta ledanti*). *Alauda* **50**: 228. In French.
- Fotso, R.C. (1996). Seasonal breeding in birds and its implications for the conservation of biodiversity in the Oku region, Cameroon. *Bird Conserv. Int.* **6**: 393–408.
- Frandsen, J. (1982). *Birds of the South Western Cape*. Sable, Cape Town.
- Franke, E., Jackson, S. & Nicolson, S. (1998). Nectar sugar preferences and absorption in a generalist African frugivore, the Cape White-eye *Zosterops pallidus*. *Ibis* **140**: 501–506.
- Frankis, M.P. (1991). Krüper's Nuthatch *Sitta krueperi* and Turkish pine *Pinus brutia*: an evolving association? *Sandgrouse* **13**: 92–97.
- Franklin, D.C. (1995). Helmeted Honeyeaters build bulkier nests in cold weather. *Auk* **112**(1): 247–248.
- Franklin, D.C. (1996). *The Status of the Black-eared Miner Manorina melanotis in New South Wales*. RAOU Report 99. Royal Australasian Ornithologists Union, Melbourne, Victoria.
- Franklin, D.C. (1997). The foraging behaviour of avian nectarivores in a monsoonal Australian woodland over a six-month period. *Corella* **21**(2): 48–54.
- Franklin, D.C. & Alley, J.C. (1995). Some observations of foraging and social behaviour of the Striped Honeyeater in south-western New South Wales. *Austr. Bird Watcher* **16**(2): 71–74.
- Franklin, D.C. & Menkhurst, P.W. (1988). A history of the Regent Honeyeater in South Australia. *South Austr. Orn.* **30**(6): 141–145.
- Franklin, D.C. & Noske, R.A. (1998). Local movements of honeyeaters in a sub-coastal vegetation mosaic in the Northern Territory. *Corella* **22**(4): 97–103.
- Franklin, D.C. & Noske, R.A. (1999). Birds and nectar in a monsoonal woodland: correlations at three spatio-temporal scales. *Emu* **99**(1): 15–28.
- Franklin, D.C. & Noske, R.A. (2000a). Nectar sources used by birds in monsoonal north-western Australia: a regional survey. *Austr. J. Bot.* **48**(4): 461–474.
- Franklin, D.C. & Noske, R.A. (2000b). The nesting biology of the Brown Honeyeater *Lichmera indistincta* in the Darwin region of northern Australia, with notes on tidal flooding of nests. *Corella* **24**(3): 38–44.
- Franklin, D.C. & Robinson, J.L. (1989). Territorial behaviour of a Regent Honeyeater at feeding sites. *Austr. Bird Watcher* **13**(4): 129–132.
- Franklin, D.C. & Wilson, K.J. (2003). Are low reproductive rates characteristic of New Zealand's native terrestrial birds? Evidence from the allometry of nesting parameters in altricial species. *New Zealand J. Zool.* **30**: 185–204.
- Franklin, D.C., Menkhurst, P.W. & Robinson, J.L. (1987). Field surveys of the Regent Honeyeater *Xanthomyza phrygia* in Victoria. *Austr. Bird Watcher* **12**(3): 91–95.
- Franklin, D.C., Menkhurst, P.W. & Robinson, J.L. (1989). Ecology of the Regent Honeyeater *Xanthomyza phrygia*. *Emu* **89**(3): 140–154.
- Franklin, D.C., Smales, I.J., Miller, M.A. & Menkhurst, P.W. (1995). The reproductive biology of the Helmeted Honeyeater *Lichenostomus melanops cassidix*. *Wildl. Res.* **22**(2): 173–191.
- Franklin, D.C., Smales, I.J., Quin, B.R. & Menkhurst, P.W. (1999). Annual cycle of the Helmeted Honeyeater *Lichenostomus melanops cassidix*, a sedentary inhabitant of a predictable environment. *Ibis* **141**(2): 256–268.
- Franklin, D.C., Smales, I.J., Quin, B.R. & Menkhurst, P.W. (2000). Age and sex characteristics of the Helmeted Honeyeater *Lichenostomus melanops cassidix* in the hand. *Corella* **24**: 30–35.
- Fransson, T., Jakobsson, S., Johansson, U.S., Kullberg, C., Lind, J. & Vallin, A. (2001). Bird migration – magnetic cues trigger extensive refuelling. *Nature (London)* **414**: 35–36.
- Franz, D. (1988a). Eine Kronenbeutelmeise *Remiz pendulinus coronatus* am Neusiedlersee. *Limicola* **2**(4): 147–152. In German with English summary.
- Franz, D. (1988b). Wanderungen der Beutelmeise *Remiz pendulinus* während der Brutperiode – Ausdehnung, Häufigkeit und ökologische Bedeutung. *Vogelwelt* **109**(5/6): 188–206. In German with English summary.
- Franz, D. (1991). Paarungssystem und Fortpflanzungsstrategien der Beutelmeise (*Remiz p. pendulinus*). *J. Orn.* **132**(3): 241–266. In German with English summary.
- Franz, D. & Theiß, N. (1983). Brutbiologie und Bestandentwicklung einer farbberingten Population der Beutelmeise *Remiz pendulinus*. *Verh. Orn. Ges. Bayern* **23**(5/6): 393–442. In German with English summary.
- Franzreb, K.E. (1985). Foraging ecology of Brown Creeper in a mixed-coniferous forest. *J. Field Orn.* **56**(1): 9–16.
- Fraser, B.J. & Henson, S.M. (1996). *Survey of Endemic Bird Species on Gunung Lompobattang, South Sulawesi*. Memorandum Teknis **12**. BirdLife International Indonesia Programme, Bogor, Indonesia.
- Fraser, M.W. (1989). Short-term responses of birds to fire in old mountain fynbos. *Ostrich* **60**: 172–182.
- Fraser, M.W. (1997a). Cape Sugarbird *Promerops cafer*. Pp. 484–485 in: Harrison *et al.* (1997).
- Fraser, M.W. (1997b). Malachite Sunbird *Nectarinia famosa*. Pp. 488–490 in: Harrison *et al.* (1997).
- Fraser, M.W. (1997c). Orangebreasted Sunbird *Nectarinia violacea*. Pp. 492–493 in: Harrison *et al.* (1997).
- Fraser, M.W. (1997d). Lesser Doublecollared Sunbird *Nectarinia chalybea*. Pp. 500–501 in: Harrison *et al.* (1997).
- Fraser, M.W. & McMahon, L. (1991). Orangebreasted Sunbird feeding from *Agapanthus* flowers. *Promerops* **198**: 13.
- Fraser, M.W. & McMahon, L. (1992). Habitat change by Cape Sugarbirds and Orangebreasted Sunbirds in an apparent response to fire in old mountain fynbos. *Safring News* **21**(2): 51–54.
- Fraser, M.W. & Wheeler, G. (1991). Dusky Sunbirds at Rondevlei. *Promerops* **199**: 6.
- Fraser, M.W., McMahon, L., Underhill, L.G., Underhill, G.D. & Rebelo, A.G. (1989). Nectarivore ringing in the southwestern Cape. *Safring News* **18**: 3–18.
- Frauch, H. (1980). Die seltsamen Gewohnheiten der australischen Panthervogel und Mistelfresser (Familie Dicaeidae). *Gefiederte Welt* **104**(10): 197–199. In German.
- Freeman, A.N.D. (1994). Landbirds recorded at the Chatham Islands, 1940 to December 1993. *Notornis* **41** (Suppl.): 127–141.
- Freeman, A.N.D. (1999). Bird counts in Kennedy's Bush Scenic Reserve, Port Hills, Christchurch. *Notornis* **46**: 388–404.
- Freeman, D.J. (1971). The nest of the White-lined Honeyeater. *Emu* **71**(2): 86–87.
- Freeman, J. (2003). Bitter sweet. Sugarbirds pay the price of perfection. *Africa Birds & Birding* **8**(4): 26–31.
- Freifeld, H.B. (1999). Habitat relationships of forest birds on Tutuila island, American Samoa. *J. Biogeogr.* **26**(6): 1191–1213.
- Freifeld, H.B., Solek, C. & Tualaulelei, A. (2004). Temporal variation in forest bird survey data from Tutuila island, American Samoa. *Pacific Sci.* **58**(1): 99–117.

- Freifeld, H.B., Steadman, D.W. & Sailer, J.K. (2001). Landbirds on offshore islands in Samoa. *J. Field Orn.* **72**(1): 72–85.
- French, K. (1990). Evidence for frugivory by birds in montane and lowland forests in south-east Australia. *Emu* **90**(3): 185–189.
- French, K. (1996). The gut passage rate of Silvereyes and its effect on seed viability. *Corella* **20**: 16–19.
- French, K., Major, R.E. & Hely, K. (2005). Use of native and exotic garden plants by suburban nectarivorous birds. *Biol. Conserv.* **12**: 545–559.
- French, W. (1957). Correspondence [Birds of the Solomon Islands]. *Ibis* **99**: 126–127.
- Frentiu, F.D., Clegg, S.M., Blows, M.W. & Owens, I.P.F. (2007). Large body size in an island-dwelling bird: a microevolutionary analysis. *J. Evol. Biol.* **20**: 639–649.
- Friedmann, H. (1931). The Tanganyikan form of *Anthreptes orientalis*. *Occas. Pap. Boston Soc. Nat. Hist.* **5**: 383–384.
- Friedmann, H. (1937). Birds collected by the Childs Frick Expedition to Ethiopia and Kenya Colony. Part 2. Passeres. *US Natl. Mus. Bull.* **153**: i–xii, 1–506.
- Friedmann, H. (1952). The Long-tailed Sugarbird of eastern Rhodesia. *J. Washington Acad. Sci.* **42**: 31–32.
- Friedmann, H. (1966). A contribution to the ornithology of Uganda. *Bull. Los Angeles County Mus. (Nat. Hist.) Sci.* **3**: 1–55.
- Friedmann, H. & Loveridge, A. (1937). Notes on the ornithology of tropical East Africa. *Bull. Mus. Comp. Zool. Harvard* **81**(1): 1–413.
- Friedmann, H. & Stager, K.E. (1969). Results of the 1968 Avil Expedition to Mt. Nyiru, Samburu district, Kenya. Ornithology. *Nat. Hist. Mus. Los Angeles County (Contrib. Sci.)* **174**: 1–30.
- Friedmann, H. & Williams, J.G. (1970). The birds of the Kalinzu Forest, southwestern Ankole, Uganda. *Contrib. Sci.* **195**: 1–27.
- Friedmann, H. & Williams, J.G. (1971). The birds of the lowlands of Bwamba, Toro province, Uganda. *Contrib. Sci.* **211**: 1–70.
- Friend, G.R. (1982). Bird populations in exotic pine plantations and indigenous eucalypt forests in Gippsland, Victoria. *Emu* **82**(2): 80–91.
- Frith, C.B. (1971). Nidification of some New Guinea birds. *Bull. Brit. Orn. Club* **91**: 164–165.
- Frith, C.B. (1977). Life history notes on some Aldabran landbirds. *Atoll Res. Bull.* **210**: 1–17.
- Frith, C.B. & Beehler, B.M. (1998). *The Birds of Paradise*. Oxford University Press, Oxford, UK.
- Frith, C.B. & Frith, D.W. (1988). Nests and eggs of the Papuan Scrub-wren *Sericornis papuensis* (Acanthizidae) and Grey-streaked Honeyeater *Ptiloprora perstriata* (Meliphagidae). *Austr. Bird Watcher* **12**(5): 168–170.
- Frith, C.B. & Frith, D.W. (1992). Annotated list of birds in western Tari Gap, Southern Highlands, Papua New Guinea, with some nidification notes. *Austr. Bird Watcher* **14**(7): 262–276.
- Frith, C.B. & Frith, D.W. (1993a). Notes on birds found nesting at Iron Range, Cape York Peninsula, November–December 1990. *Sunbird* **23**: 44–58.
- Frith, C.B. & Frith, D.W. (1993b). Results of a preliminary highland bird-banding study at Tari Gap, Southern Highlands, Papua New Guinea. *Corella* **17**: 5–21.
- Frith, C.B. & Frith, D.W. (2005). A long-term bird banding study in upland tropical rainforest, Paluma Range, north-eastern Queensland with notes on breeding. *Corella* **29**(2): 25–48.
- Frith, C.B. & McGuire, M. (1996). Visual evidence of vocal avian mimicry by male Tooth-billed Bowerbirds *Scenopoeetes dentirostris* (Ptilorhynchidae). *Emu* **96**(1): 12–16.
- Frith, D.W. (1984). Foraging ecology of birds in an upland tropical rainforest in North Queensland. *Austr. Wildl. Res.* **11**(2): 325–347.
- Frith, D.W. & Frith, C.B. (1995). *Cape York Peninsula: a Natural History*. Reed Books, Chatswood, New South Wales.
- Frith, H.J. ed. (1969). *Birds in the Australian High Country*. A.H. & A.W. Reed, Sydney.
- Frith, H.J. ed. (1984). *Birds in the Australian High Country*. Revised edition. Angus & Robertson, London, Sydney & Melbourne.
- Frith, H.J. & Davies, S.J.J.F. (1961). Breeding seasons of birds in subcoastal Northern Territory. *Emu* **61**(2): 97–111.
- Frith, H.J. & Hitchcock, W.B. (1974). Birds. Pp. 109–178 in: Frith, H.J. & Calaby, J.H. eds. (1974). *Fauna Survey of the Port Essington District, Cobourg Peninsula, Northern Territory of Australia*. CSIRO Division of Wildlife Research Technical Paper **28**. Commonwealth Scientific & Industrial Research Organization, Canberra.
- Frost, S.K. & Frost, P.G.H. (1980). Territoriality and changes in resource use by sunbirds at *Leonotis leonurus* (Labiatae). *Oecologia* **45**: 109–116.
- Frost, S.K. & Frost, P.G.H. (1981). Sunbird pollination of *Strelitzia nicolai*. *Oecologia (Berlin)* **49**(3): 379–384.
- Fry, C.H. (1961). Notes on the birds of Annobón and other islands in the Gulf of Guinea. *Ibis* **103A**: 267–276.
- Fry, C.H. (1965). A nest of the Buff-throated Sunbird. *Bull. Nigerian Orn. Soc.* **2**: 81–82.
- Fry, C.H. (1970). Migration, moult and weights of birds in Northern Guinea Savanna in Nigeria and Ghana. Pp. 239–263 in: Maclean, G.L. ed. (1971). *Proceedings of the Third Pan-African Ornithological Congress Held at Pretoriuskop, Kruger National Park, 15 to 19 September 1969* [...]. Ostrich Supplement **8**. South African Ornithological Society, Cape Town & Pretoriuskop.
- Fry, C.H. (2000). Family Promeropidae: sugarbirds. Pp. 326–338 in: Fry, Keith & Urban (2000).
- Fry, C.H., Ash, J.S. & Ferguson-Lees, I.J. (1970). Spring weights of Palaearctic migrants at Lake Chad. *Ibis* **112**: 58–82.
- Fry, C.H., Ferguson-Lees, I.J. & Dowsett, R.J. (1972). Flight muscle hypertrophy and ecophysiological variation of Yellow Wagtail *Motacilla flava* races at Lake Chad. *J. Zool., London* **167**: 293–306.
- Fry, C.H., Keith, S. & Urban, E.K. eds. (2000). *The Birds of Africa*. Vol. 6. Picathartes to Oxyechers. Academic Press, London.
- Frye, G.G. & Gerhardt, R.P. (2001). Apparent cooperative hunting in Loggerhead Shrike. *Wilson Bull.* **113**: 462–464.
- Fu Tongsheng, Gao Wei & Song Yujun (1984). *Changbai Shan Niao lei*. [Birds of the Changbai Mountains]. Northeast Normal University Press, Changchun, China. In Chinese.
- Fuchs, J., Cibois, A., Duckworth, J.W., Eve, R., Robichaud, W.G., Tizard, T. & van Gansberghe, D. (2007). Birds of Phongsaly province and the Nam Ou river, Laos. *Forktail* **23**: 22–86.
- Fuggles-Couchman, N.R. (1984). The distribution of, and other notes on, some birds of Tanzania – Part 2 (continued). *Scopus* **8**: 81–92.
- Fuggles-Couchman, N.R. (1986). Breeding records of some Tanzanian birds. *Scopus* **10**: 20–26.
- Fuggles-Couchman, N.R. & Elliot, H.F.I. (1946). Some records and field-notes from north-eastern Tanganyika Territory. *Ibis* **88**: 327–347.
- Fuiz, T.I. & Yosef, R. (2001). Effect of habitat quality on the hunting behaviour of breeding Great Grey Shrikes (*Lanius excubitor*). *Acta Zool. Acad. Sci. Hung.* **47**(4): 311–320.
- Fulton, G.R. (2006). Observations of predation, nest-predation and other disturbance events at Dryandra, south-western Australia. 1. Birds as predators. *Austr. Field Orn.* **23**(3): 144–151.
- Funnell, J.R. & Munro, U. (2007). Orientation in captive migratory and sedentary Australian Silvereyes *Zosterops lateralis* (Zosteropidae). *Behav. Ecol. Sociobiol.* **61**: 337–345.
- Gadow, H. (1883). *Catalogue of the Passeriformes, or Perching Birds, in the Collection of the British Museum*. Vol. 8. Cichlomorphae: Part V. Containing the families Paridae and Laniidae (titmice and shrikes), and Certhiomorphae (creepers and nuthatches). Trustees of the British Museum, London.
- Gadow, H. (1884). *Catalogue of the Passeriformes, or Perching Birds, in the Collection of the British Museum*. Vol. 9. Cinnymorphae: containing the families Nectariniidae and Meliphagidae (sun-birds and honey-eaters). Trustees of the British Museum, London.
- Gaines, D. (1988). *Birds of Yosemite and the East Slope*. Artemisia, Lee Vining, California.
- Gaither, J.C. (1994). Weights of Bornean understorey birds. *Bull. Brit. Orn. Club* **114**: 89–90.
- Galbraith, I.C.J. (1957). On the application of the name *Zosterops rendovae* Tristram 1882. *Bull. Brit. Orn. Club* **77**: 10–16.
- Galbraith, I.C.J. & Galbraith, E.H. (1962). Land birds of Guadalcanal and the San Cristoval Group, eastern Solomon Islands. *Bull. Brit. Mus. (Nat. Hist.) Zool.* **9**(1): 1–86.
- Gall, B.C. & Longmore, N.W. (1978). Avifauna of the Thredbo valley, Kosciusko National Park. *Emu* **78**(4): 189–196.
- Gallagher, M. & Woodcock, M.W. (1980). *The Birds of Oman*. Quartet Books, London.
- Galushin, V.M. & Polozov, S.A. (1998). Population status and breeding ecology of the Long-tailed Shrike (*Lanius schach*) in Kabul, Afghanistan. Pp. 45–48 in: Yosef & Lohrer (1998).
- Gamauf, A. & Tebbich, S. (1995). Re-discovery of the Isabela Oriole *Oriolus isabellae*. *Forktail* **11**: 170–171.
- Ganguly, J.K. (1986). Co-operative feeding of chicks of the Purple-rumped Sunbird (*Nectarinia zeylonica*). *J. Bombay Nat. Hist. Soc.* **83**: 447.
- Gannon, G.R. (1953). Group nesting of the same species of passerine birds. With comments on the territory theory. *Emu* **53**(4): 295–302.
- Gannon, G.R. (1962). Distribution of the Australian honeyeaters. *Emu* **62**(3): 145–166.
- Gannon, G.R. (1966). The influence of habitat on the distribution of Australian birds. *Emu* **65**(4): 241–253.
- Gantlett, S. & Millington, R. eds. (1992). Photo-forum: Wallcreeper. *Birding World* **5**: 271–274.
- Gao Wie (1978). On the breeding behaviour and feeding habits of the Black-headed Nuthatch. *Acta Zool. Sinica* **24**: 260–68. In Chinese with English summary.
- Gardiner, J. & Meikle, J. (1985). Note on the breeding habits of the Bronze Sunbird. *Honeyguide* **31**: 58–59.
- Gardner, A.L. (2005). The gender of genus-group names ending in either *-otis* or *-otus*. *Bull. Zool. Nomencl.* **62**(3): 183–184.
- Gardner, L.L. (1925). The adaptive modifications and the taxonomic value of the tongue in birds. *Proc. US Natl. Mus.* **67**(19): 1–49.
- Gargallo, G. (1996). Evidence for partial prenuptial moult in adult and first-year Penduline Tits *Remiz pendulinus*. *Bird Study* **43**(2): 157–163.
- Garnett, S.T. (1987). An Australian record of Gurney's Eagle *Aquila gurneyi*. *Austr. Bird Watcher* **12**(4): 134–135.
- Garnett, S.T. ed. (1993). *Threatened and Extinct Birds of Australia*. RAOU Report **82**. Royal Australasian Ornithologists Union, Melbourne, Victoria.
- Garnett, S.T. & Bredl, R. (1985). Birds in the vicinity of Edward River Settlement. Part 2. Discussion, references, list of passerines. *Sunbird* **15**(2): 25–40.
- Garnett, S.T. & Cox, J.B. (1983). *Birds of the Townsville Town Common*. Published privately, Townsville, Queensland.
- Garnett, S.T. & Cox, J.B. (1988). *Birds of the Townsville Common*. 2nd edition. Queensland National Parks and Wildlife Service, Townsville, Queensland.
- Garnett, S.T. & Crowley, G.M. (1997). Range extension of the White-streaked Honeyeater *Trichodere cockerelli*. *Sunbird* **27**(1): 22–23.
- Garnett, S.T. & Crowley, G.M. (2000). *The Action Plan for Australian Birds, 2000*. Environment Australia, Canberra.
- Garnett, S.T., Harrington, G.N., Freeman, A.N.D. & Holmes, G. (2004). The Yellow White-eye *Zosterops luteus* on eastern Cape York Peninsula. *Austr. Field Orn.* **21**(3): 118–120.
- Garnett, S.T., Williams, A.C., Hindmarsh, R.W.H. & Hindmarsh, N.L. (1991). Island colonisation after possible reconnaissance by the Yellow-bellied Sunbird *Nectarinia jugularis*. *Emu* **91**: 185–186.
- Gartrell, B.D. (2000). The nutritional, morphologic, and physiologic bases of nectarivory in Australian birds. *J. Avian Med. & Surg.* **14**(2): 85–94.
- Gaston, A.J. (1973). The ecology and behaviour of the Long-tailed Tit. *Ibis* **115**(3): 330–351.
- Gaston, A.J. (1985). Tit, Long-tailed. Pp. 596–597 in: Campbell & Lack (1985).
- Gaston, A.J. (1989). Andrew Leith Adams: a pioneer of Himalayan ornithology. *Forktail* **4**: 3–8.
- Gatter, W. (1988). The birds of Liberia (West Africa): a preliminary list with status and open questions. *Verh. Orn. Ges. Bayern* **24**: 689–723.
- Gatter, W. (1997). *Birds of Liberia*. Pica Press, Aula-Verlag & Yale University Press, Robertsbridge, Wiesbaden & New Haven.
- Gatter, W. & Mattes, H. (1979). Zur Populationsgröße und Ökologie des neuentdeckten Kabylenkleibers *Sitta ledanti* Viellardi 1976. *J. Orn.* **120**(4): 390–405. In German with English summary.
- Gaugris, Y. (1976). Additions à l'inventaire des oiseaux du Burundi (Décembre 1971 – Décembre 1975). *Oiseau et RFO (Nouv. Sér.)* **46**: 273–289. In French.
- Gaugris, Y., Prigogine, A. & Vande weghe, J.P. (1981). Additions et corrections à l'avifaune du Burundi. *Gerfaut* **71**(1): 3–39. In French with English and Flemish summary.
- Gauthier-Clerc, M. (1991). Le Tichodrome échelette nicheur dans le massif du Jura français. *Nos Oiseaux* **41**(4): 237–246. In French with English and German summaries.
- Gauthreaux, S.A. (1982). The ecology and evolution of avian migration systems. Pp. 93–167 in: Farner, D.S. & King, J.R. eds. (1982). *Avian Biology*. Vol. 6. Academic Press, New York.
- Gavrilov, A.E. & Zhatkanbaev, A.Z. (1995). [On the distribution of the Penduline Tit (*Remiz pendulinus*) in Kazakhstan]. *Ornithologiya* **26**: 178. In Russian.
- Gavrilov, E.I. & Gavrilov, A.E. (2005). *The Birds of Kazakhstan*. Abridged edition. Tethys Ornithological Research 2. Tethys, Almaty, Kazakhstan.
- Gavrilov, E.I. & Gistov, A.P. (1985). *Sezomnye perelety ptits v predgor'ях yakh zapadnogo Tyan'-Shanya*. [Seasonal Bird Migration in the Foothills of the Western Tien Shan]. Nauka, Alma-Ata, Kazakhstan. In Russian.
- Gavrilov, E.I., Dolgushin, I.A. & Rodionov, E.F. (1968). [Breeding biology of the White-browed Tit-warbler in the Zailiyskiy Alatau]. *Trudy Inst. Zool. Akad. Nauk Kazakh. SSR* **29**: 32–40. In Russian.
- Gawlik, D.E. (1991). Natural history and management of the San Clemente Loggerhead Shrike. *Wilson Bull.* **103**: 528–529.
- Gawlik, D.E. & Bildstein, K.L. (1990). Reproductive success and nesting habitat of Loggerhead Shrikes in north-central South Carolina. *Wilson Bull.* **102**: 37–48.
- Gawlik, D.E. & Bildstein, K.L. (1993). Seasonal habitat use and abundance of Loggerhead Shrikes in South Carolina, USA. *J. Wildl. Management* **57**: 352–357.
- Gawlik, D.E., Papp, J. & Bildstein, K.L. (1991). Nestling diet and prey-delivery rates of Loggerhead Shrikes (*Lanius ludovicianus*) in north-central South Carolina. *Chat* **55**: 1–5.
- Gaymer, R., Blackman, R.A.A., Dawson, P.G., Penny, M. & Penny, C.M. (1969). The endemic birds of Seychelles. *Ibis* **111**: 157–176.
- Gaze, P.D. (1984). Yellow Bellbirds. *Notornis* **31**(4): 278.
- Gaze, P.D. & Clout, M.N. (1983). Honeydew and its importance to birds in beech forests of South Island, New Zealand. *New Zealand J. Ecol.* **6**: 33–37.
- Gaze, P.D. & Fitzgerald, B.M. (1982). The food of honeyeaters on Little Barrier Island. *Notornis* **29**(3): 209–213.
- Gee, P., Gee, I. & Read, J. (1996). An annotated list from the Davenport Range, South Australia. *South Austr. Orn.* **32**: 76–81.
- Geering, D.J. (1997). The Regent Honeyeater in the Capertee valley, NSW, 1994–1996. Report to Capertee Valley Regent Honeyeater Recovery Group, Southern New South Wales & Australian Capital Territory Group of Birds Australia, Sydney. Unpubl.
- Geering, D.J. (1998). Playback tapes as an aid for mist-netting Regent Honeyeaters. *Corella* **22**(2): 61–63.
- Geering, D.J. & French, K. (1998). Breeding biology of the Regent Honeyeater *Xanthomyza phrygia* in the Capertee valley, New South Wales. *Emu* **98**(2): 104–116.
- Geering, D.J. & Herman, K. (1999). The Regent Honeyeater in the Capertee valley, NSW, 1997–1998. Report to Capertee Valley Regent Honeyeater Recovery Group, Southern New South Wales, Australian Capital Territory Group of Birds Australia & Regent Honeyeater Recovery Team, Sydney. Unpubl.

- Geertsma, M., van Berkel, H. & Esselink, H. (2000). Are high fitness values sufficient to maintain a Dutch population of the Red-backed Shrike. *Ring* **22**(1): 79–88.
- Geeves, J. & Horton, H. (1990). Bird observations – Cairns to Iron Range. *Queensland Nat.* **30**(1/2): 6–12.
- Gell, P. (1977). Bird list: Wyperfeld National Park, Victoria. *Austr. Bird Watcher* **7**(2): 52–55.
- Gepp, B.C. (1986). Birds in pine forests in South Australia. Pp. 140–149 in: Ford & Paton (1986).
- Gepp, B.C. & Fife, A.J. (1975). Birds seen in forest reserves in South Australia. *South Austr. Orn.* **27**(1): 12–17.
- Gerlach, J. ed. (1997). *Seychelles Red Data Book*. The Nature Protection Trust of Seychelles, Victoria, Mahé, Seychelles.
- Gerlach, J. (2001). Population dynamics of insular vertebrates, examples from the Seychelles islands. *Biota Race* **2**(2): 125–135.
- Gerlach, J. ed. (2007). *Terrestrial and Freshwater Vertebrates of the Seychelles Islands*. Backhuys, Leiden.
- Géroutet, P. (1987). À propos du Tichodrome au Salève. *Nos Oiseaux* **39**(2): 53–55. In French.
- Géroutet, P. (1994a). Le Tichodrome échelette dans le Jura suisse: répartition des nicheurs. *Nos Oiseaux* **42**: 379–410. In French.
- Géroutet, P. (1994b). Autours du Tichodrome et de ses nidifications jurassiennes: réflexions sur l'oiseau et les hommes. *Nos Oiseaux* **42**: 461–475. In French.
- Géroutet, P. & Gauthier-Clerc, M. (1994). Le Tichodrome échelette (*Tichodroma muraria*) nicheur: nouvelle mise au point pour le Jura français et synthèse jurassienne franco-suisse. *Nos Oiseaux* **42**(7): 411–418. In French with German summary.
- Ghalambor, C.K. & Martin, T.E. (1999). Red-breasted Nuthatch *Sitta canadensis*. No. 459 in: Poole, A. & Gill, F. eds. (1999). *The Birds of North America*. Vol. 12. The Birds of North America Inc., Philadelphia, Pennsylvania.
- Giachola, V. (1996). Nesting of *Remiz pendulinus* on *Phragmites australis*. *Riv. Ital. Orn.* **66**(1): 73–74. In Italian with English summary.
- Gibb, J.A. (2000a). Dawn to dusk counts of common or garden birds. Wellington, New Zealand. *Notornis* **47**(4): 184–191.
- Gibb, J.A. (2000b). Bird activity in the Western Hutt Hills, Wellington, New Zealand. *Notornis* **47**(1): 13–35.
- Gibbs, D. (1994). Undescribed taxa and new records from the Fakfak Mountains, Irian Jaya. *Bull. Brit. Orn. Club* **114**(1): 4–12.
- Gibbs, D. (1996a). A checklist of the birds of the Solomon Islands. Unpubl.
- Gibbs, D. (1996b). Notes on Solomon Island birds. *Bull. Brit. Orn. Club* **116**(1): 18–25.
- Gibson, D.F. (1986). *A Biological Survey of the Tanami Desert in the Northern Territory*. Technical Report 30. Conservation Commission of the Northern Territory, Alice Springs, Northern Territory.
- Gibson, J.D. (1977). The birds of the County of Camden (including the Illawarra district). *Austr. Birds* **11**(3): 41–74.
- Gibson-Hill, C.A. (1947). Notes on the birds of Christmas Island. *Bull. Raffles Mus. Singapore* **18**: 87–169.
- Gibson-Hill, C.A. (1949). An annotated checklist of the birds of Malaya. *Bull. Raffles Mus. Singapore* **20**: 1–299.
- Gibson-Hill, C.A. (1950a). Ornithological notes from the Raffles Museum. 5. A collection of birds' eggs from North Borneo. *Bull. Raffles Mus. Singapore* **21**: 114, 122–131.
- Gibson-Hill, C.A. (1950b). Notes on the birds of the Cocos-Keeling Islands. *Bull. Raffles Mus. Singapore* **22**: 212–270.
- Gil, D. (1997). Increased response of the Short-toed Treecreeper *Certhia brachydactyla* in sympathy to the playback of the song of the Common Treecreeper *C. familiaris*. *Ethology* **103**(8): 632–641.
- Gilbert, P.A. (1919). The Black-throated Honey-eater (*Melithreptus gularis*). *Emu* **19**(1): 28–33.
- Gilbert, P.A. (1923). Notes on honeyeaters. *Emu* **23**: 109–118.
- Gilbert, P.A. (1935). The seasonal movements and migrations of birds in eastern New South Wales. *Emu* **35**: 17–27.
- Gilbert, P.A. (1937). Field notes from New South Wales. *Emu* **37**: 28–31.
- Giles, S. & Lill, A. (1999). The effect of fruit abundance, conspicuousness and sugar concentration on fruit colour choice by captive Silvereyes. *Ethology, Ecology & Evolution* **11**: 229–242.
- Gill, B.J. (1983). April bird-counts at Ohau Gorge near Levin. *Notornis* **30**(4): 337–339.
- Gill, B.J. (1987). Notes on the birds, reptiles and mammals of Tongatapu and 'Eua (Tonga). *Notornis* **34**: 217–233.
- Gill, B.J. (1988). Records of birds and reptiles from Tonga. *Rec. Auckland Inst. Mus.* **25**: 87–94.
- Gill, B.J. (1989). Bird counts in regenerated urban forest at Auckland Domain. *Notornis* **36**(2): 81–87.
- Gill, B.J. (1990). Records of wildlife from Tonga, especially Yava'u. *Rec. Auckland Inst. Mus.* **27**: 165–173.
- Gill, B.J. (1994). Natal down of the Silvereye. *Notornis* **41**: 147–148.
- Gill, B.J. (1995). Notes on the birds of Wallis and Futuna, south-west Pacific. *Notornis* **42**: 17–22.
- Gill, B.J. (1999). A myna increase – notes on introduced mynas (*Acridotheres*) and bulbuls (*Pycnonotus*) in Western Samoa. *Notornis* **46**(2): 268–269.
- Gill, B.J. & Veitch, C.R. (1990). Measurements of bush birds on Little Barrier Island, New Zealand. *Notornis* **37**(2): 141–145.
- Gill, E.H.N. (1923). A description of the nests and eggs of the common birds occurring in the plains of the United Provinces. Part 2. *J. Bombay Nat. Hist. Soc.* **29**(1): 107–116, pls. 1–2.
- Gill, F.B. (1969). Additions to the birds known from the West Sumatran islands. *Ardea* **57**: 89–91.
- Gill, F.B. (1970a). The taxonomy of the Mascarene Olive White-eye, *Zosterops olivaceus* (L.). *Bull. Brit. Orn. Club* **90**: 81–82.
- Gill, F.B. (1970b). Hybridization in Norfolk Island White-eyes (*Zosterops*). *Condor* **72**: 481–482.
- Gill, F.B. (1971a). Ecology and evolution of the sympatric Mascarene White-eyes, *Zosterops borbonica* and *Zosterops olivacea*. *Auk* **88**(1): 35–60.
- Gill, F.B. (1971b). Tongue structure of the sunbird *Hypogramma hypogrammica*. *Condor* **73**(4): 485–486.
- Gill, F.B. (1973). *Intra-island variation in the Mascarene White-eye (Zosterops borbonica)*. Ornithological Monographs 12. American Ornithologists' Union, Washington, D.C.
- Gill, F.B. (1985). Sunbird. Pp. 567–568 in: Campbell & Lack (1985).
- Gill, F.B. & Conway, C.A. (1979). Floral biology of *Leonotis nepetifolia* (Labiatae). *Proc. Acad. Nat. Sci. Philadelphia* **131**: 244–256.
- Gill, F.B. & Wolf, L.L. (1975a). Foraging strategies and energetics of East African sunbirds at mistletoe flowers. *Amer. Naturalist* **109**: 491–510.
- Gill, F.B. & Wolf, L.L. (1975b). Economics of feeding territoriality in the Golden-winged Sunbird. *Ecology* **56**: 333–345.
- Gill, F.B. & Wolf, L.L. (1977). Non-random foraging by sunbirds in a patchy environment. *Ecology* **58**: 1284–1296.
- Gill, F.B. & Wolf, L.L. (1978). Comparative foraging efficiencies of some montane sunbirds in Kenya. *Condor* **80**: 391–400.
- Gill, F.B. & Wolf, L.L. (1979). Nectar loss by Golden-winged Sunbirds to competitors. *Auk* **96**: 448–461.
- Gill, H.B. (1970). Birds of Innisfail and hinterland. *Emu* **70**(3): 105–116.
- Gill, R.E., Piersma, T., Huford, G., Servanckx, R. & Riegen, A. (2005). Crossing the ultimate ecological barrier: evidence for an 11,000 km-long nonstop flight from Alaska to New Zealand and eastern Australia by Bar-tailed Godwits. *Condor* **107**: 1–20.
- Gilliard, E.T. (1950a). Notes on a collection of birds from Bataan, Luzon, Philippine islands. *Bull. Amer. Mus. Nat. Hist.* **94**(8): 457–504.
- Gilliard, E.T. (1950b). Notes on birds of southeastern Papua. *Amer. Mus. Novit.* **1453**: 1–40.
- Gilliard, E.T. (1958). *Living Birds of the World*. Hamish Hamilton, London.
- Gilliard, E.T. (1959). The ecology of hybridization in New Guinea honeyeaters (Aves). *Amer. Mus. Novit.* **1937**: 1–26.
- Gilliard, E.T. (1960). Results of the 1958–1959 Gilliard New Britain Expedition. 1. A new genus of honeyeater (Aves). *Amer. Mus. Novit.* **2001**: 1–5.
- Gilliard, E.T. & LeCroy, M. (1961). Birds of the Victor Emanuel and Hindenburg Mountains, New Guinea. Results of the American Museum of Natural History Expedition to New Guinea in 1954. *Bull. Amer. Mus. Nat. Hist.* **123**(1): 1–86, pls. 1–17.
- Gilliard, E.T. & LeCroy, M. (1966). Birds of the Middle Sepik region, New Guinea. Results of the American Museum of Natural History Expedition to New Guinea in 1953–1954. *Bull. Amer. Mus. Nat. Hist.* **132**(4): 245–275.
- Gilliard, E.T. & LeCroy, M. (1967a). Annotated list of birds of the Adelbert Mountains, New Guinea. Results of the 1959 Gilliard Expedition. *Bull. Amer. Mus. Nat. Hist.* **138**(2): 51–81.
- Gilliard, E.T. & LeCroy, M. (1967b). Results of the 1958–1959 Gilliard New Britain Expedition. 4. Annotated list of birds of the Whiteman Mountains, New Britain. *Bull. Amer. Mus. Nat. Hist.* **135**(4): 173–216.
- Gilliard, E.T. & LeCroy, M. (1968). Birds of the Schrader Mountain region, New Guinea – Results of the American Museum of Natural History Expedition to New Guinea in 1964. *Amer. Mus. Novit.* **2343**: 1–41.
- Gilliard, E.T. & LeCroy, M. (1970). Notes on birds from the Tamrau Mountains, New Guinea. *Amer. Mus. Novit.* **2420**: 1–28.
- Gilmore, A.M. (1985). The influence of vegetation structure on the density of insectivorous birds. Pp. 21–31 in: Keast et al. (1985).
- Gilmore, S., Mackey, B. & Berry, S. (2007). The extent of dispersive movement behaviour in Australian vertebrate animals, possible causes, and some implications for conservation. *Pacific Conserv. Biol.* **13**: 93–103.
- Gilyazov, A. & Sparks, T. (2002). Change in the timing of migration of common birds at the Lapland Nature Reserve (Kola Peninsula, Russia) during 1931–1999. *Avian Ecol. Behav.* **8**: 35–47.
- Ginn, P.J. (1989). What birds feed their chicks. *Homeguide* **35**: 170–171.
- Ginn, P.J., Melleron, W.G. & le S. Milstein, P. eds. (1989). *The Complete Book of Southern African Birds*. Struik, Foreshore, Cape Town.
- Girtanner, A. (1864). Notizen über *Tichodroma phoeniceptera* (Alpen-Mauerläufer). *Ber. Tätigkeit St. Gall. Naturwiss. Ges.* **1863/64**: 102–129. In German.
- Girtanner, A. (1868). Beobachtungen über Fortpflanzung und Entwicklung des Alpen-Mauerläufers *Tichodroma phoeniceptera*. *Ber. Tätigkeit St. Gall. Naturwiss. Ges.* **1867/68**: 83–122. In German.
- Girvan, G. (1994). Striated Pardalote *Pardalote striatus*: the nest. *Austr. Avicult.* **48**(6): 129–130.
- Glen, N.W. & Perrins, C.M. (1988). Co-operative breeding by Long-tailed Tits. *British Birds* **81**: 630–641.
- Glenister, A.G. (1951). *The Birds of the Malay Peninsula, Singapore and Penang*. Oxford University Press, London, UK.
- Glenister, A.G. (1985). *The Birds of the Malay Peninsula, Singapore and Penang – An Account of all the Malayan Species, with a Note of their Occurrence in Sumatra, Borneo, and Java and a List of the Birds of those Islands*. 5th edition. Oxford University Press, Singapore.
- Glutz von Blotzheim, U.N. (1962). *Die Brutvögel der Schweiz – eine Zusammenfassung unserer heutigen Kenntnisse über Verbreitung, Bestandessichte, Ernährung und Fortpflanzung der seit 1900 in der Schweiz als Brutvögel nachgewiesenen Arten*, 2nd edition. Schweizerische Vogelwarte Sempach & Aargauer Tagblatt, Aarau, Switzerland. In German.
- Glutz von Blotzheim, U.N. & Bauer, K.M. eds. (1993). *Handbuch der Vögel Mitteleuropas*. Vol. 13(2). Passeriformes (4. Teil) Sittidae–Laniidae. Aula-Verlag, Wiesbaden, Germany. In German.
- Godfrey, W.E. (1986). *The Birds of Canada*. Revised edition. National Museums of Canada (Natural Sciences), Ottawa, Canada.
- Golawski, A. (2006). Comparison of methods for diet analysis and prey preference: case study of the Red-backed Shrike. *Ornis Fenn.* **83**: 108–116.
- Golawski, A. (2007). Does the Red-backed Shrike (*Lanius collurio*) benefit from nesting in the association with the Barred Warbler (*Sylvia nisoria* Bechst.)? *Polish J. Ecol.* **55**(3): 601–604.
- Goldstein, H. & Yom-Tov, Y. (1988). The breeding biology of the Orange-tufted Sunbird in Israel. *Ardea* **76**: 169–174.
- Goldstein, H., Eisikovitz, E. & Yom-Tov, Y. (1986). Infanticide in the Palestine Sunbird *Nectarinia osea*. *Condor* **88**: 528–529.
- Goldstein, H., Verbeek, N.A.M., Eisikovitz, E. & Yom-Tov, Y. (1987). Sunbirds prefer to feed in the sun. *Ardea* **75**: 293–295.
- Gonzales, J.C.T. (1993). An avifaunal survey of Puerto Galera, Oriental Mindoro province, Philippines. *Asia Life Sci.* **2**: 163–176.
- Gonzales, P.C. & Rees, C.P. (1988). *Birds of the Philippines*. Haribon Foundation, Manila.
- Goodman, S.M. & Gonzales, P.C. (1990). The birds of Mt. Isarog National Park, southern Luzon, Philippines, with particular reference to altitudinal distribution. *Fieldiana Zool. (New Ser.)* **60**: 1–39.
- Goodman, S.M. & Meininger, P.L. eds. (1989). *The Birds of Egypt*. Oxford University Press, Oxford, UK.
- Goodman, S.M. & Parillo, P. (1997). A study of the diets of Malagasy birds based on stomach contents. *Ostrich* **68**: 104–113.
- Goodman, S.M. & Putnam, M.S. (1997). The birds of the eastern slopes of the Réserve Naturelle Intégrale d'Andringitra, Madagascar. *Fieldiana Zool. (New Ser.)* **85**: 171–190.
- Goodman, S.M., Langrand, O. & Whitney, B.M. (1996). A new genus and species of passerine from the eastern rain forest of Madagascar. *Ibis* **138**: 153–159.
- Goodman, S.M., Pidgeon, M., Hawkins, A.F.A. & Schulenberg, T.S. (1997). The birds of south-eastern Madagascar. *Fieldiana Zool. (New Ser.)* **87**: 1–132.
- Goodman, S.M., Willard, D.E. & Gonzales, P.C. (1995). The birds of Sibuyan island, Romblon province, Philippines, with particular reference to elevational distribution and biogeographic affinities. *Fieldiana Zool. (New Ser.)* **82**: 1–57.
- Goodwin, D. (1967). Notes on behaviour of some Australian birds. *Emu* **66**(3): 237–251.
- Gore, M.E.J. (1990). *Birds of The Gambia. An Annotated Check-list*. 2nd edition. British Ornithologists' Union Check-list 3. British Ornithologists' Union, London.
- Gore, M.E.J. & Won Pyong-Oh (1971). *The Birds of Korea*. Royal Asiatic Society, Korea Branch, Taewon Publishing Company & Charles E. Tuttle, Seoul & Rutland.
- Gorman, G. (1996). *The Birds of Hungary*. Christopher Helm & A&C Black, London.
- Gorman, M.L. (1975). Habitats of the land birds of Viti Levu, Fiji Islands. *Ibis* **117**: 152–161.
- Gorney, D. (2000). Brown Creeper in Indiana. *Indiana Audubon Quarterly* **78**(1): 3–15.
- Gosper, C.R. (1999). Plant food resources of birds in coastal dune communities in New South Wales. *Corella* **23**(3): 53–62.
- Gosper, C.R. & Baker, J. (1997). Notes on the birds of Nadgee, particularly the Striated Fieldwren *Calamanthus fuliginosus*. *Austr. Bird Watcher* **17**(3): 111–125.
- Gosper, D.G. (1986). Birds in the Richmond River district, N.S.W., 1973–1983. 1. Distribution. *Corella* **10**(1): 1–16.
- Gosper, D.G. (1992). Forest bird communities of the Richmond River district, New South Wales. *Corella* **16**(3): 78–88.
- Gosper, D.G. (1996). Insectivory in the Figbird in northern New South Wales. *Sunbird* **26**(2): 36–38.
- Gotzman, J. (1967). Remarks on ethology of the Red-backed Shrike, *Lanius collurio* L. – nest defence and nest desertion. *Acta Orn. (Warszawa)* **10**: 83–96.
- Gould, J. (1855). *The Birds of Asia*. Part 7 (Vol. 2). Published privately, London.
- Gould, J. (1878). *The Birds of New Guinea and the Adjacent Papuan Islands Including any New Species that May Be Discovered in Australia*. Part 7. John Gould, London.
- Gould, J. (1885a). *The Birds of New Guinea and the Adjacent Papuan Islands Including any New Species that May Be Discovered in Australia*. Part 19. Henry Sotherton & Co, London.
- Gould, J. (1885b). *The Birds of New Guinea and the Adjacent Papuan Islands Including any New Species that May Be Discovered in Australia*. Part 20. Henry Sotherton & Co, London.
- Gould, M.L., Green, L., Altenau, B. & Blumstein, D.T. (2004). A study of the species-confidence hypothesis with Spiny-cheeked Honeyeater (*Acanthagenys rufogularis*). *Emu* **104**(3): 267–271.

- Granchi, E. (1988). Longevità 'dei nettarinai di *Nectarinia venusta* è *N. habessinica*, della Somalia, mantenuti in cattività. *Riv. Ital. Orn.* **58**(1/2): 99–100. In Italian with English summary.
- Gränitz, R. (1965). Zum Winteraufenthalt eines Mauerläufers (*Tichodroma muraria* L.) am Schloß Augustsburg/Erzgebirge. *Beitr. Vogelkd.* **10**: 426–432. In German.
- Grant, C.H.B. & Mackworth-Praed, C.W. (1942). Notes on Eastern African birds. *Bull. Brit. Orn. Club* **63**: 43–47.
- Grant, C.H.B. & Mackworth-Praed, C.W. (1943a). A new race of sunbird from the southern Belgian Congo. *Bull. Brit. Orn. Club* **63**: 63.
- Grant, C.H.B. & Mackworth-Praed, C.W. (1943b). Notes on Eastern African birds. *Bull. Brit. Orn. Club* **64**: 7–12.
- Grant, C.V., Steele, B.B. & Bayn, R.L. (1991). Raptor population dynamics in Utah's Uinta Basin: the importance of food resource. *Southwest. Nat.* **36**(3): 265–280.
- Grant, P.R. (1975). The classical case of character displacement. *Evol. Biol.* **8**: 237–337.
- Grant, P.R. (1978). Recent evolution of *Zosterops lateralis* on Norfolk Island, Australia. *Can. J. Zool.* **56**: 1624–1626.
- Grasseau, J. (2004). *Les Oiseaux de l'Est Africain*. Boubée, Paris. In French.
- Gravatt, D.J. (1969). *The Feeding Ecology of Honeyeaters (Aves – Meliphagidae) on Little Barrier Island*. MSc thesis, University of Auckland, Auckland, New Zealand.
- Gravatt, D.J. (1970). Honeyeater movements and the flowering cycle of vegetation on Little Barrier Island. *Notornis* **17**(2): 96–101.
- Gravatt, D.J. (1971). Aspects of habitat use by New Zealand honeyeaters, with reference to other forest species. *Emu* **71**(2): 65–72.
- Gray, C.S. (1988). *Ranging Behaviour of the Capricorn Silveryeye* *Zosterops lateralis chlorocephala* on *Heron Island*. MSc thesis, University of Queensland, Brisbane, Queensland.
- Gray, G.R. (1870). Descriptions of new species of birds from the Solomon and Banks's Groups of Islands. *Ann. Mag. Nat. Hist. Ser. 4, no. 5*: 327–331.
- Gray, H.H. (1972). The nests of three forest birds. *Bull. Nigerian Orn. Soc.* **9**: 24–25.
- Gray, H.H. (1986). Johanna's Sunbird in Nigeria. *Malimbus* **8**: 44.
- Greaves, P. (1978). Great Grey Shrikes feeding young on peanuts and bread. *British Birds* **71**: 362–363.
- Green, A.A. (1990). The avifauna of the southern sector of the Gashaka-Gumti Game Reserve, Nigeria. *Malimbus* **12**: 31–51.
- Green, C.A. (1991). First sight record of Yellow-vented Flowerpecker for Bali. *Kukila* **5**(2): 143–144.
- Green, K. (2006). Effect of variation in snowpack on timing of bird migration in the Snowy Mountains of south-eastern Australia. *Emu* **106**(3): 187–192.
- Green, K. & Sanecki, G. (2006). Immediate and short-term responses of bird and mammal assemblages to a subalpine wildfire in the Snowy Mountains, Australia. *Austr. Ecol.* **31**(6): 673–681.
- Green, M., Alerstam, T., Clausen, P., Drent, R. & Ebbinge, B.S. (2002). Dark-bellied Brent Geese *Branta bernicla bernicla*, as recorded by satellite telemetry, do not minimize flight distance during spring migration. *Ibis* **144**(1): 106–121.
- Green, M.J.B. (1986). The birds of the Kedarnath Sanctuary, Chamoli district, Uttar Pradesh: status and distribution. *J. Bombay Nat. Hist. Soc.* **83**: 603–617.
- Green, R.H. (1969). The birds of Flinders Island. *Rec. Queen Victoria Mus.* **34**: 1–32.
- Green, R.H. (1971). Nesting habits of the Yellow-tipped Pardalote. *Austr. Bird Bander* **9**(2): 34–35.
- Green, R.H. (1989). *Birds of Tasmania: an Annotated Checklist with Photographs*. 3rd edition. Potoroo Publishing, Launceston, Tasmania.
- Green, R.H. (1995). *The Fauna of Tasmania: Birds*. Potoroo Publishing, Launceston, Tasmania.
- Green, R.H. & McGarvie, A.M. (1971). The birds of King Island. *Rec. Queen Victoria Mus.* **40**: 1–42.
- Green, R.H. & Mollison, B.C. (1961). Birds of Port Davey and south coast of Tasmania. *Emu* **61**(3): 223–236.
- Green, R.J. (1984). Native and exotic birds in a suburban habitat. *Austr. Wildl. Res.* **11**(1): 181–190.
- Green, R.J. (1986). Native and exotic birds in the suburban habitat. Pp. 130–139 in: Ford & Paton (1986).
- Green, R.J. (1993). Avian seed dispersal in and near subtropical rainforests. *Wildl. Res.* **20**(4): 535–557.
- Green, R.J. & Catterall, C.P. (1998). The effects of forest clearing and regeneration on the fauna of Wivenhoe Park, south-east Queensland. *Wildl. Res.* **25**(6): 677–690.
- Greenway, J.C. (1935). Birds from the coastal range between the Markham and Waria Rivers, northeastern New Guinea. *Proc. New England Zool. Club* **14**: 15–106.
- Greenway, J.C. (1958). *Extinct and Vanishing Birds of the World*. Special Publication 13. American Committee for International Wild Life Protection, New York.
- Greenway, J.C. (1962). Family Oriolidae, orioles. Pp. 122–137 in: Mayr, E. & Greenway, J.C. eds. (1962). *Check-list of Birds of the World. A Continuation of the Work of James L. Peters*. Vol. 15. Museum of Comparative Zoology, Cambridge, Massachusetts.
- Greenway, J.C. (1966). Birds collected on Batanta, off Western New Guinea, by E. Thomas Gilliard in 1964. *Amer. Mus. Novit.* **2258**: 1–27.
- Greenway, J.C. (1967a). Family Sittidae, nuthatches, treerunners and wallcreepers. Pp. 125–149 in: Paynter (1967).
- Greenway, J.C. (1967b). Family Certhiidae, treecreepers and Spotted Creeper. Pp. 150–160 in: Paynter (1967).
- Greenway, J.C. (1967c). Family Rhabdornithidae, Philippine creepers. Pp. 161–162 in: Paynter (1967).
- Greenwood, S. (1967). Great Grey Shrike catching House Martin in flight. *British Birds* **60**: 92.
- Grégoire, A., McFarlane, M.L., Faivre, B., Evans, M.R. & Cherry, M.I. (2007). Patterns of morphological variation in two sexually dimorphic nectivorous bird species with different tail shapes. *Biol. J. Linn. Soc.* **91**: 437–443.
- Gregory, P. (1993). An unidentified berrypecker *Melanocharis* sp. from the Ok Tedi area. *Muruk* **6**(1): 33.
- Gregory, P. (1995a). *The Birds of the Ok Tedi Area*. Ok Tedi Mining, Tabubil, Papua New Guinea.
- Gregory, P. (1995b). Further studies of the birds of the Ok Tedi area, Western Province, Papua New Guinea. *Muruk* **7**(1): 1–38.
- Gregory, P. (1995c). More from Manus. *Muruk* **7**(3): 112–115.
- Gregory, P. (1996). Birding the Middle Sepik. *Muruk* **8**(1): 24–27.
- Gregory, P. (1997). Range extensions and unusual sightings from Western Province, Papua New Guinea. *Bull. Brit. Orn. Club* **117**(4): 304–311.
- Gregory, P. ed. (2007). Significant sightings from tour reports. *Muruk* **8**(3): 99–128.
- Gregory, P. & Eastwood, C. (1994). Interesting sightings during 1993 & 1994. *Muruk* **7**(3): 128–142.
- Gregory, P. & Johnston, G.R. (1993). Birds of the cold tropics: Dokfuma, Star Mountains, New Guinea. *Bull. Brit. Orn. Club* **111**(3): 139–145.
- Gregory, P. & Webster, R. (2004). Papua New Guinea 2004 – July 27, 2004 to August 17, 2004. Field Guides Incorporated, Austin, Texas. Pp. 20. URL: <http://www.fieldguides.com/2004weblists/png04LIST.pdf?search=%22berrypecker%20Gregory%20obscure%22> (download 24 July 2007).
- Gregory, P., Halse, S.A., Jaensch, R.P., Kay, W.R., Kulmoi, P., Pearson, G.B. & Storey, A.W. (1996). The Middle Fly Waterbird Survey 1994–95. *Muruk* **8**(1): 1–7.
- Gregory-Smith, R. (1994). Birds and mammals in mangroves of mainland Kedah. *Malay. Nat. J.* **47**: 425–430.
- Gregory-Smith, R. & Gregory-Smith, J. (1989). Bird notes from Wallai Island. *Muruk* **4**(1): 21.
- Greig-Smith, P.W. (1977). Mixed-species flocking of Nigerian forest birds. *Bull. Nigerian Orn. Soc.* **13**: 53–56.
- Greig-Smith, P.W. (1978). Imitative foraging in mixed-species flocks of Seychelles birds. *Ibis* **120**: 233–235.
- Greig-Smith, P.W. (1979). Observations of nesting and group behaviour of Seychelles White-eyes *Zosterops modesta*. *Ibis* **121**: 344–348.
- Greig-Smith, P.W. (1980). Foraging, seasonality and nesting of Seychelles Sunbirds *Nectarinia dussumieri*. *Ibis* **122**: 307–321.
- Greig-Smith, P.W. (1984a). Significance of a hovering display at the nests of the Long-tailed Tit *Aegithalos caudatus*. *Behaviour* **89**(1/2): 59–72.
- Greig-Smith, P.W. (1984b). Changes in the eyelid colour of Long-tailed Tits *Aegithalos caudatus*. *Bird Study* **31**(1): 35–38.
- Greig-Smith, P.W. (1986). The distribution of native and introduced landbirds on Silhouette Island, Seychelles, Indian Ocean. *Biol. Conserv.* **38**(1): 35–54.
- Gretton, A. (1990). Recent reports. *Bull. Oriental Bird Club* **11**: 40–48.
- Grewal, B. (1993). *Birds of India, Bangladesh, Nepal, Pakistan & Sri Lanka: a Photographic Guide*. Guidebook Company, Hong Kong.
- Grey, J.A. (1985). *Behavioural Energetics of Honeyeaters in Relation to Pollination and Resource Selection*. MSc thesis, Curtin University of Technology, Perth, Western Australia.
- Grey, M.J., Clarke, M.F. & Loyn, R.H. (1997). Initial changes in the avian communities of remnant eucalypt woodlands following a reduction in the abundance of Noisy Miners, *Manorina melanocephala*. *Wildl. Res.* **24**(6): 631–648.
- Grey, M.J., Clarke, M.F. & Loyn, R.H. (1998). Influence of the Noisy Miner *Manorina melanocephala* on avian diversity and abundance in remnant grey box woodland. *Pacific Conserv. Biol.* **4**(1): 55–69.
- Griffin, A.C.M. (1972). Yellow-tinted Honeyeaters near Townsville. *Sunbird* **3**: 26–28.
- Griffin, A.C.M. (1974). Birds of Mount Spec. *Sunbird* **5**(2): 29–39.
- Griffin, A.C.M. (1995). An annotated list of the birds of the Paluma Range, North Queensland. *Sunbird* **25**: 73–92.
- Griffioen, P.A. & Clarke, M.F. (2002). Large-scale bird-movement patterns in eastern Australian atlas data. *Emu* **102**(1): 99–125.
- Grimes, L.G. (1971). Notes on some birds seen at Buea and on Mount Cameroon 30 Dec. 1970–Jan. 1971. *Bull. Nigerian Orn. Soc.* **8**: 35–45.
- Grimes, L.G. (1974). Dialects and geographical variation in the song of the Splendid Sunbird *Nectarinia cocciniger*. *Ibis* **116**: 314–329.
- Grimes, L.G. (1975). Cooperative breeding behaviour and family relationship within groups of the Long-tailed Shrike *Corvinella corvina*. *Emu* **74** (Suppl.): 309–310.
- Grimes, L.G. (1976). The occurrence of cooperative breeding behaviour in African birds. *Ostrich* **47**: 1–15.
- Grimes, L.G. (1979a). Sexual dimorphism in the Yellow-billed Shrike *Corvinella corvina* and in other African shrikes. *Bull. Brit. Orn. Club* **99**: 33–36.
- Grimes, L.G. (1979b). The Yellow-billed Shrike *Corvinella corvina* an abnormal host of the Yellow-billed Cuckoo *Cuculus gularis*. *Bull. Brit. Orn. Club* **99**(1): 36–38.
- Grimes, L.G. (1980). Observations of group behaviour and breeding biology of the Yellow-billed Shrike *Corvinella corvina*. *Ibis* **122**: 166–192.
- Grimes, L.G. (1985). Shrike. Pp. 534–536 in: Campbell & Lack (1985).
- Grimes, L.G. (1987). *The Birds of Ghana. An Annotated Check-list*. British Ornithologists' Union Checklist **9**. British Ornithologists' Union, London.
- Grimes, L.G. (2002). Observations of the breeding and social behaviour of the Long-tailed Shrike in the vicinity of Bulawayo. *Honeyguide* **48**: 5–27.
- Grimes, L.G. (2006). Changes in the number of cooperative breeding groups of Yellow-billed Shrike *Corvinella corvina* at the University of Ghana, Legon, over 34 years. *Malimbus* **28**: 35–44.
- Grimes, L.G. (2007). Dialects in the song of the Splendid Sunbird *Cinnyris coccinigastra* [sic] at the University of Ghana, Legon, Ghana, February–April 2004. *Malimbus* **29**(1): 1–15.
- Grimm, H. (2006). Notizen zu Habitatwahl, Biologie und Verhalten von *Lanius tephronotus tephronotus* (Vigors, 1831) (Aves) in Nordwest-Nepal. Pp. 49–54 in: Hartmann, M. & Weipert, J. eds. (2006). *Biodiversität und Naturschutz im Himalaya*. [Part] 2. Verein der Freunde und Förderer des Naturkundemuseums Erfurt e.V., Erfurt, Germany. In German with English summary.
- Grimmett, R., Inskipp, C. & Inskipp, T. (1998). *Birds of the Indian Subcontinent*. Christopher Helm & A&C Black, London.
- Grimmett, R., Inskipp, C. & Inskipp, T. (1999). *A Guide to the Birds of India, Pakistan, Bangladesh, Bhutan, Sri Lanka and the Maldives*. Princeton University Press, Princeton.
- Grimmett, R., Inskipp, C. & Inskipp, T. (2000). *Birds of Nepal*. Christopher Helm & A&C Black, London.
- Grinnell, J. (1903). Call notes of the Bush-tit. *Condor* **5**: 85–87.
- Grote, H. (1924). Neue Formen aus Westafrika. *Pern. Monatsber.* **32**(3): 68–72. In German.
- Groth, J.G. (2002). A phylogenetic hypothesis for passerine birds: taxonomic and biogeographic implications of an analysis of nuclear DNA sequence data. *Austr. J. Zool.* **41**(5): 423–432.
- Groth, J.G. & Barrowclough, G.F. (1999). Basal divergences in birds and the phylogenetic utility of the nuclear RAG-1 gene. *Mol. Phylog. Evol.* **12**: 115–123.
- Grubb, T.C. & Yosef, R. (1994). Habitat-specific nutritional condition in Loggerhead Shrikes (*Lanius ludovicianus*): evidence from ptitochronology. *Auk* **111**: 756–759.
- Grubb, T.G., Bowerman, W.W. & Howe, P.W. (1994). Tracking local and seasonal movements of wintering Bald Eagles *Haliaeetus leucocephalus*. Pp. 347–358 in: Meyburg, B.U. & Chancellor, R.D. eds. (1994). *Raptor Conservation Today*. Pica Press, London.
- Grunwald, H. (1991). Die Gartenbänderschnecke als Beute überwinternden Raubvögels. *Charadrius* **2**: 81–87. In German.
- Grzimek, B., Meise, W., Niethammer, G. & Steinbacher, J. eds. (1984). *Grzimek's Animal Life Encyclopedia*. Vol. 9. Birds. 3rd English edition. Van Nostrand Reinhold Company, New York.
- Gubanich, A.A. & Panik, H.R. (1990). Cowbird parasitism on the Lead-colored Bush-tit. *Western Birds* **21**(1): 35–36.
- Gudmundsson, G.A., Lindström, A. & Alerstam, T. (1991). Optional fat loads and long distance flights by migrating Knots *Calidris canutus*, Sanderlings *C. alba* and Turnstones *A. interpres*. *Ibis* **133**: 140–152.
- Guest, R. & Guest, G.P. (1987). Birds from a Te Kuiti garden. *Notornis* **34**(1): 59–64.
- Guest, R. & Guest, G.P. (1993). Birds from a Palmerston North garden. *Notornis* **40**(2): 137–141.
- Guest, S.J. (1973a). *A Reproductive Biology and Natural History of the Japanese White-eye* (*Zosterops japonica japonica*) in *Urban Oahu*. MSc thesis, University of Hawaii, Honolulu, Hawaii.
- Guest, S.J. (1973b). White-eye vocal mimicry. *Elepaio* **34**: 3–4.
- Güntert, M., Hay, D.B. & Balda, R.P. (1988). Communal roosting in Pygmy Nuthatch: a winter survival strategy. Pp. 1964–1972 in: Ouellet, H. ed. (1988). *Acta XIX Congressus Internationalis Ornithologici*. Vol. 2. University of Ottawa Press, Ottawa, Canada.
- Günther, R. & Feiler, A. (1985). Die Vögel der Insel São Tomé. *Mitt. Zool. Mus. Berlin* **61** (Suppl. Ann. **9**): 3–28. In German with English summary.
- Guo Guiyun, Zhou Youbing, Zhang Jun, Tang Kuanjun, Zheng Feng & Jing Xiaojing (2006). Nest-site selection, breeding ecology and helper behavior of *Aegithalos concinnus* in northeastern Sichuan, China. *Chinese J. Zool.* **41**(6): 29–35. In Chinese with English summary.
- Gwinner, E. (1968). Circannuale Periodik als Grundlage des jahreszeitlichen Funktionswandels bei Zugvögeln. Untersuchungen am Fitis (*Phylloscopus trochilus*) und am Waldbaubsänger (*P. sibilatrix*). *J. Orn.* **109**: 70–95. In German with English summary.
- Gwinner, E. (1971). A comparative study of circannual rhythms in warblers. Pp. 405–427 in: Menaker, M. ed. (1971). *Biochronometry*. National Academy of Sciences, Washington, D.C.
- Gwinner, E. (1972). Adaptive functions of circannual rhythms in warblers. Pp. 218–236 in: Voous, K.H. ed. (1972). *Proceedings of the 15th International Ornithological Congress*, 30 Aug.–5 Sept. 1970. *The Hague*. E.J. Brill, Leiden, The Netherlands.
- Gwinner, E. (1981). Circannual rhythms: their dependence on the circadian system. Pp. 153–169 in: Follett, B.K. & Follett, D.E. eds. (1981). *Biological Clocks in Seasonal Reproductive Cycles*. Wright Publishers, Bristol, UK.
- Gwinner, E. (1986). *Circannual Rhythms*. Springer, Berlin.
- Gwinner, E. ed. (1990a). *Bird Migration. Physiology and Ecophysiology*. Springer, Berlin.

- Gwinner, E. (1990b). Circannual rhythms in bird migration: control of temporal patterns and interactions with photoperiod. Pp. 257–267 in: Gwinner (1990a).
- Gwinner, E. (1996). Circannual clocks in avian reproduction and migration. *Ibis* **138**: 47–63.
- Gwinner, E. & Biebach, H. (1977). Endogene Kontrolle der Mauser und der Zugdisposition bei südfinnischen und südfanzösischen Neuntörtern. *Vogelwarte* **29**: 56–63. In German.
- Gwinner, E. & Helm, B. (2003). Circannual and circadian contributions to the timing of avian migration. Pp. 81–95 in: Berthold *et al.* (2003).
- Gwinner, E. & Wiltshko, W. (1978). Endogenously controlled changes in migratory direction of the Garden Warbler *Sylvia borin*. *J. Comp. Physiol.* **125**: 267–273.
- Gwynne, A.J. (1948). Notes on the Brown Honeyeater. *Emu* **47**(3): 161–164.
- Gyldenstolpe, N. (1924). Zoological results of the Swedish Expedition to Central Africa 1921. Vertebrata. 1. Birds. *Kung. Svenska Vet. Handl. Ser. 3, no. 1*(3): 1–326, pls. 1–2.
- Gyldenstolpe, N. (1955a). Notes on a collection of birds made in the Western Highlands, Central New Guinea, 1951. *Ark. Zool. Ser. 2, no. 8*(1): 1–181, pls. 1–15.
- Gyldenstolpe, N. (1955b). Birds collected by Dr. Sten Bergman during his expedition to Dutch New Guinea 1948–1949. *Ark. Zool. Ser. 2, no. 8*(2): 183–397, pls. 1–6.
- Haas, C.A. (1985). Nest nesting dates for Brown Thrashers, Loggerhead Shrikes, and American Robins in North Dakota. *Prairie Nat.* **17**: 249–250.
- Haas, C.A. (1987). Eastern subspecies of the Loggerhead Shrike: the need for measurements of live birds. *North Amer. Bird Bander* **12**: 99–102.
- Haas, C.A. (1995). Dispersal and use of corridors by birds in wooded patches on an agricultural landscape. *Conserv. Biol.* **9**(4): 845–854.
- Haas, C.A. & Ogawa, I. (1995). Population trends of Bull-headed and Brown Shrikes in Hokkaido, Japan. *Proc. West. Found. Vert. Zool.* **6**: 72–75.
- Haas, C.A. & Sloane, S. (1989). Low return rates of migratory Loggerhead Shrikes: winter mortality or low site fidelity? *Wilson Bull.* **101**: 458–460.
- Hachisuka, Marquess (1930). Contribution to the birds of the Philippines. No. 2(4). *Orn. Soc. Japan Suppl. Publ.* **14**: 141–222.
- Hadden, D. (1975). New distributional record. Yellow-bellied Mountain White-eye *Zosterops fuscicapilla*. *Papua New Guinea Bird Soc. Newsl.* **115**: 16.
- Hadden, D. (1981). *Birds of the North Solomons*. Wau Ecology Institute Handbook **8**. Wau Ecology Institute, Wau, Papua New Guinea.
- Hadden, D. (2004). *Birds and Bird Lore of Bougainville and the North Solomons*. Dove Publications, Alderley, Queensland.
- Hadley, C.J. & Parker, S.A. (1965). Fieldnotes on the birds of the Santa Cruz Islands, south west Pacific. *Bull. Brit. Orn. Club* **85**: 154–159.
- Haensel, J. (1963). Vom Schwarzstirnwürger (*Lanius minor* Gmelin) im nordöstlichen Harzvorland, seine Bestandsschwankungen und ihre vermutlichen Ursachen. *Beitr. Vogelkd.* **8**: 353–360. In German.
- Haensel, J. (1965). Zur Ernährungsbiologie des Schwarzstirnwürgers (*Lanius minor* Gm.) nach Gewöluntersuchungen im nördlichen Harzvorland. *Beitr. Vogelkd.* **10**: 199–210. In German.
- Haffer, J. (1993a). Sittidae – Kleiber, Spechtmeisen / Gattung *Sitta* Linnaeus 1758. Pp. 817–823 in: Glutz von Blotzheim & Bauer (1993).
- Haffer, J. (1993b). Tichodromidae – Mauerläufer. Pp. 880–881 in: Glutz von Blotzheim & Bauer (1993).
- Haffer, J. (1993c). Familie Certhiidae – Baumläufer. Pp. 919–923 in: Glutz von Blotzheim & Bauer (1993).
- Haffer, J. (1993d). *Certhia familiaris* Linnaeus 1758 – Waldbaumläufer [with additions on voice and behaviour by G. Thielcke]. Pp. 923–968 in: Glutz von Blotzheim & Bauer (1993).
- Haffer, J. (1993e). *Certhia brachydactyla* C. L. Brehm 1820 – Gartenbaumläufer [with additions on voice and behaviour by G. Thielcke]. Pp. 969–996 in: Glutz von Blotzheim & Bauer (1993).
- Haffer, J. (1993f). Remizidae – Beutelmeisen / Gattung *Remiz* Jarocki 1819. Pp. 997–998 in: Glutz von Blotzheim & Bauer (1993).
- Haffer, J. (1993g). Oriolidae – Pirole / Gattung *Oriolus* Linnaeus 1766. Pp. 1069–1071 in: Glutz von Blotzheim & Bauer (1993).
- Haffer, J. (1993h). Laniidae – Würger. Pp. 1122–1365 in: Glutz von Blotzheim & Bauer (1993).
- Hagemeijer, W.J.M. & Blair, M.J. eds. (1997). *The EBCC Atlas of European Breeding Birds: their Distribution and Abundance*. T.&A.D. Poyser, London.
- Hahnke, H. (1998). The Long-tailed Shrike (*Lanius schach*) – a superspecies? Page 113 in: Yosef & Lohrer (1998).
- Hailman, J.P. & Hailman, E.D. (1991). Bellbirds feeding on sap of black beech. *Notornis* **38**(3): 238–239.
- Hale, M. (1996). Thick-billed Flowerpecker – a first record for Bali: *Kukila* **8**: 155–157.
- Hall, B.P. (1960). The ecology and taxonomy of some Angola Birds. *Bull. Brit. Mus. (Nat. Hist.) Zool.* **6**(7): 368–453, pls. 5–6.
- Hall, B.P. & Carline, F. (1974). Oriolidae – orioles. Pp. 327–330 in: Hall, B.P. ed. (1974). *Birds of the Harold Hall Australian Expeditions 1962–70*. Trustees of the British Museum (Natural History), London.
- Hall, B.P. & Moreau, R.E. (1970). *An Atlas of Speciation in African Passerine Birds*. Trustees of the British Museum (Natural History), London.
- Hall, R. (1996). Reconstructing Cenozoic SE Asia. Pp. 153–184 in: Hall, R. & Blundell, D. eds. (1996). *Tectonic Evolution in Southeast Asia*. Geological Society of London, London.
- Hall, R. (2002). Cenozoic geological and plate tectonic evolution of SE Asia and the SW Pacific: computer based reconstructions, models and animations. *J. Asian Earth Sci.* **20**: 353–431.
- Halse, S.A. (1978). Feeding habits of six species of honeyeater in south-western Australia. *Emu* **78**(3): 145–148.
- Halse, S.A., Morris, K.D., Nichols, O.G. & Rice, G.E. (1985). Vertebrate fauna along the Marchagee Track, Western Australia. *West. Austr. Nat.* **16**(4): 57–68.
- Hambly, C., Markman, S., Roxburgh, L. & Pinshow, B. (2007). Seasonal sex-specific energy expenditure in breeding and non-breeding Palestine Sunbirds *Nectarinia osea*. *J. Avian Biol.* **38**(2): 190–197.
- Hammersley, J. & Hammersley, J. (1983). In search of the Huon endemics. *Papua New Guinea Bird Soc. Newsl.* **203**–206: 11–17.
- Handrinos, G. & Akriotis, T. (1997). *The Birds of Greece*. Christopher Helm & A&C Black, London.
- Haneda, K. & Takahashi, Y. (1968). Life history of the Japanese Red-tailed Shrike (*Lanius cristatus superciliosus*). I. Breeding season. *Jap. J. Ecol.* **18**(2): 47–56. In Japanese with English summary.
- Haney, J.C. (1981). The distribution and life history of the Brown-headed Nuthatch (*Sitta pusilla*) in Tennessee. *Migrant* **52**(4): 77–86.
- Hannmer, D.B. (1979). The Grey Sunbird *Nectarinia veronii* in southern Malawi. *Bull. Brit. Orn. Club* **99**: 71–72.
- Hannmer, D.B. (1981). Mensural and moult data of nine species of sunbird from Moçambique and Malawi. *Ostrich* **52**(3): 156–178.
- Hannmer, D.B. (1989). The end of an era – final longevity figures for Nchalo. *Safring News* **18**: 19–32.
- Hannmer, D.B. (1992). Sunbirds drinking in hot weather. *Honeyguide* **38**(2): 79.
- Hannmer, D.B. (1997). Bird longevity in the Eastern Highlands of Zimbabwe – drought survivors. *Safring News* **26**: 47–54.
- Hannmer, D.B. (2001). Sunbird movement in the Eastern Highlands of Zimbabwe. *Honeyguide* **47**: 140–161.
- Hannmer, D.B. (2002). A xanthochromic Black Sunbird. *Honeyguide* **48**(1): 89.
- Hannah, D., Woinarski, J.C.Z., Catterall, C.P., McCosker, J.C., Thurgate, N.Y. & Fensham, R.J. (2007). Impacts of clearing, fragmentation and disturbance on the bird fauna of eucalypt savanna woodlands in Central Queensland, Australia. *Austr. Ecol.* **32**: 261–276.
- Hannecart, F. & Létocart, Y. (1980). *Oiseaux de Nouvelle-Calédonie et des Loyautés*. Vol. 1. Les Éditions Cardinalis, Nouméa, New Caledonia. In French.
- Hannecart, F. & Létocart, Y. (1983). *Oiseaux de Nouvelle-Calédonie et des Loyautés*. Vol. 2. Les Éditions Cardinalis, Nouméa, New Caledonia. In French.
- Hansen, D.M., Olesen, J.M. & Jones, C.G. (2002). Trees, birds and bees in Mauritius: exploitative competition between introduced honey bees and endemic nectarivorous birds? *J. Biogeogr.* **29**(5/6): 721–734.
- Hantge, E. (1957). Zur Brutbiologie des Schwarzstirnwürgers *Lanius minor*. *Vogelwelt* **78**: 137–146. In German.
- Happel, R. (1986). Observations of birds and other frugivores feeding at *Tetrorchidium didymostemon*. *Malimbis* **8**: 77–78.
- Harding, E. (1982). Birds of Nissan and Pinipel Islands, North Solomons province. *Papua New Guinea Bird Soc. Newsl.* **195/196**: 4–12.
- Hardy, J.W. & Farrell, J.R. (1990). A bird banding study in the Blue Mountains, New South Wales. 1. Overview. *Corella* **14**(1): 1–15.
- Harebottle, D.M. (1999). Nestling period of the Greater Doublecollared Sunbird *Nectarinia afra*. *Bird Numbers* **8**(1): 22–23.
- Hargrave, L.L. (1939). Bird bones from abandoned Indian dwellings in Arizona and Utah. *Condor* **41**: 206–210.
- Harrap, S. (1991). The Hainan Nuthatch. *Bull. Oriental Bird Club* **13**: 35–36.
- Harrap, S. (1992). Identification of Short-toed Treecreeper. *Birding World* **5**(1): 10–16.
- Harrap, S. & Fisher, T. (2007). The Philippines 11 February–5 March 2006 – tour report. URL: <http://www.birdquest.co.uk/reportFiles/PHILIPPINES%20REP%2006.pdf> (download 28 April 2008).
- Harrap, S. & Quinn, D. (1996). *Tits, Nuthatches & Treecreepers*. Christopher Helm & A&C Black, London.
- Harris, A. (1998). An almost fully melanistic Silvereye (*Zosterops lateralis*) from Otago. *Notornis* **45**: 309–310.
- Harris, J.G.K. (1980). Birds of the Sullivans Cove area, City of Hobart. *Tasmanian Nat.* **60**: 1–6.
- Harris, T. (1995). Species recognition in the Southern African population of the Fiscal Shrike (*Lanius collaris*). *Proc. West. Found. Vert. Zool.* **6**(1): 11–21.
- Harris, T. (1998). Conservation status of African true shrikes. Pp. 102–111 in: Yosef & Lohrer (1998).
- Harris, T. & Arnott, G. (1988). *Shrikes of Southern Africa: True Shrikes, Helmet-shrikes and Bush-shrikes. Including the Batises and Black-throated Wattle-eye*. Struik Winchester, Cape Town.
- Harris, T. & Franklin, K. (2000). *Shrikes & Bush-shrikes Including Wood-shrikes, Helmet-shrikes, Flycatcher-shrikes, Philentomas, Batises and Wattle-eyes*. Helm Identification Guides. Christopher Helm & A&C Black, London.
- Harrison, C.J.O. (1968a). Some comparative notes on the Common and Yellow Silver-eyes. *Emu* **68**: 127–131.
- Harrison, C.J.O. (1968b). The nest and eggs of *Arachnothera chrysogenys*. *Bull. Brit. Orn. Club* **88**(8): 138–139.
- Harrison, C.J.O. (1969). Helpers at the nest in Australian passerine birds. *Emu* **69**(1): 30–40.
- Harrison, C.J.O. (1975). *A Field Guide to the Nests, Eggs and Nestlings of British and European Birds with North Africa and the Middle East*. Collins, London.
- Harrison, C.J.O. & Frith, C.B. (1970). Nests and eggs of some New Guinean birds. *Emu* **70**: 173–178.
- Harrison, C.J.O. & Parker, S.A. (1966). The taxonomic affinities of the New Guinea genera *Paramythia* and *Oreocharis*. *Bull. Brit. Orn. Club* **86**: 15–20.
- Harrison, J. (1999). *A Field Guide to the Birds of Sri Lanka*. Oxford University Press, Oxford & New York.
- Harrison, J.A. (1997a). Greater Doublecollared Sunbird *Nectarinia afra*. Pp. 504–505 in: Harrison *et al.* (1997).
- Harrison, J.A. (1997b). Dusky Sunbird *Nectarinia fusca*. Pp. 510–511 in: Harrison *et al.* (1997).
- Harrison, J.A., Allan, D.G., Underhill, L.G., Herremans, M., Tree, A.J., Parker, V. & Brown, C.J. eds. (1997). *The Atlas of Southern African Birds*. Vol. 2. Passerines. BirdLife South Africa, Johannesburg, South Africa.
- Harrison, M.J.S. (1990). A recent survey of the birds of Pagalu (Annobón). *Malimbis* **11**: 135–143.
- Harrison, P. (1983). *Seabirds. An Identification Guide*. Croom Helm, Beckenham, UK.
- Harrison, T.H. (1956a). The Mountain Black-eye (*Chlorocharis*). Ecology and natural history. *Sarawak Mus. J.* **6**: 662–688.
- Harrison, T.H. (1956b). A new Mountain Black-eye (*Chlorocharis*) from North Borneo. *Sarawak Mus. J.* **7**: 518–521.
- Harrop, H. & Jenkins, G. (2006). The Wallcreepers of Les Baux de Provence. *Birding World* **19**(2): 71–73.
- Hartert, E.J.O. (1895). List of a second collection of birds from the Natuna Islands. *Novit. Zool.* **2**: 466–478.
- Hartert, E.J.O. (1896). An account of the collections of birds made by Mr. William Doherty in the Eastern Archipelago. *Novit. Zool.* **3**: 537–590.
- Hartert, E.J.O. (1897a). Descriptions of seven new species of birds and one new subspecies from Flores, and of one new subspecies from Djampea. *Novit. Zool.* **4**: 170–172.
- Hartert, E.J.O. (1897b). On the birds collected by Mr. Everett in south Flores. Part 1. *Novit. Zool.* **4**: 513–528.
- Hartert, E.J.O. (1898a). On the birds collected on Sudest Island in the Louisiade Archipelago by Albert S. Meek. *Novit. Zool.* **5**: 521–532.
- Hartert, E.J.O. (1898b). On the birds of the Mariana Islands. *Novit. Zool.* **5**: 51–69.
- Hartert, E.J.O. (1899a). On the birds collected by Mr. Meek on Rossel Island in the Louisiade Archipelago. *Novit. Zool.* **6**: 76–84.
- Hartert, E.J.O. (1899b). On the birds collected by Mr. Meek on St. Aignan Island in the Louisiade Archipelago. *Novit. Zool.* **6**: 206–217.
- Hartert, E.J.O. (1900a). On the birds of Ruk in the central Carolines. *Novit. Zool.* **7**: 1–11.
- Hartert, E.J.O. (1900b). The birds of Dammer Island in the Banda Sea. *Novit. Zool.* **7**: 12–24.
- Hartert, E.J.O. (1900c). The birds of Buru. Being a list of collections made on that island by Messrs. William Doherty and Dumas. *Novit. Zool.* **7**: 226–242.
- Hartert, E.J.O. (1901). On a collection of birds from the Timorlaut Islands. *Novit. Zool.* **8**: 163–176.
- Hartert, E.J.O. (1903a). *Die Vögel der paläarktischen Fauna – Systematische Übersicht der in Europa, Nord-Asien und der Mittelmeerregion vorkommenden Vögel*. Vol. 1(1). R. Friedländer und Sohn, Berlin. In German.
- Hartert, E.J.O. (1903b). On the birds of the Key and South-east Islands, and of Ceram-Laut. *Novit. Zool.* **10**: 232–254.
- Hartert, E.J.O. (1904). The birds of the South-west Islands Wetter, Roma, Kisser, Letti and Moa. *Novit. Zool.* **11**: 174–221.
- Hartert, E.J.O. (1905). *Die Vögel der paläarktischen Fauna. Systematische Übersicht der in Europa, Nord-Asien und der Mittelmeerregion vorkommenden Vögel*. Vol. 1(3). R. Friedländer und Sohn, Berlin. In German.
- Hartert, E.J.O. (1907a). *Die Vögel der paläarktischen Fauna. Systematische Übersicht der in Europa, Nord-Asien und der Mittelmeerregion vorkommenden Vögel*. Vol. 1(4). R. Friedländer und Sohn, Berlin. In German.
- Hartert, E.J.O. (1907b). Die Gattung *Pholidornis*. *J. Orn.* **55**(4): 620–622. In German.
- Hartert, E.J.O. (1908). [Description of new forms from the Solomon Islands]. *Bull. Brit. Orn. Club* **21**: 105–106.
- Hartert, E.J.O. (1920). Types of birds in the Tring Museum. Nectariniidae to Troglodytidae. *Novit. Zool.* **27**: 425–505.
- Hartert, E.J.O. (1924a). Notes on some birds from Buru. *Novit. Zool.* **31**: 104–111.
- Hartert, E.J.O. (1924b). The birds of New Hanover. *Novit. Zool.* **31**: 194–213.
- Hartert, E.J.O. (1925). A collection of birds from New Ireland (Neu Mecklenburg). *Novit. Zool.* **32**: 115–136.
- Hartert, E.J.O. (1926a). On the birds of Feni and Nissan Islands, east of south New Ireland. *Novit. Zool.* **33**(1): 33–48.
- Hartert, E.J.O. (1926b). On the birds of the district of Talasea in New Britain. *Novit. Zool.* **33**(2): 122–145.

Hartert, E.J.O. (1926c). On the birds of the French Islands, north of New Britain. *Novit. Zool.* **33**(2): 171–178.

Hartert, E.J.O. (1929). Birds collected during the Whitney South Sea Expedition. 8. Notes on birds from the Solomon Islands. *Amer. Mus. Novit.* **364**: 1–19.

Hartert, E.J.O. (1930). List of birds collected by Ernst Mayr. *Novit. Zool.* **36**: 27–128.

Hartert, E.J.O., Paludan, K., Rothschild, W. & Stresemann, E. (1936). Ornithologische Ergebnisse der Expedition Stein 1931–1932. IV. Die Vögel des Weyland-Gebirges und seines Vorlandes. *Mitt. Zool. Mus. Berlin* **11**(2): 165–240. In German.

Hartlaub, G. (1865). Monographischer Versuch über die Gattung *Zosterops*. *J. Orn.* **13**: 1–30. In German.

Hartlaub, G. (1877). *Die Vögel Madagascars und der benachbarten Inselgruppen*. H.W. Schmidt, Halle/Saale, Germany. In German.

Hartlaub, G. & Finsch, O. (1868). On a collection of birds from the Pelew Islands. *Proc. Zool. Soc. London* **1868**(1): 4–9.

Hartlaub, G. & Finsch, O. (1872). On a fourth collection of birds from the Pelew and Mackenzie Islands. *Proc. Zool. Soc. London* **1872**(1): 87–114.

Hartley, I.R. & McGowan, P.J.K. (1991). Moults and biometrics in five birds endemic to Palawan, Philippines. *Forktail* **6**: 74–77.

Hartman, F.A. (1955). Heart weight in birds. *Condor* **57**: 221–238.

Hartshorne, C. (1973). *Born to Sing*. Indiana University Press, Bloomington, Indiana.

Harwin, R.M. & Manson, A.J. (1972). A melanistic oriole – a problem in identification. *Honeyguide* no. 70 [vol. 17(2)]: 33–34.

Hasan, M. (2001). *Birds of the Indus*. Oxford University Press, Oxford & Karachi.

Haselgrove, P. (1975). Notes on the birds of Groote Eylandt, N.T. *Sunbird* **6**(2): 32–41.

Hastings, R.A. & Beattie, A.J. (2006). Stop the bullying in the corridors: can including shrubs make your revegetation more Noisy Miner free? *Ecol. Manag. & Restor.* **7**(2): 105–112.

Hatchwell, B.J., Ross, D.J., Chaline, N., Fowle, M.K. & Burke, T. (2002). Parentage in the cooperative breeding system of Long-tailed Tits, *Aegithalos caudatus*. *Anim. Behav.* **64**: 55–63.

Hatchwell, B.J., Ross, D.J., Fowle, M.K. & McGowan, A. (2001). Kin discrimination in cooperatively breeding Long-tailed Tits. *Proc. Royal Soc. London (Ser. B Biol. Sci.)* **268**: 885–890.

Hatchwell, B.J., Russell, A.F., MacColl, A.D.C., Ross, D.J., Fowle, M.K. & McGowan, A. (2004). Helpers increase long-term but not short-term productivity in cooperatively breeding Long-tailed Tits. *Behav. Ecol.* **15**(1): 1–10.

Haugaard, J. (1995). Unusual aggression by sunbird. *Vogifer* **2**: 6.

Haupt, H., Todte, B. & Todte, I. (1992). Beiträge zur Brutbiologie der Beutelmäuse (*Remiz pendulinus*). *Beitr. Vogelkd.* **38**(4): 231–248. In German with English summary.

Haupt, H., Todte, B. & Todte, I. (1993). Ängstlerstreuung, Zug und Lebensalter ostdeutscher Beutelmäusen (*Remiz pendulinus*). *Beitr. Vogelkd.* **39**(6): 321–350. In German with English summary.

Hauri, R. (1970). Zur Lebensweise des Mauerläufers *Tichodroma muraria* im Winter. *Orn. Beob.* **67**: 14–34. In German.

Hauri, R. (1978). Beiträge zur Brutbiologie des Mauerläufers *Tichodroma muraria*. *Orn. Beob.* **75**: 173–192. In German.

Hauri, R. (1988). Zur Vogelwelt der Molassefelsen im bernischen Mittelland. *Orn. Beob.* **85**: 1–79. In German.

van der Have, T.M., Keijl, G.O., Mansoori, J. & Morozov, V.V. (2001). *Searching for Slender-billed Curlews in Iran, January–February 2000: Result of a Coastal Wetland Survey in the Islamic Republic of Iran, with Special Attention for Slender-billed Curlews*. WWO-Report **72**. Stichting Werkgroep voor Internationaal Wad- en Watervogelonderzoek, Zeist, Netherlands. 69 pp.

Haw, J.M., Clout, M.N. & Powlesland, R.G. (2001). Diet of Moreporks (*Ninox novaeseelandiae*) in Pūreora Forest determined from prey remains in regurgitated pellets. *New Zealand J. Ecol.* **25**: 61–67.

Hawbecker, A.C. (1948). Analysis of variation in western races of the White-breasted Nuthatch. *Condor* **50**: 26–39.

Hayes, F.E. & William, S.B. (1987). Loggerhead Shrike feeds on dead American Coot. *Western Birds* **18**: 133–134.

Hayes, W.K., Barry, R.X., McKenzie, Z. & Barry, P. (2004). Grand Bahama’s Brown-headed Nuthatch: a distinct and endangered species. *Bahamas J. Sci.* **12**(1): 21–28.

Haywood, B. (2006). Distribution of the Black-chinned Honeyeater *Melithreptus gularis* and Chestnut-rumped Heathwren *Hylacola pyrrhopygius* in the south east of South Australia. *South Austr. Orn.* **35**(1/2): 1–14.

Haywood, B. & Green, B. (2003). Mimicry observed in Silvereye *Zosterops lateralis* at Ewens Ponds Conservation Park, South Australia. *South Austr. Orn.* **34**: 90.

Heath, P. (1991). Greater Sundas 1991 (Sumatra, Java and Bali) 7/6/91–2/8/91. Birdwatcher report. Unpubl.

Heathcote, C.F. (1989). *The Acoustic Repertoire of the Bell Miner*, Manorina melanophrys. PhD thesis, University of Melbourne, Melbourne, Victoria.

Heather, B.D. & Robertson, H.A. (1997). *The Field Guide to the Birds of New Zealand*. Oxford University Press, Oxford.

Hedenström, A. & Ålerstam, T. (1998). How fast can birds migrate? *J. Avian Biol.* **29**: 424–432.

Hedenström, A., Ålerstam, T., Green, M. & Gudmundsson, G.S. (2005). Adaptive variation of airspeed in relation to wind, altitude and climb rate by migrating birds in the Arctic. *Behav. Ecol. Sociobiol.* **52**: 308–317.

Heinrich, G. (1956). Biologische Aufzeichnungen über Vögel von Halmahera und Batjan. *J. Orn.* **97**(1): 31–40. In German.

Heinroth, O. (1903). Ornithologische Ergebnisse der I. Deutschen Südsee Expedition von Br. Mencke. [Part 2]. *J. Orn.* **51**(1): 65–125. In German.

Heinroth, O. & Heinroth, M. (1926). *Die Vögel Mitteleuropas in allen Lebens- und Entwicklungsstufen photographisch aufgenommen und in ihrem Seelenleben bei der Aufrucht vom Ei ab beobachtet*. Vol. 1. Sperlingsvögel, Rackenvögel, Kuckuck, Spechte. Hugo Bermühler, Berlin, Germany. In German.

Hejl, S.J., Newlon, K.R., McFadden, M.E., Young, J.S. & Ghalambor, C.K. (2002). Brown Creeper (*Certhia americana*). No. 669 in: Poole, A. & Gill, F. eds. (2002). *The Birds of North America*. Vol. 17. The Birds of North America Inc., Philadelphia, Pennsylvania.

Helbig, A.J. (1991). Inheritance of migratory direction in a bird species: a cross-breeding experiment with SE- and SW-migrating Blackcaps (*Sylvia atricapilla*). *Behav. Ecol. Sociobiol.* **28**: 9–12.

Helbig, A.J. & Wiltchko, W. (1989). The skylight polarization patterns at dusk affect the orientation behavior of Blackcaps, *Sylvia atricapilla*. *Naturwissenschaften* **76**: 227–229.

Hellebrekers, W.P.J. & Hoogerwerf, A. (1967). A further contribution to our oological knowledge of the island of Java (Indonesia). *Zool. Verhand. Leiden* **88**: 1–164.

Hellmayr, C.E. (1903). Paridae, Sittidae and Certhiidae. Issue **18** in: Schulze, F.E. ed. (1903). *Das Tierreich*. R. Friedländer und Sohn, Berlin. In German.

Hellmayr, C.E. (1911). Passeres, Fam. Paridae. Part 18 in: Wytsman, P.A.G. ed. (1911). *Genera Avium*. V. Verteneuil & L. Desmet, Brussels.

Hellmayr, C.E. (1914). Die Avifauna von Timor. 1st instalment [vi, 112 pp., 1 plate] in: Haniel, C.B. ed. (1914). *Zoologie von Timor – Ergebnisse der unter Leitung von Joh. Wanner im Jahre 1911 ausgeführten Timor-Expedition*. E. Schweizerbartsche Verlags-Buchhandlung, Stuttgart. In German.

Hellmayr, C.E. (1916). Weiteres zur Avifauna von Timor. *Novit. Zool.* **23**: 96–111. In German.

Hellmayr, C.E. (1934). *Catalogue of Birds of the Americas and the Adjacent Islands in Field Museum of Natural History*. Part 7. Corvidae, Paridae, Sittidae, Certhiidae, Chamacidae, Cnecidae, Troglodytidae, Prunellidae, Mimidae, Turridae, Zeledoniidae, Sylviidae. Field Museum of Natural History Publication **330**. Zoological Series 13. Field Museum of Natural History, Chicago. Vi, 531 pp.

Helms, C.W. (1963). The annual cycle and Zugunruhe in birds. Pp. 925–939 in: Sibley, C.G. ed. (1963). *Proceedings XIII. International Ornithological Congress, Ithaca, 17–24 June 1962*. American Ornithologists’ Union, Baton Rouge, Louisiana.

Hemmingsen, A.M. (1969). *Observations on Birds in North Eastern China. Especially the Migration at Pei-Tai-Ho Beach*. Vetch and Lee, Hong Kong.

Henderson, C.L. & Cherry, M.I. (1998). Testing alternative hypotheses of provisioning in the Cape Sugarbird *Procerops cafer*. *Ostrich* **69**(1/2): 253.

Henderson, D.G. & Green, R.H. (1982). Bird in the hand. Ageing and sexing endemic Tasmanian honeyeaters. *Corella* **6**(2): 44–45.

Henderson, L.J. (1977). *Relations among Figs. Fig Wasp. and Silvereyes on Heron Island*. MSc thesis, University of Queensland, Brisbane, Queensland.

Hendricks, F.L. & Massart-Lis, Y. (1952). *Cimyris rockefelleri* Chapin. *Ibis* **94**(3): 531–532.

Henle, K. (1989). A two year avifaunistic survey in Kinchega National Park, western New South Wales. *Austr. Birds* **22**(3/4): 53–68.

Henriette-Payet, E. (2007). *The Seychelles White-eye (Zosterops modestus) Population of Frigate Island, Seychelles: Territories and Aspects of Population Dynamics, Biology and Ecology*. MSc thesis, Biodiversity of Tropical Ecosystems, Université de la Réunion, Réunion.

Henry, G.M. (1955). *A Guide to the Birds of Ceylon*. Oxford University Press, Bombay.

Henry, G.M. (1971). *A Guide to the Birds of Ceylon*. 2nd edition. Oxford University Press, Oxford, UK.

Henry, G.M. (1998). *A Guide to the Birds of Sri Lanka*. 3rd edition. Oxford University Press, Delhi & Oxford.

Henry, P.Y. & Gazave, E. (1998). Repeated attacks of a Southern Grey Shrike *Lanius meridionalis elegans* on Hoopoe *Lark Alaudon alaudipes*: competition or kleptoparasitism? *Alauda* **63**: 256–257.

Herklots, G.A.C. (1936). The birds of Hong Kong. Part 23. Family Oriolidae (Orioles). *Hong Kong Nat.* **7**: 99–101.

Herklots, G.A.C. (1953). *Hong Kong Birds*. South China Morning Post, Hong Kong.

Hermes, N. (1981). Mixed species flocks in a dry sclerophyll forest in autumn and winter. *Corella* **5**(2): 41–45.

Hermes, N. (1985). *Birds of Norfolk Island*. Wonderland Publications, Norfolk Island.

Hernández, M.A. (1993a). Dieta de los pollos de tres especies simpátricas de alcaudones (*Lanius* spp.): variaciones con la edad, estacionales e interespecíficas. *Doñana Acta Vertebrata* **20**(2): 145–163. In Spanish.

Hernández, M.A. (1993b). Estudio comparado sobre la biología de la reproducción de tres especies simpátricas de Alcaudones (Real *Lanius excubitor*, Dorsirrojo *L. collurio* y Común *L. senator*). *Doñana Acta Vertebrata* **20**(2): 179–250. In Spanish.

Hernández, M.A. (1993c). Acerca del significado de los ataques de alcaudones *Lanius* spp. sobre aves. *Doñana Acta Vertebrata* **20**(2): 255–259. In Spanish.

Hernández, M.A. (1993d). Almacenamiento de alimento por el Alcaudón Común *Lanius senator* en el noroeste de España. *Bull. Grup Català d’Anellament* **10**: 67–71. In Spanish.

Hernández, M.A. (1994a). Métodos de sujeción utilizados por dos especies de alcaudones *Lanius excubitor* y *L. collurio* para almacenar alimento. *Doñana Acta Vertebrata* **21**(2): 143–151. In Spanish.

Hernández, M.A. (1994b). Selección de hábitat en tres especies simpátricas de Alcaudones (Real *Lanius excubitor*, Dorsirrojo *L. collurio* y Común *L. senator*): segregación interespecífica. *Ecología* **8**: 395–413. In Spanish.

Hernández, M.A. (1995a). Temporal-spatial patterns of food caching in two sympatric shrike species. *Condor* **97**: 1002–1010.

Hernández, M.A. (1995b). Depredación sobre anfibios, reptiles y aves por tres especies de alcaudones (*Lanius* spp.) en el Noroeste de la Península Ibérica. *Ecología* **9**: 409–415. In Spanish.

Hernández, M.A. (1995c). Descripción de las egagrópilas de tres especies de alcaudones (*Lanius excubitor*, *L. collurio* y *L. senator*). *Ecología* **9**: 435–440. In Spanish.

Hernández, M.A. (1995d). Selective predation by Northern Shrikes on small mammals in a natural environment. *J. Field Orn.* **66**: 236–246.

Hernández, M.A. (1999a). Tres métodos para el estudio de la dieta de los alcaudones (*Lanius* spp.): ventajas e inconvenientes. *Chioglossa* **1**: 87–93. In Spanish.

Hernández, M.A. (1999b). Información adicional sobre el almacenamiento de presas por el Alcaudón Real (*Lanius meridionalis*) en el sur de España: datos del valle de Alcudia (Ciudad Real). *Chioglossa* **1**: 95–96. In Spanish.

Hernández, M.A. (1999c). Empalamento de una culebra de collar (*Natrix natrix*) por un Alcaudón Real (*Lanius meridionalis*). *Chioglossa* **1**: 145–146. In Spanish.

Hernández, M.A. (1999d). La migración de los alcaudones (*Lanius* spp.) en la Península Ibérica. *Ecología* **13**: 289–302. In Spanish.

Hernández, M.A. & Infante, O. (2003). Alcaudón Real (*Lanius meridionalis*). Pp. 534–535 in: Martí, R. & del Moral, J.C. eds. (2003). *Atlas de las Aves Reproductoras de España*. Dirección General de Conservación de la Naturaleza-Sociedad Española de Ornitología, Madrid. In Spanish.

Hernández, M.A. & Infante, O. (2004). Alcaudón Real (*Lanius meridionalis*). Pp. 351–354 in: Madroño, A., González, C. & Aienza, J.C. eds. (2004). *Libro Rojo de las Aves de España*. SEO, BirdLife, Dirección General de Conservación de la Naturaleza & Ministerio de Medio Ambiente, Madrid. In Spanish.

Hernández, M.A. & Salgado, J.M. (1993). Almacenamiento de presas por el Alcaudón Real *Lanius excubitor* en La Serena (Badajoz) y la Sierra de Cabo de Gata (Almería). *Bull. Grup Català d’Anellament* **10**: 63–65. In Spanish.

Hernández, M.A., Alegre, J., Velasco, T. & Casas, V.M. (1993a). Hábitat del Treparriscos *Tichodroma muraria* en la Península Ibérica e Islas Baleares. *Bull. Grup Català d’Anellament* **10**: 39–45. In Spanish.

Hernández, M.A., Alegre, J., Velasco, T. & Casas, V.M. (1993b). Fenología de reproducción del Treparriscos *Tichodroma muraria* en la Península Ibérica. *Bull. Grup Català d’Anellament* **10**: 47–49. In Spanish.

Hernández, M.A., Campos, F., Gutiérrez-Corcheró, F. & Amezcua, A. (2004). Identification of *Lanius* species and subspecies using tandem repeats in the mitochondrial DNA control region. *Ibis* **146**(2): 227–230.

Hernández, M.A., Purroy, F.J. & Salgado, J.M. (1993). Variación estacional, solapamiento interespecífico y selección en la dieta de tres especies simpátricas de alcaudones (*Lanius* spp.). *Ardeola* **40**: 143–154. In Spanish.

Hernández, M.A., Salgado, J.M. & Alegre, J. (1993). Datos sobre la dieta del Treparriscos *Tichodroma muraria* en la Cordillera Cantábrica. *Bull. Grup Català d’Anellament* **10**: 51–53. In Spanish.

Heron, S.J. (1974). Further information on the birds of Papua New Guinea. *Emu* **74**: 201–202.

Heron, S.J. (1977a). Birds observed in little known areas of the Goilala sub-province, Central Province. *Papua New Guinea Bird Soc. Newsl.* **135**: 6–12.

Heron, S.J. (1977b). Notes on the breeding of the Spot-eared Honeyeater near Bereina, Papua New Guinea. *Emu* **77**(1): 34.

Herremans, M. (1992). Indirect evidence for the existence of movements of sunbirds in Botswana. *Babbler (Botswana)* **24**: 4–9.

Herremans, M. (1994). Fifteen years of migrant phenology records in Botswana: a summary and prospects. *Babbler (Botswana)* **28**: 47–68.

Herremans, M. (1995). Non-breeding site-fidelity of Red-backed Shrikes *Lanius collurio* in Botswana. *Ostrich* **66**: 145–147.

Herremans, M. (1997a). Habitat segregation of male and female Red-backed Shrikes *Lanius collurio* and Lesser Grey Shrikes *Lanius minor* in the Kalahari Basin, Botswana. *J. Avian Biol.* **28**: 240–248.

Herremans, M. (1997b). Minor Sunbird *Nectarinia mariquensis*. Pp. 494–495 in: Harrison et al. (1997).

Herremans, M. (1998). Monitoring the world population of the Lesser Grey Shrike (*Lanius minor*) on the non-breeding grounds in Southern Africa. *J. Orn.* **139**: 485–493.

Herrera, C.M. (1978). Ecological correlates of residence and non-residence in a Mediterranean passerine bird community. *J. Anim. Ecol.* **47**: 871–890.

Herrmann, E. (2004). Common Fiscal *Lanius collaris* preying on a Cape serotine bat *Eptesicus capensis*. *Ostrich* **75**(4): 333.

- Herroelen, P. (1987). The status of the Woodchat Shrike in Belgium. *Ornis Flandriae* 6: 1–9.
- Herroelen, P. (2006). Further annotations and an addition to the avifauna of the Democratic Republic of Congo. *Bull. Brit. Orn. Club* 126: 19–37.
- Hertz, P.E., Van Remsen, J. & Zones, S.I. (1976). Ecological complementarity of three sympatric parids in a California oak woodland. *Condor* 78(3): 307–316.
- Heuglin, T. von (1861). On a new African species of the genus *Zosterops*. *Ibis Ser. 1, no. 3*: 357–361.
- Hewish, M. (1985). A Bell Miner in Bacchus Marsh. *Geelong Naturalist* 21(4): 81–84.
- Hewish, M. (1994). Movements of Spiny-cheeked Honeyeaters on the western side of Port Phillip Bay. *Geelong Bird Rep.* 1993: 21–30.
- Hewish, M. (1995). Geelong bird report 1994. *Geelong Bird Rep.* 1994: 3–19.
- Hewish, M. (1998). Geelong bird report 1997. *Geelong Bird Rep.* 1997: 3–43.
- Hicks, D. (1997). Friarbird on Timor. Two Mambai myths of avian rivalry. *Anthropos* 92: 198–200.
- Hicks, D. (2006). How friarbird got his helmet. Some novel features in an eastern Indonesian narrative. *Anthropos* 101: 570–575.
- Hicks, R.K. (1988a). Food plants of female Fan-tailed Berrypeckers. *Muruk* 3(1): 13.
- Hicks, R.K. (1988b). Feeding observations at a fruiting *Pipturus*. *Muruk* 3(1): 15.
- Hicks, R.K. (1988c). Recent observations April to June 1987. *Muruk* 3(1): 32–38.
- Hicks, R.K. (1988d). Recent observations October to December 1987. *Muruk* 3(2): 77–86.
- Hicks, R.K. (1990a). Recent observations January–March 1989. *Muruk* 4(2): 76–85.
- Hicks, R.K. (1990b). Recent observations April–June 1989. *Muruk* 4(3): 115–123.
- Hicks, R.K. (1990c). Recent observations July–September 1989. *Muruk* 4(3): 125–134.
- Hicks, R.K. (1992). Observations of birds feeding at a flowering *Syzygium*. *Muruk* 5(3): 107–108.
- Hicks, R.K. & Burrows, I. (1989). Port Moresby ringing report: 1986–1987. *Muruk* 4(1): 1–10.
- Hicks, R.K. & Burrows, I. (1992). Port Moresby ringing report: 1988. *Muruk* 5(2): 66–84.
- Hicks, R.K. & Hicks, J.H. (1991). In search of the Manus endemics. *Muruk* 5(1): 34–36.
- Higgins, P.J. (1992). *Social Organization and Territorial Behaviour of White-eared Honeyeaters at Brisbane Water National Park, New South Wales*. MSc thesis, University of Sydney, Sydney.
- Higgins, P.J. ed. (1999). *Handbook of Australian, New Zealand and Antarctic Birds*. Vol. 4. Parrots to Dollarbird. Oxford University Press, Melbourne, Victoria.
- Higgins, P.J. & Peter, J.M. eds. (2002). *Handbook of Australian, New Zealand and Antarctic Birds*. Vol. 6. Pardalotes to shrike-thrushes. Oxford University Press, Melbourne, Victoria.
- Higgins, P.J., Peter, J.M. & Cowling, S.J. eds. (2006a). *Handbook of Australian, New Zealand and Antarctic Birds*. Vol. 7, Part A. Boatbill to larks. Oxford University Press, Melbourne, Victoria.
- Higgins, P.J., Peter, J.M. & Cowling, S.J. eds. (2006b). *Handbook of Australian, New Zealand and Antarctic Birds*. Vol. 7, Part B. Dunnock to starlings. Oxford University Press, Melbourne, Victoria.
- Higgins, P.J., Peter, J.M. & Steele, W.K. eds. (2001). *Handbook of Australian, New Zealand and Antarctic Birds*. Vol. 5. Tyrant-flycatchers to chats. Oxford University Press, Melbourne, Victoria.
- Higuchi, H., Nakane, M. & Maru, T. (1993). Home range and pair duration of the Bonin Islands Honeyeater *Apalopteron familiare*. *Strix* 12: 23–33.
- Higuchi, H., Nakane, M. & Suzuki, A. (1984). Some notes on the ecology and behavior of the Bonin Islands Honeyeater *Apalopteron familiare*. *Tori* 33: 67–73. In Japanese with English summary.
- Hilden, O. (1977). Mass irruption of Long-tailed Tits *Aegithalos caudatus* in northern Europe in 1973. *Ornis Fenn.* 54(2): 47–65.
- Hill, G.F. (1911). Field notes on the birds of the Kimberley, north-west Australia. *Emu* 10: 258–290.
- Hill, M. (2000). Bird fauna of two protected forests in Northern Vietnam. *Forktail* 16: 5–14.
- Hillman, J.C. & Hillman, S.M. (1986). Notes on some unusual birds of the Banggai area, south west Sudan. *Scopus* 10: 29–32.
- Hindwood, K.A. (1930a). A curious habit of the White-eared Honeyeater. *Emu* 29: 181–182.
- Hindwood, K.A. (1930b). The Yellow Tufted Honeyeater. *Emu* 29: 234.
- Hindwood, K.A. (1930c). A sub-cutaneous avian parasite. *Emu* 30: 131–137.
- Hindwood, K.A. (1930d). The Yellow-faced Honeyeater. *Emu* 30: 140.
- Hindwood, K.A. (1932). Honeyeaters at play. *Emu* 32: 123–124.
- Hindwood, K.A. (1935). The Painted Honeyeater. *Emu* 34(3): 149–157.
- Hindwood, K.A. (1937a). Notes on the Painted Honeyeater. *Emu* 36: 319–320.
- Hindwood, K.A. (1937b). The Black-chinned Honeyeater. *Emu* 37: 143.
- Hindwood, K.A. (1940). The birds of Lord Howe Island. *Emu* 40: 1–86.
- Hindwood, K.A. (1943). Whose nest was that? *Emu* 42(3): 183.
- Hindwood, K.A. (1944). Honeyeaters of the Sydney district (County of Cumberland), New South Wales. *Austr. Zool.* 10: 231–251.
- Hindwood, K.A. (1945). The Striped Honeyeater in coastal New South Wales. *Emu* 45(1): 88.
- Hindwood, K.A. (1948). Migration of two species of honeyeaters. *Emu* 47(5): 391–393.
- Hindwood, K.A. (1950). Breeding of the White-plumed Honeyeater near Sydney. *Emu* 49(3): 211–213.
- Hindwood, K.A. (1953). Yellow-faced Honeyeaters migrating. *Emu* 53(1): 89–90.
- Hindwood, K.A. (1956a). The Mangrove Honeyeater in New South Wales. *Emu* 56(5): 353–356.
- Hindwood, K.A. (1956b). The migration of the White-naped and Yellow-faced Honeyeaters. *Emu* 56(5): 421–425.
- Hindwood, K.A. (1959). The Mangrove Honeyeater: an extension in range. *Emu* 59(1): 57–58.
- Hindwood, K.A. (1966). Nectar-feeding birds near Sydney. *Austr. Birds (J. NSW Field Orn. Club)* 1(1): 4–5.
- Hindwood, K.A. (1967). Birds that seek nesting material from living mammals. *Austr. Birds (J. NSW Field Orn. Club)* 2: 21–22.
- Hindwood, K.A. & Mayr, E. (1946). A revision of the Striped-crowned Pardalotes. *Emu* 46: 49–67.
- Hindwood, K.A. & McGill, A.R. (1951). The 'Derra Derra' 1950 camp-out of the R.A.O.U. *Emu* 50(4): 217–238.
- Hindwood, K.A. & McGill, A.R. (1958). *The Birds of Sydney*. The Royal Zoological Society of New South Wales, Sydney.
- Hingston, A. (1994). Bird populations and movements relative to vegetation in Jackeys Marsh, Tasmania. *Tasmanian Bird Rep.* 23: 5–23.
- Hinkelmann, C. (1988). Zur Situation des Norfolkbrillenvogels (*Zosterops albogularis*). *Trochilus* 9(4): 133. In German.
- Hipkiss, A.J., Watson, L.G. & Evans, T.D. (1994). The Cambridge-Tanzania Rainforest Project 1992: brief account of ornithological results and conservation proposals. *Ibis* 136(1): 107–108.
- Hirschfeld, E. (1984). The problems of identification of [Common] Tree Creepers *Certhia familiaris* and Short-toed Tree Creepers *Certhia brachydactyla* in the field. *Var. Fagelvärld* 43(1): 21–26. In Swedish with English summary.
- Hirschfeld, E. (1985). Further comments on treecreeper identification. *British Birds* 78: 300–302.
- Hirschfeld, E. (1995). *Birds in Bahrain: a Study of their Migration Patterns 1990–1992*. Hobby Publications, Dubai.
- Hirschfeld, E. (2007). *Rare Birds Yearbook 2008*. BirdLife International & MagDig Media, Shrewsbury, UK.
- Hitoshi, N., Asama, S. & Biun, A. (1996). *A Photographic Guide to the Birds of Mt. Kinabalu, Borneo*. Bun-ichi Sogoshuppan, Tokyo.
- Hobbs, J.N. (1958). Association between the Black Honeyeater and the emu bush. *Emu* 58(2): 127–129.
- Hobbs, J.N. (1961). The birds of south-west New South Wales. *Emu* 61(1): 21–55.
- Hobbs, J.N. (1967). Honeyeaters and emu bush. *Emu* 66(4): 386–388.
- Hobbs, J.N. (1969). Report on the birds of Sunraysia, 1968. *Sunraysia Nat. Res. Trust Rep.* 6: 55–56.
- Hobbs, J.N. (1986). Birds feeding on fruits of the leafless cherry. *Austr. Birds* 20(3): 85–87.
- Hobson, W. (1964). Notes on the Corsican Nuthatch (*Sitta whiteheadi*, Sharpe). *Ool. Res.* 38: 22–25.
- Hockey, P.A.R. (1997). Blue-throated Sunbird in Kruger not a South African first! *Africa Birds & Birding* 2(1): 15.
- Hockey, P.A.R., Dean, W.R.J. & Ryan, P.G. eds. (2005). *Roberts' Birds of Southern Africa*. 7th edition. The Trustees of the John Voelcker Bird Book Fund, Cape Town.
- Hockey, P.A.R., Underhill, L.G., Neatherway, M. & Ryan, P.G. (1989). *Atlas of the Birds of the South-western Cape*. Cape Bird Club, Cape Town.
- Hodgson, B.H. (1836). Description of sundry new species of *Cinnyris* inhabiting Nepal. *India Rev.* 1(7): 272–274.
- Hoesch, W. (1933). Ein Vogelnest mit verschließbarem Eingang: das Nest von *Anthoscopus caroli* (Sharpe). *Orn. Monatsber.* 41: 1–4. In German.
- Hoesch, W. (1934). Wie *Anthoscopus minutus* sein Nest verschließt. *Orn. Monatsber.* 42: 50–51. In German.
- Hoi, H., Kristin, A., Valera, F. & Hoi, C. (2004). Clutch enlargement in Lesser Grey Shrikes (*Lanius minor*) in Slovakia when food is super abundant: a maladaptive response? *Auk* 121: 557–564.
- Hoi, H., Valera, F., Kristin, A. & König, C. (1997). Reproductive strategies in the Lesser Grey Shrike (*Lanius minor*). Page 122 in: Spina, F. & Grattarola, A. eds. (1997). *Proceedings of the 1st Meeting of the European Ornithologists' Union*. Biologia e Conservazione della Fauna 102. Istituto Nazionale per la Fauna Selvatica, Bologna, Italy.
- Holan, V. & Sviecka, J. (1996). Frekvence vyskytu mladat kukacky obecné (*Cuculus canorus*) v hnizdech tuhyka obecného (*Lanius collurio*) v Ceske republice. *Sylvia* 32: 136–141. In Czech.
- Holdaway, R.N., Worthy, T.H. & Tennyson, A.J.D. (2001). A working list of breeding bird species of the New Zealand region at first human contact. *New Zealand J. Zool.* 28: 119–187.
- Holland, L.M. (1962). Vocal mimicry by the Southern Figbird. *Emu* 62(3): 205.
- Holland, L.M. (1972). Field notes on the Green-backed Honeyeater. *Austr. Bird Watcher* 4(7): 226–233.
- Hollom, P.A.D., Porter, R.F., Christensen, S. & Willis, I. (1988). *Birds of the Middle East and North Africa*. Poyser, Calton, UK.
- Holm, E. & Marais, E. (1992). *Fruit Chafers of Southern Africa (Scarabaeidae: Cetoniini)*. Ekogilde Publishers, Hartebeespoort, South Africa.
- Holman, F.C. (1949). The nest and eggs of *Cinnyris johannae*. *Ibis* 91: 351–352.
- Holmes, D.A. (1994). A review of the land birds of the West Sumatran islands. *Kukila* 7(1): 28–46.
- Holmes, D.A. (1996). Sumatra bird report. *Kukila* 8: 9–56.
- Holmes, D.A. (1997). Kalimantan bird report 2. *Kukila* 9: 141–169.
- Holmes, D.A. & Burton, K. (1987). Recent notes on the avifauna of Kalimantan. *Kukila* 3(1/2): 2–32.
- Holmes, D.A. & Nash, S. (1989). *The Birds of Java and Bali*. Oxford University Press, Singapore, Oxford & New York.
- Holmes, D.A. & Nash, S. (1990). *The Birds of Sumatra and Kalimantan*. Oxford University Press, Singapore, Oxford & New York.
- Holmes, D.A. & Philipps, K. (1996). *The Birds of Sulawesi*. Oxford University Press, Kuala Lumpur & Oxford.
- Holmes, G. & Noske, R.A. (1990). New locality records of birds in Arnhem Land and southern Gulf of Carpentaria. *North. Territ. Naturalist* 12: 13–19.
- Holmes, P.R. (1986). The avifauna of the Suru River valley, Ladakh. *Forktail* 2: 21–42.
- Holmes, P.R. & Holmes, H.J. (1985). Notes on *Zosterops* spp. From the Lake Matano area of southeast Sulawesi. *Bull. Brit. Orn. Club* 105(4): 136–139.
- Holmes, P.R. & Wood, H. (1980). *The Report of the Ornithological Expedition to Sulawesi, 1979*. Published privately, Ruislip, UK.
- Holmes, R.T. & Recher, H.F. (1986a). Search tactics of insectivorous birds foraging in an Australian eucalypt forest. *Auk* 103: 515–530.
- Holmes, R.T. & Recher, H.F. (1986b). Determinants of guild structure in forest bird communities: an intercontinental comparison. *Condor* 88: 427–439.
- Holub, E. & Pelzelin, A. von (1882). *Beiträge zur Ornithologie Südafrikas, mit besonderer Berücksichtigung der von Dr. Holub auf seinen südafrikanischen Reisen gesammelten [...] Arten*. Hölder, Vienna. In German.
- Holyoak, D.T. (1979). Notes on the birds of Viti Levu and Taveuni, Fiji. *Emu* 79: 7–18.
- Hölzinger, J. ed. (1987). *Artenschutzsymposium Neuntöter des Deutschen Bundes für Vogelschutz Landesverband Baden-Württemberg e.V. am 16. und 17. Juni 1984 in Bad Buchau am Federsee*. Beihefte zu den Veröffentlichungen für Naturschutz und Landschaftspflege in Baden-Württemberg 48. Institut für Ökologie und Naturschutz, Karlsruhe, Germany. 204 pp. In German.
- Hölzinger, J. (1989). Verbreitung des Mauerläufers *Tichodroma muraria* (Linnaeus, 1766) auf dem Peloponnes. *Ökol. Vögel* 11: 257–263. In German with English summary.
- Hölzinger, J. (1997). *Die Vögel Baden-Württembergs. 2. Passeriformes – Sperlingsvögel: Muscicapidae (Fliegenschwärmer) und Thraupidae (Ammertangaren)*. Vol. 3.2. Singvögel. Eugen Ulmer, Stuttgart, Germany. In German.
- Hoogerwerf, A. (1948). Contribution to the knowledge of the distribution of birds on the island of Java. *Treubia* 19(2): 83–137.
- Hoogerwerf, A. (1949). Bijdrage tot de oölogie van Java. *Limosa* 22(1/2): 1–279. In Dutch.
- Hoogerwerf, A. (1950). De avifauna van Tjibodas en omgeving, inclusief het natuurmonument Tjibodas–gn. Gede (West-Java). *Limosa* 23(1/2): 1–158. In Dutch.
- Hoogerwerf, A. (1955). Iets over de vogels van de eilanden Komodo, Padar en Rintja, het land van *Varanus komodoensis*. *Limosa* 28: 96–112. In Dutch.
- Hoogerwerf, A. (1964). On birds new for New Guinea or with a larger range than previously known. [Part 5]. *Bull. Brit. Orn. Club* 84: 153–161.
- Hoogerwerf, A. (1966). Nouvelles notes sur les sous-espèces indonésiennes du Souimanga à gorge rousse (*Antheptes malacensis* Scop.). *Oiseau et RFO (Nouv. Sér.)* 36: 51–62. In French.
- Hoogerwerf, A. (1967a). A new subspecies of the Ruby-cheek (*Antheptes singalensis*) (Gmelin) from Java. *Bull. Brit. Orn. Club* 87: 5–10.
- Hoogerwerf, A. (1967b). Notes on the island of Bawean (Java Sea) with special reference to the birds. Part 2. *Nat. Hist. Bull. Siam Soc.* 22: 15–103.
- Hoogerwerf, A. (1971). On a collection of birds from the Vogelkop, near Manokwari, north-Western New Guinea. [Part 2]. *Emu* 71(2): 73–83.
- Hoogerwerf, A. & Rengers Hora Siccama, G.F.H.W. (1938). De avifauna van Batavia en omstreken. Part 4. *Ardea* 27(3/4): 179–246. In Dutch.
- Hoogstraal, H., Traylor, M.A., Gaber, S., Malakatis, G., Guindy, E. & Helmy, I. (1964). Ticks (Ixodidae) on migrating birds in Egypt, spring and fall 1962. *Bull. World Health Org.* 30: 355–367.
- Hopkins, H.F. (1992). Some records of birds feeding on flowers and fruits in montane forest, near Myola, Oro Province, and Tari Gap, Southern Highlands province, Papua New Guinea. *Muruk* 5(2): 86–89.
- Hopkins, M. & Hiaso, J. (1994). *Varirata: National Park Trail Guide*. Christensen Research Institute Publications 11. Christensen Research Institute, Madang, Papua New Guinea.
- Hopkins, M.T.E., Demey, R. & Barker, J.C. (1999). First documented records of Green-throated Sunbird *Nectarinia rubescens* for Nigeria, with a discussion of the distinctive race *crossensis*. *Malimbus* 21(1): 57–60.
- Hopper, S.D. (1980a). Bird and mammal pollen vectors in *Banksia* communities at Cheyne Beach, Western Australia. *Austr. J. Bot.* 28(1): 61–75.
- Hopper, S.D. (1980b). Pollen and nectar feeding by Purple-crowned Lorikeets on *Eucalyptus occidentalis*. *Emu* 80(4): 239–240.
- Hopper, S.D. (1981). Honeyeaters and their winter food plants on granite rocks in the central Wheatbelt of Western Australia. *Austr. Wildl. Res.* 8(1): 187–197.
- Hopper, S.D. & Burbidge, A.A. (1982a). Feeding behaviour of birds and mammals on flowers of *Banksia grandis* and *Eucalyptus angulosa*. Pp. 67–75 in: Armstrong, J.A., Powell, J.M. & Richards, A.J. eds. (1982). *Pollination and Evolution*. Royal Botanic Gardens, Sydney.
- Hopper, S.D. & Burbidge, A.A. (1982b). Observations on honeyeaters and their food plants in Peak Charles National Park. *West. Austr. Nat.* 15(3): 74–75.

- Hopper, S.D. & Burbidge, A.H. (1978). Assortative pollination by Red Wattlebirds in a hybrid population of *Anigozanthos labill* (Haemodorraceae). *Austr. J. Bot.* **26**(3): 335–350.
- Hopper, S.D. & Burbidge, A.H. (1986). Speciation of bird-pollinated plants in south-western Australia. Pp. 20–31 in: Ford & Paton (1986).
- Hopper, S.D. & Moran, G.F. (1981). Bird pollination and the mating system of *Eucalyptus stoatei*. *Austr. J. Bot.* **29**(5): 625–638.
- Höppner, G. (1964). Der Einfluß des Nachwinters 1953 auf einen Brutbestand des Pirols (*Oriolus oriolus*). *Orn. Mitt.* **16**: 207–208. In German.
- Hopton, D. (1998). Observation of a male Painted Honeyeater on the Fleurieu Peninsula. *South Austr. Orn.* **33**(1/2): 17–18.
- Hopwood, J.C. & Mackenzie, J.M.D. (1917). A list of birds from the north Chin Hills. *J. Bombay Nat. Hist. Soc.* **25**: 72–91.
- Hornabrook, J. (1985). Ornithion superba – Easter 1985. *Papua New Guinea Bird Soc. Newsl.* **214**: 2–4.
- Hornbuckle, J. (2001). New to science – discovered! *Birdwatch* **112**: 30–33.
- Hornbuckle, J. (2003). Notable records from Yunnan, May 2002. *Bull. Oriental Bird Club* **37**: 50–52.
- Horne, J.E.M. (1987). Vocalisations of the endemic land-birds of the Mascarene Islands. Pp. 101–150 in: Diamond, A.W. ed. (1987). *Studies of Mascarene Landbirds*. Cambridge University Press, Cambridge.
- Hornsby, P. (1996). Red-browed Pardalote *Pardalotus rubricatus* in the Flinders Ranges. *South Austr. Orn.* **32**(4/5): 86–87.
- Hornsby, P. (1997). Records of birds seen at Brindana Gorge, in the north Flinders Ranges, South Australia. *South Austr. Orn.* **32**: 118–127.
- Hornskov, J. (1987). More birds from Berbak Game Reserve, Sumatra. *Kukila* **3**(1/2): 58–59.
- Hornskov, J. (1996). Recent observations of birds in the Philippine archipelago. *Forktail* **11**: 1–10.
- Horrocks, G.F.B. & Brown, G.W. (1993). The vertebrate fauna of Point Nepean, Victoria. 2. Birds. *Austr. Bird Watcher* **15**(1): 24–34.
- Horton, W. (1975). The birds of Mount Isa. *Sunbird* **6**(3): 49–69.
- Horváth, L. (1959). The life history of the Lesser Grey Shrike in Hungary. *Acta Zool. Acad. Sci. Hung.* **4**: 319–332.
- Hose, C. (1893). On the avifauna of Mount Dulit and the Baram district in the territory of Sarawak. *Ibis Ser. 6*, no. 5: 381–424, pls. 10–11.
- How, R.A. & Dell, J. (1990). Vertebrate fauna of Bold Park, Perth. *West. Austr. Nat.* **18**(4/5): 122–131.
- Howard, M. (1986). Notes on birds of the Wittenoom area, Western Australia. *Austr. Bird Watcher* **11**(8): 247–257.
- Howard, M.J. (1983). Birds of the Camarvon region, Western Australia. *Austr. Bird Watcher* **10**(3): 86–98.
- Howard, T. & Crawford, I. (1989). Annotated vertebrate list. Pp. 9–33 in: Anon. (1989). *Rotamah Island Bird Observatory Report 3: July 1984–June 1987*. RAOU Report **63**. Royal Australasian Ornithologists Union, Melbourne, Victoria.
- Howe, F.E. (1917). Description of nest and eggs of *Melithreptus atricapillus mallee*, Mathews. *Emu* **16**(4): 238.
- Howe, F.E. (1928). Notes on some Victorian birds. *Emu* **27**: 252–265.
- Howe, R.W. (1984). Local dynamics of bird assemblages in small forest habitat islands in Australia and North America. *Ecology* **65**(5): 1585–1601.
- Howe, R.W., Howe, T.D. & Ford, H.A. (1981). Bird distributions on small rainforest remnants in New South Wales. *Austr. Wildl. Res.* **8**(3): 637–651.
- Howell, S.N.G. & Webb, S. (1995). *A Guide to the Birds of Mexico and Northern Central America*. Oxford University Press, Oxford, UK.
- Howells, W.W. (1971). Breeding of the Coppery Sunbird at Salisbury, Rhodesia. *Ostrich* **42**: 99–109.
- Howells, W.W. (1985). The birds of the Dande Communal Lands, middle Zambezi valley, Zimbabwe. *Honeyguide* **31**: 26–48.
- Howland, L.A. (1988). Interactions between adult and juvenile Spotted Creeper. *Honeyguide* **34**(2): 76–77.
- Hromada, M., Kuczynski, L., Kristin, A. & Tryjanowski, P. (2003). Animals of different phenotype differentially utilise dietary niche – the case of the Great Grey Shrike. *Ornis Fenn.* **80**: 71–78.
- Hromada, M., Tryjanowski, P. & Antczak, M. (2002). Presence of the Great Grey Shrike *Lanius excubitor* affects breeding passerine assemblage. *Ann. Zool. Fennici* **39**: 125–130.
- Hubalek, Z. (2003). Spring migration of birds in relation to North Atlantic oscillation. *Folia Zool. (Brno)* **52**: 287–298.
- Hudde, H. (1993). *Aegithalos caudatus* – Schwanzmeise. Pp. 321–358 in: Glutz von Blotzheim, U.N. & Bauer, K.M. eds. (1993). *Handbuch der Vögel Mitteleuropas*. Vol. 13(1). Passeriformes (4. Teil) Muscicapidae – Paridae. Aula-Verlag, Wiesbaden. In German.
- Hudec, K. ed. (1983). *Práci – Aves. Fauna CSSR*. Vol. 3(2). Československá Academia Ved, Prague. In Czech.
- Hudson, K., Catterall, C.P., McNamara, S. & Kingston, M.B. (1997). How useful are small but lightly treed suburban parks for forest birds in Brisbane? *Sunbird* **27**: 57–64.
- Hull, A.F.B. (1910). The birds of Lord Howe and Norfolk Islands. *Proc. Linn. Soc. New South Wales* **34**: 636–693.
- Hulley, P.E., Craig, A.J.F.K., Underhill, G.D., Bonnevie, B.T., Nuttall, R.J. & de Swardt, D.H. (2004). Timing of moult and breeding in the Cape White-eye, *Zosterops pallidus*, from three different geographical regions in South Africa. *Emu* **104**(4): 353–358.
- Hume, A.O. & Oates, E.W. ed. (1889). *The Nests and Eggs of Indian Birds*. 2nd edition. Vol. 1. R.H. Porter, London.
- Hunter, S.A., Daniel, B., Robert, E.C. & Kennell, A.L. (1995). Status of the Loggerhead Shrike in Pennsylvania. *Proc. West. Found. Vert. Zool.* **6**: 78–80.
- Hušík, J. & Adamík, P. (2008). Long-term trends in the timing of breeding and brood size in the Red-backed Shrike *Lanius collurio* in the Czech Republic, 1964–2004. *J. Orn.* **149**(1): 97–103.
- Hustler, K. (1985). Which sunbird was it? *Honeyguide* **31**(3): 173–174.
- Hutchins, B.R. (1988). Black Honeyeaters feeding amongst charcoal and ash. *South Austr. Orn.* **30**(6): 160.
- Hüttenmoser, E. (1989). Erlebnisse mit dem Mauerläufer. *Vögel der Heimat* **59**: 103–105. In German.
- Hutton, I. (1991). *Birds of Lord Howe Island Past and Present*. Published privately, Coffis Harbour, New South Wales.
- Hutton, I., Parkes, J.P. & Sinclair, A.R.E. (2007). Reassembling island ecosystems: the case of Lord Howe Island. *Anim. Conserv.* **10**: 22–29.
- Hutton, J. (1985). Another Greater Doublecollared Sunbird. *WBC News* **128**: 9.
- Hyem, E.L. (1937). Notes on the birds of “Mernot”, Barrington, N.S.W. Part 2. *Emu* **36**: 262–272.
- Hyett, J. (1963). The display at the nesting-hole and the vocabulary of the Striated Pardalote (*Pardalotus substriatus*). *Austr. Bird Watcher* **2**: 27–31.
- Iddi, K.N. (2005). Taxonomic significance of vocalisations of sunbirds (Nectariniidae). *Bull. Brit. Orn. Club* **125**(4): 243.
- Iddi, K.N., Cheke, R.A. & Kenyon, L. (2006). Phylogenies of the sunbirds (Nectariniidae) and flowerpeckers (Dicaeidae) based on analyses of vocalisations. *J. Orn.* **147**(5) (Suppl. 1): 185.
- Ilijtshev, V. (1976). [Key to Sexing and Ageing of Passerines in Soviet Union]. Nauka, Moscow. In Russian.
- Imanishi, S. (1994). A Brown Shrike feeding a young Bull-headed Shrike. *Strix* **13**: 224–226. In Japanese with English summary.
- Imanishi, S. (2002). The drastic decline of breeding population on Brown Shrike *Lanius cristatus superciliosus* at Nobeyama Plateau in central Japan. *J. Yamashina Inst. Orn.* **34**: 228–231. In Japanese with English summary.
- Imanishi, S. (2007a). High mortality of Bull-headed Shrike *Lanius bucephalus* nestling during consecutive rainfall. *J. Yamashina Inst. Orn.* **39**: 35–39. In Japanese with English summary.
- Imanishi, S. (2007b). Interspecific pair of a male Brown and a female Thick-billed Shrike, *Lanius cristatus superciliosus* and *L. tigrinus*, and their hybrids at Nobeyama Plateau in central Japan. *J. Yamashina Inst. Orn.* **39**: 90–96. In Japanese with English summary.
- Imanishi, S., Haas, C.A. & Shigeta, Y. (1992). [Sexual differences and white patches on wings in *Lanius cristatus superciliosus*]. *Jap. J. Orn.* **40**: 132. In Japanese.
- Immelmann, K. (1960). Behavioural observations on several species of Western Australian birds. *Emu* **60**(4): 237–244.
- Immelmann, K. (1961). Beiträge zur Biologie und Ethologie australischer Honigfresser (Meliphagidae). *J. Orn.* **102**(2): 164–207. In German with English summary.
- Immelmann, K. (1968). *Lanius souzae* near the Spitzkoque, South West Africa. *Ostrich* **39**: 41.
- Inbar, R. (1995). Shrikes nesting on Mount Hermon, Israel. *Proc. West. Found. Vert. Zool.* **6**: 215–217.
- Indrawan, M. (2004). *Avifaunal Distribution and Endemism in the Togian Islands, Gulf of Tomini, Central Sulawesi*. PhD dissertation, University of Indonesia, Jakarta.
- Indrawan, M., Rasmussen, P.C. & Sunarto (2008). A new white-eye (*Zosterops*) from the Togian Islands, Sulawesi, Indonesia. *Wilson J. Orn.* **120**(1): 1–9.
- Indrawan, M., Somadikarta, S., Supriatna, J., Bruce, M.D., Sunarto & Djanubudiman, G. (2006). The birds of the Togian Islands, Central Sulawesi, Indonesia. *Forktail* **22**: 7–22.
- Infante, O. (2002). Alcaudón Real (*Lanius meridionalis*). Pp. 272–273 in: del Moral, J.C., Molina, B., de la Puente, J. & Pérez-Tris, J. eds. (2002). *Atlas de las Aves Invernantes de Madrid 1999–2001*. SEO-Monticola & Comunidad de Madrid, Madrid. In Spanish.
- Infante, O. (2004). *Biometría y Ecología del Alcaudón Real* (*Lanius meridionalis* Temminck. 1820). MSc thesis, Facultad de Biología, Universidad de Salamanca, Salamanca, Spain. In Spanish.
- Infante, O. & Peris, S.J. (2004). Sexual dimorphism in the Southern Grey Shrike *Lanius meridionalis* in the central west of the Iberian Peninsula. *Ardeola* **51**(2): 455–460.
- Ingold, J.J. & Ingold, D.A. (1987). Loggerhead Shrike kills and transports a Northern Cardinal. *J. Field Orn.* **58**: 66–68.
- Ingram, G. (1976). Birds from some islands of the Torres Strait. *Sunbird* **7**(3): 67–76.
- Inskipp, C. & Inskipp, T.P. (1985). *A Guide to the Birds of Nepal*. Croom Helm, London.
- Inskipp, C. & Inskipp, T.P. (1991). *A Guide to the Birds of Nepal*. 2nd edition. Christopher Helm & A&C Black, London.
- Inskipp, C., Inskipp, T.P. & Grimmett, R.F.A. (1999). *Birds of Bhutan*. Helm Field Guides. Christopher Helm & A&C Black, London.
- Inskipp, C., Inskipp, T.P. & Sherub (2000). The ornithological importance of the Thrumshingla National Park, Bhutan. *Forktail* **16**: 147–162.
- Inskipp, T., Lindsey, N. & Duckworth, W. (1996). *An Annotated Checklist of the Birds of the Oriental Region*. Oriental Bird Club, Sandy, UK.
- Iova, B.A. (1993). Birds near Laronu Village, Doroboriso, Central Province. *Muruk* **6**(1): 26–27.
- Iredale, T. (1910). Birdlife on the Kermadec Islands. *Emu* **10**(1): 2–16.
- Iredale, T. (1950). *The Birds of Paradise and Bowerbirds*. Georgian House, Melbourne, Victoria.
- Iredale, T. (1956). *Birds of New Guinea*. Vol. 2. Georgian House, Melbourne, Victoria.
- Irwin, M.P.S. (1961). Notes on the South African forms of the Collared Sunbird *A. collaris* (Vieillot) with the description of a new race. *Durban Mus. Novit.* **6**: 105–111.
- Irwin, M.P.S. (1963). A new race of *Anthoscoptes caroli* (Sharpe) from the Zambezi valley. *Bull. Brit. Orn. Club* **83**: 2–4.
- Irwin, M.P.S. (1980). Are some Miombo (*Brachystegia*) woodland bird species endangered? *Honeyguide* **no. 101** [vol. 25(2)]: 34–36.
- Irwin, M.P.S. (1981a). On the supposed occurrence of Shelley's Sunbird in southern Mozambique. *Honeyguide* **no. 106** [vol. 26(3)]: 20–21.
- Irwin, M.P.S. (1981b). *The Birds of Zimbabwe*. Quest Publishing, Salisbury [Harare], Zimbabwe.
- Irwin, M.P.S. (1984). Final comment on Yellowbellied Sunbirds. *WBC News* **127**: 8.
- Irwin, M.P.S. (1993). What sunbirds belong to the genus *Anthreptes*? *Honeyguide* **39**(4): 211–215.
- Irwin, M.P.S. (1995a). The Plain-backed Sunbird in the Transvaal and Zimbabwe. *Honeyguide* **41**(1): 26–27.
- Irwin, M.P.S. (1995b). On the affinities of the Plain-backed Sunbird *Anthreptes reichenowi*. *Honeyguide* **41**(1): 47–48.
- Irwin, M.P.S. (1996). More on the affinities of *Nectarinia* ('*Anthreptes*') *pallidigaster*. *Honeyguide* **42**(1): 54–56.
- Irwin, M.P.S. (1999). The genus *Nectarinia* and the evolution and diversification of sunbirds: an Afrotropical perspective. *Honeyguide* **45**(1): 45–58.
- Irwin, M.P.S. (2004). The Eastern and Western Olive Sunbirds *Cyanomitra olivacea* (Smith) and *C. obscura* (Jardine) are conspecific. *Honeyguide* **50**(1): 85–92.
- Irwin, M.P.S. (2005). The sunbirds *Cinnyris shelleyi* and *C. hofmanni* are specifically distinct. *Honeyguide* **51**(2): 33–35.
- Isenmann, P. (1988). Une nichée tardive de Tichodrome échelette, *Tichodroma muraria*, en Savoie. *Nos Oiseaux* **39**: 417. In French.
- Isenmann, P. & Bouchet, M.A. (1993). L'aire de distribution Française et le statut taxonomique de la Pie-grièche grise méridionale *Lanius elegans* [sic] *meridionalis*. *Alauda* **61**(4): 223–227. In French.
- Isenmann, P. & Debout, G. (2000). Vineyards harbour a relict population of Lesser Grey Shrike (*Lanius minor*) in Mediterranean France. *J. Orn.* **141**: 435–440.
- Isenmann, P. & Fradet, G. (1995). Is the nesting association between the Orphean Warbler (*Sylvia hortensis*) and Woodchat Shrike (*Lanius senator*) an anti-predator oriented mutualism? *J. Orn.* **136**(3): 288–291.
- Isenmann, P. & Fradet, G. (1998). Nest site, laying period, and breeding success of the Woodchat Shrike (*Lanius senator*) in Mediterranean France. *J. Orn.* **139**: 49–54.
- Isenmann, P. & Lefranc, N. (1994). Le statut taxinomique de la Pie-grièche méridionale *Lanius meridionalis* (Temminck 1820). *Alauda* **62**(3): 138–139. In French.
- Isenmann, P., Debout, G. & Lepey, M. (2000). La Pie-grièche à poitrine rose *Lanius minor* nicheuse à Montpellier (sud France). *Alauda* **68**(2): 123–131. In French.
- Isherwood, I., Edwards, T., Ekstrom, J., Robinson-Dean, J., Tobias, J. & Willis, J. (1998). New information on the birds of Seram, Indonesia, and their conservation. *Bull. Oriental Bird Club* **28**: 18–22.
- Ishigaki, K. (1966). The interspecific territorialism between the shrikes, *Lanius bucephalus* and *L. cristatus*, in their cohabiting area. *Jap. J. Ecol.* **16**(3): 87–93. In Japanese with English summary.
- Ishizuka, T. (1990). A case of hybridization in Brown Shrike subspecies, *Lanius cristatus lucionensis* and *L. c. superciliosus* in Kanazawa. *Strix* **9**: 71–75. In Japanese with English summary.
- Isles, A. & Menkhurst, P.W. (1976). Bird list, Finschhafen–Sattelberg area. *Papua New Guinea Bird Soc. Newsl.* **121**: 16–20.
- Itino, T., Kato, M. & Hotta, M. (1991). Pollination ecology of the two wild bananas, *Musa acuminata* ssp. *halabanensis* and *Musa salacensis*: chiropterophily and ornithophily. *Biotropica* **23**: 151–158.
- Ivanov, A.I. (1940). *Plitsy Tadzhikestana*. [The Birds of Tajikistan]. Trudy tadjikistskoi bazy **10** (zoologiya i parazitologiya). Akademiya nauk SSSR, Moscow & Leningrad [St. Petersburg]. In Russian.
- Ivanov, A.I. (1969). *Plitsy Pamiro-Alaya*. [The Birds of the Pamir Alai]. Nauka, Leningrad [St. Petersburg]. In Russian.
- Iwarson, M. (1979). Pollen from bills of African sunbirds (Nectariniidae). *Bot. Notiser* **132**: 349–355.
- Jackson, F.J. & Sclater, W.L. (1938). *The Birds of Kenya Colony and the Uganda Protectorate*. Vol. 2. Gurney and Jackson, London & Edinburgh.
- Jackson, H.D. (1970). Unusual nest of a Bronze Sunbird. *Ostrich* **41**: 262–263.
- Jackson, S., Nicolson, S.W. & Lotz, C.N. (1998). Sugar preferences and 'side bias' in Cape Sugarbirds and Lesser Double-collared Sunbirds. *Auk* **115**(1): 156–165.
- Jackson, S., Nicolson, S.W. & van Wyk, B.E. (1998). Apparent absorption efficiencies of nectar sugars in the Cape Sugarbird, with a comparison of methods. *Physiol. Zool.* **71**(1): 106–115.
- Jacobs, P., Mahler [= Malher], F. & Ochando, B. (1978). A propos de la couleur de la calotte chez la Sittelle kabyle (*Sitta ledanti*). *Aves* **15**: 149–153. In French.
- Jacobson, E. (1919). In het oerbos van den Ophir. *Tropische Natuur* **8**: 1–5, 17–21, 49–54, 65–72, 81–92, 113–121, 129–133, 145–150. In Dutch.

- Jaeger, M.M., Bruggers, R.L., Johns, B.E. & Erickson, W.A. (1986). Evidence of itinerant breeding of the Red-billed Quelea *Quelea quelea* in the Ethiopian Rift Valley. *Ibis* **128**: 469–482.
- Jahn, H. (1942). Zur Ökologie und Biologie der Vögel Japans. *J. Orn.* **90**: 1–301. In German.
- Jakober, H. & Stauber, W. (1978). Beerenahrung beim Neuntöter (*Lanius collurio*). *Vogelwarte* **29**: 280. In German.
- Jakober, H. & Stauber, W. (1980). Der Neuntöter *Lanius collurio* als Kuckuckswirt in Baden-Württemberg. *Ökol. Vogel* **2**: 37–41. In German with English summary.
- Jakober, H. & Stauber, W. (1981). Habitatsansprüche des Neuntöters *Lanius collurio* – ein Beitrag zum Schutz einer gefährdeten Art. *Ökol. Vogel* **3**: 223–247. In German with English summary.
- Jakober, H. & Stauber, W. (1983). Zur Phänologie einer Population des Neuntöters (*Lanius collurio*). *J. Orn.* **124**: 29–46. In German with English summary.
- Jakober, H. & Stauber, W. (1987a). Zur Populationsdynamik des Neuntöters (*Lanius collurio*). Pp. 71–78 in: Hölzinger (1987). In German with English summary.
- Jakober, H. & Stauber, W. (1987b). Dispersionsprozesse in einer Neuntöter-Population. Pp. 119–130 in: Hölzinger (1987). In German with English summary.
- Jakober, H. & Stauber, W. (1989a). Beeinflussen Brutfolge und Alter die Ortstreue des Neuntöters (*Lanius collurio*)? *Vogelwarte* **35**: 32–36. In German with English summary.
- Jakober, H. & Stauber, W. (1989b). Attrappenversuche am Neuntöter (*Lanius collurio*). *J. Orn.* **130**: 247–251. In German with English summary.
- Jakober, H. & Stauber, W. (1994). Kopulationen und Partnerbewachung beim Neuntöter *Lanius collurio*. *J. Orn.* **135**: 535–547. In German with English summary.
- Jakober, H. & Stauber, W. (1998). Zur Flügelform des Neuntöters (*Lanius collurio*). *Vogelwarte* **39**: 217–221. In German with English summary.
- Jakober, H. & Stauber, W. (2000a). Frühe Eiablage und Zweitbrut beim Neuntöter – *Lanius collurio*. *Vogelwarte* **40**: 240–242. In German with English summary.
- Jakober, H. & Stauber, W. (2000b). Werden die Neuntöter (*Lanius collurio*) kleiner? *J. Orn.* **141**: 408–417. In German with English summary.
- Jakober, H. & Stauber, W. (2002). Warum verstecken Neuntöter (*Lanius collurio*) ihre Nester nicht besser? *J. Orn.* **143**(4): 397–404. In German with English summary.
- Jakober, H. & Stauber, W. (2004). Ergebnisse einer langjährigen Populationsuntersuchung am Neuntöter – *Lanius collurio*. *Mitt. Vereins Sächsischer Orn.* **9**: 307–315. In German with English summary.
- Jakober, H., Stauber, W., Bairlein, F. & Voss, M. (2007). Analysis of stable isotopes in feathers of Red-backed Shrikes (*Lanius collurio*): no evidence for different wintering habitats of males and females. *J. Orn.* **148**(1): 129–131.
- Jakosalem, P.G.C., Paguntalan, L.M.J., Pedregosa, M.G., Gadiana, M.J.C. & Bueno, R.G. (2002). The status of threatened and endemic birds of Siquijor island, Philippines. *Silliman J.* **43**(1): 137–152.
- Jamdar, N. (1987). An interesting feeding behaviour of the White-cheeked Nuthatch (*Sitta leucopsis*). *J. Bombay Nat. Hist. Soc.* **84**: 443.
- James, D. (1995). Mastering the mysterious meliphagas: honeyeaters with yellow ear-spots. *Wingspan* **5**(3): 34–37.
- Jansen, A. (1990). Acquisition of foraging skills by Heron Island Silvereyes *Zosterops lateralis chlorocephala*. *Ibis* **132**: 95–101.
- Jansson, G. (1997). *The Long-tailed Tit (Aegithalos caudatus) as an Indicator for the Distribution of the Deciduous Forest in Boreal Landscapes*. Swedish University of Agricultural Sciences, Department of Conservation Biology, Uppsala, Sweden. In English with Swedish summary.
- Jany, E. (1948). L'influence de l'humidité du climat sur la coloration du plumage chez les Pies-grêches de l'Afrique du Nord. *Oiseau et RFO* **18**: 117–132. In French.
- Jany, E. (1955). Neue Vogelformen von den Nord-Molukken. *J. Orn.* **96**: 102–106. In German.
- Jardine, W. (1843). The natural history of the Nectariniidae [sic] or sun-birds. Pp. 147–277 in: Jardine, W. ed. (1843). *The Naturalist's Library*. Vol. 5. Ornithology: sun-birds. W.H. Lizars, Edinburgh, UK.
- Jehl, J.R. (1990). Aspects of the molt migration. Pp. 102–113 in: Gwinner (1990a).
- Jenkins, D.V. & de Silva, G.S. (1996). An annotated checklist of the birds of Kinabalu Park. Pp. 397–437 in: Wong, K.M. & Philipps, A. eds. (1996). *Kinabalu, Summit of Borneo*. Revised and expanded edition (by D.R. Wells & A. Philipps). The Sabah Society & Sabah Parks, Kota Kinabalu, Borneo.
- Jenkins, J.M. (1983). *The Native Forest Birds of Guam*. Ornithological Monographs **31**. American Ornithologists' Union, Washington, D.C. 61 pp.
- Jenkins, V. & Miller, R. (1976). The status and distribution of the Yellow-fronted Honeyeater in New South Wales. *Austr. Birds* **10**(3): 41–49.
- Jenni, L. & Jenni-Eiermann, S. (1998). Fuel supply and metabolic constraints in migrating birds. *J. Avian Biol.* **29**: 521–528.
- Jenni-Eiermann, S. & Jenni, L. (1991). Metabolic responses to flight and fasting in night migratory passerines. *J. Comp. Physiol. B Biochem. Syst. Environm. Physiol.* **161**: 465–474.
- Jennings, M.C. (1981). *The Birds of Saudi Arabia: a Check-list*. Published privately, Whittlesford, Cambridge, UK.
- Jennings, M.C. (1995). *An Interim Atlas of the Breeding Birds of Arabia*. National Commission for Wildlife Conservation and Development, Riyadh, Saudi Arabia.
- Jensen, F.P. (1983). A new species of sunbird from Tanzania. *Ibis* **125**(4): 447–449.
- Jensen, F.P. & Brögger-Jensen, S. (1992). The forest avifauna of the Uzungwa Mountains, Tanzania. *Scopus* **15**: 65–83.
- Jensen, F.P., Tottrup, A.P. & Christensen, K.D. (2005). The avifauna of coastal forests in southeast Tanzania. *Scopus* **25**: 1–22.
- Jensen, J.V. & Kirkeby, J. (1980). *The Birds of The Gambia: an Annotated Check-list and Guide to Localities in The Gambia*. Aros Nature Guides, Aarhus, Denmark.
- Jensen, R.A.C. & Cinning, C.F. (1974). Breeding biology of two cuckoos and their hosts in south-west Africa. *Living Bird* **13**: 5–50.
- Jepson, P. (1993a). Recent ornithological observations from Buru. *Kukila* **6**(2): 85–109.
- Jepson, P. (1993b). Secrets of Sumba. *World Birdwatch* **15**(4): 6–8.
- Jerdon, T.C. (1863). *The Birds of India – Being a Natural History of all the Birds Known to Inhabit Continental India: with Descriptions of the Species, Genera, Families, Tribes, and Orders, and a Brief Notice of such Families as are not found in India, Making a Manual of Ornithology Specially Adapted for India*. Vol. 2. Military Orphan Press, Calcutta, India.
- Jeyarajasingam, A. (1990). A note on birds observed and heard at Bukit Larut (Maxwell's Hill), Perak, in June 1988. *Malay. Naturalist* **43**(3): 29–33.
- Jeyarajasingam, A. & Pearson, A. (1999). *A Field Guide to the Birds of West Malaysia and Singapore*. Oxford University Press, Oxford & New York.
- Job, R. (1969). A bird list from the Dryandra Forest. *West. Austr. Nat.* **11**(4): 90–97.
- Johns, B. & Johns, D. (2001). Loggerhead Shrike larval and prey. *Blue Jay* **59**: 125–129.
- Johnson, D.H., Igl, L.D., Dechant, J.A., Sondreal, M.L., Goldade, C.M., Nennenman, M.P. & Euliss, B.R. (1998). *Effects of Management Practices in Grassland Birds: Loggerhead Shrike*. Northern Prairie Wildlife Research Center, Jamestown, North Dakota. 12 pp.
- Johnson, D.N. (1997). Neergaard's Sunbird *Nectarinia neergaardi*. Page 499 in: Harrison *et al.* (1997).
- Johnson, H.R. & Hooper, N. (1973). The birds of the Iron Range area of Cape York Peninsula. *Austr. Bird Watcher* **5**(3): 80–95.
- Johnson, S.D. & Brown, M. (2004). Transfer of pollinaria on birds' feet: a new pollination system in orchids. *Plant Syst. Evol.* **244**: 181–188.
- Johnstone, R.E. (1983). Part 5. Birds. Pp. 54–69 in: McKenzie, N.L. ed. (1983). *Wildlife of the Dampier Peninsula, South-west Kimberley, Western Australia*. Wildlife Research Bulletin of Western Australia **11**. Department of Fisheries and Wildlife (Western Australia), Perth, Western Australia.
- Johnstone, R.E. (1990). Mangroves and mangrove birds of Western Australia. *Records West. Austr. Mus.* **32** (Suppl.): 1–120.
- Johnstone, R.E. (2001). Checklist of the birds of Western Australia. *Records West. Austr. Mus.* **63** (Suppl.): 75–90.
- Johnstone, R.E. & van Balen, S. [= B.] (2008). The birds of the Kei, Tayandu and Kur Islands, Maluku region. Unpubl. MS.
- Johnstone, R.E. & Burbidge, A.H. (1991). The avifauna of Kimberley rainforests. Pp. 361–391 in: McKenzie, N.L., Johnston, R.B. & Kendrick, P.G. eds. (1991). *Kimberley Rainforests*. Surrey Beatty & Sons, Chipping Norton, New South Wales.
- Johnstone, R.E. & Jepson, P. (1996). The birds of Roti Island, Nusa Tenggara, Indonesia. *West. Austr. Nat.* **21**(1): 23–35.
- Johnstone, R.E. & Smith, L.A. (1981). Birds of Mitchell Plateau and adjacent coast and lowlands, Kimberley, Western Australia. Part 5 in: Anon. (1981). *Biological Survey of Mitchell Plateau and Admiralty Gulf, Western Australia. Papers Resulting from a Joint Field Expedition to Mitchell Plateau, Kimberley, by the Western Australian Museum, Perth, and the Field Museum of Natural History, Chicago, U.S.A.*, 1976–1977. Western Australian Museum, Perth.
- Johnstone, R.E. & Storr, G.M. (2004). *Handbook of Western Australian Birds*. Vol. 2. Passerines (Blue-winged Pitta to Goldfinch). Western Australian Museum, Perth, Western Australia.
- Johnstone, R.E. & Sudaryanti (1995). The birds of Banda Neira, Moluccas, Indonesia. *West. Austr. Nat.* **20**(1): 15–19.
- Johnstone, R.E., Dell, J., Smith, L.A. & Fuller, P.J. (1977). Birds of the Drysdale River National Park, north Kimberley, Western Australia. Pp. 87–96 in: Kabay, E.D. & Burbidge, A.A. eds. (1977). *A Biological Survey of the Drysdale River National Park, North Kimberley, Western Australia in August 1975*. Wildlife Research Bulletin of Western Australia **6**. Department of Fisheries and Wildlife (Western Australia), Perth, Western Australia.
- Johnstone, R.E., Jepson, P., Butchart, S.H.M., Lowen, J.C. & Prawiradilaga, D. (1996). The birds of Sumbawa, Moyo and Sangeang Islands, Nusa Tenggara, Indonesia. *Records West. Austr. Mus.* **18**(2): 157–178.
- Johnstone, R.E., de Rebeira, C.P.S. & Smith, L.A. (1979). Birds. Pp. 22–30 in: McKenzie, N.L. & Burbidge, A.A. eds. (1979). *The Wildlife of Some Existing and Proposed Nature Reserves in the Gibson, Little Sandy and Great Victoria Deserts, Western Australia*. Wildlife Research Bulletin of Western Australia **8**. Department of Fisheries and Wildlife (Western Australia), Perth, Western Australia.
- Johnstone, R.E., Smith, L.A. & Fuller, P.J. (1981). Birds. Pp. 46–53 in: McKenzie, N.L. ed. (1981). *Wildlife of the Edgar Ranges Area, South-west Kimberley, Western Australia*. Wildlife Research Bulletin of Western Australia **10**. Department of Fisheries and Wildlife (Western Australia), Perth, Western Australia.
- Jones, A.E. (1931). A note on the occurrence of the Turkestan Penduline Tit (*Remiz coronatus*) in the Punjab. *J. Bombay Nat. Hist. Soc.* **35**: 202.
- Jones, D. & Lambley, P. (1987). Notes on the birds of New Ireland. *Muruk* **2**(1): 29–33.
- Jones, D.N. (1981). Temporal changes in the suburban avifauna of an inland city. *Austr. Wildl. Res.* **8**(1): 109–119.
- Jones, D.N. (1983). The suburban bird community of Townsville, a tropical city. *Emu* **83**(1): 12–18.
- Jones, D.N. (1986). A survey of the bird community of "Bullamon Plains" Thallon, Southern Queensland R.A.O.U. 1985 campout. *Sunbird* **16**(1): 1–11.
- Jones, D.N. & Wienieke, J. (2000). The suburban bird community of Townsville revisited: changes over 16 years. *Corella* **24**(4): 53–60.
- Jones, H.B. (1926). Methods of recording bird calls. *South Austr. Orn.* **8**: 144–161.
- Jones, J. (1952). The Hattah Lakes camp-out, October 1951. With general notes on the birds of the Kulkyn State Forest. *Emu* **52**(4): 225–254.
- Jones, J.M.B. (1996). Purple-banded Sunbird breeding in Marondera north. *Honeyguide* **42**: 35–36.
- Jones, M.J., Banjaransari, H. & Grimmer, R. (1990). *The Ecology and Conservation of the Birds of Sumba and Buru. Preliminary Report*. Direktorat Jenderal Perlindungan Hutan Dan Pelestarian Alam, International Council for Bird Preservation & Manchester Polytechnic, Manchester.
- Jones, M.J., Juhaeni, D., Banjaransari, H., Banham, W., Lace, L., Linsley, M.D. & Marsden, S.J. (1994). *The Status, Ecology and Conservation of the Forest Birds and Butterflies of Sumba, Indonesia: a Report to the Indonesian Directorate General of Forest Protection & Nature Conservation, the Indonesian Institute of Sciences and BirdLife International*. Department of Biological Sciences, Manchester Metropolitan University, Manchester, UK.
- Jones, M.J., Linsley, M.D. & Marsden, S.J. (1995). Population sizes, status and habitat associations of the restricted-range bird species of Sumba, Indonesia. *Bird Conserv. Int.* **5**: 21–52.
- Jones, M.V. (1981). Birds of the Maryborough district, Queensland, 1972–1980. *Austr. Bird Watcher* **9**(1): 1–13.
- Jones, P. (1995). Migration strategies of Palaearctic passerines in Africa: an overview. *Israel J. Zool.* **41**: 393–406.
- Jones, P.J. & Tye, A. (1988). *A Survey of the Avifauna of São Tomé and Príncipe*. Study Report **24**. International Council for Bird Preservation, Cambridge, UK.
- Jones, P.J. & Tye, A. (2006). *The Birds of São Tomé & Príncipe, with Annobón Islands of the Gulf of Guinea: an Annotated Checklist*. British Ornithologists' Union Checklist **22**. British Ornithologists' Union & British Ornithologists' Club, Oxford, UK.
- Jönsson, K.A. & Fjeldså, J. (2006a). A phylogenetic supertree of oscine passerine birds (Aves: Passeri). *Zool. Scr.* **35**(2): 149–186.
- Jönsson, K.A. & Fjeldså, J. (2006b). Determining biogeographical patterns of dispersal and diversification in oscine passerine birds in Australia, Southeast Asia and Africa. *J. Biogeogr.* **33**(7): 1155–1165.
- Jönsson, K.A., Bowie, R.C.K., Norman, J.A., Christidis, L. & Fjeldså, J. (2008). Polyphyletic origin of toxic Pitohui birds suggests widespread occurrence of toxicity in corvid birds. *Biol. Letters (London)* **4**(1): 71–74.
- Jordan, J.P., Gfeller, E. & Delestrade, A. (2004). Nidification de la Mésange à longue queue *Aegithalos caudatus* à 2120 m d'altitude en Savoie. *Ornithos* **11**(3): 138–139. In French with English summary.
- Jordan, R. (1987). Seasonal variation in head-bill length for the eastern Spinebill *Acanthorhynchus tenuirostris* at Barren Grounds Nature Reserve, New South Wales. *Corella* **11**(4): 118–120.
- Joseph, L. (1986). The decline and present status of the Black-eared Miner in South Australia. *South Austr. Orn.* **30**(1): 5–13.
- Jourard, H. (1929). De la variabilité géographique d'*Aegithalos caudatus* dans l'Europe occidentale. *Aulauda* **1**(1): 111–159. In French.
- Jourard, H. (1930a). De la variabilité géographique de *Certhia brachydactyla* dans l'Europe occidentale. *Aulauda* **2**(1): 1–45, appendix 1–3. In French.
- Jourard, H. (1930b). De la variabilité géographique de *Certhia familiaris* dans l'Europe occidentale. *Aulauda* **2**(3/4): 1–41. In French.
- Junge, G.C.A. (1938). On a collection of birds from Enggano. *Treubia* **16**: 339–356.
- Junge, G.C.A. (1953). Zoological results of the Dutch New Guinea Expedition, 1939, No. 5 – the birds. *Zool. Verhand. Leiden* **20**: 1–77.
- Jupp, C. (2006). A brace of northern immigrants. Part two: Northern Long-tailed Tit *Aegithalos caudatus*. *Essex Bird Rep.* **2004**: 186–187.
- Jurisevic, M.A. & Sanderson, K.J. (1994a). Alarm vocalisations in Australian birds: convergent characteristics and phylogenetic differences. *Emu* **94**(2): 69–77.
- Jurisevic, M.A. & Sanderson, K.J. (1994b). The vocal repertoires of six honeyeater (Meliphagidae) species from Adelaide, South Australia. *Emu* **94**(3): 141–148.
- Kaestner, P. (1987). Some observations from lowland swamp forest in south Bougainville. *Muruk* **2**(1): 34–38.
- Kahindi, O. & Kageci, J. (1995). Violet-backed pelops Black-bellied Sunbird. *Kenya Birds* **4**: 36.
- Kalinganire, A., Harwood, C.E., Slee, M.U. & Simons, A.J. (2001). Pollination and fruit-set of *Grevillea robusta* in western Kenya. *Austr. Ecol.* **26**: 637–648.

- Kalyakin, M.V. (1996). [Avifaunistic records in the south of Vietnam]. *Ornitologiya* **27**: 273–275. In Russian.
- Kanuscák, P. & Snajdar, M. (1977). Bericht über die Verbreitung und Brutbiologie des Rotkopfwürgers (*Lanius senator*) in der breiteren Umgebung von Piesany. *Zprávy Morav. Orn. Sdružení* **35**: 49–81. In Czech with German summary.
- Karakas, R. & Biricik, M. (2005). Wintering Wallcreeper *Tichodroma muraria* in southeastern Anatolia. *Sandgrouse* **27**(2): 150–151.
- Karasawa, K. (1976). Observations on the impalements made by shrikes. *Tori* **25**: 94–100. In Japanese with English summary.
- Karasawa, K. (1982). Observations of predatory behavior of Bull-headed Shrike *Lanius bucephalus* in an early nestling period. *Tori* **31**(2/3): 57–68. In Japanese with English summary.
- Karlsson, S. (2001). Selection of habitat and perches by the Great Grey Shrike *Lanius excubitor* and the effects of snow layer and prey type. *Ornis Svecica* **11**: 7–18.
- Karlsson, S. (2002). Analysis on prey composition of overwintering Great Grey Shrikes *Lanius excubitor* in southern Finland. *Ornis Fenn.* **79**: 181–189.
- Karlsson, S. (2004). Season-dependent diet composition and habitat use of Red-backed Shrikes *Lanius collurio* in SW Finland. *Ornis Fenn.* **81**: 97–108.
- Karlsson, S. (2007). Food consumption and roosting behaviour of Great Grey Shrikes *Lanius excubitor* wintering in south-western Finland. *Ornis Fenn.* **84**: 57–65.
- Kasperek, M. (1992). *Die Vögel der Türkei – eine Übersicht*. Max Kasperek, Heidelberg, Germany. In German.
- Kaufman, D.W. (1973). Shrike prey selection: color or conspicuousness? *Auk* **90**: 204–206.
- Kavanagh, R.P. & Stanton, M.A. (2003). Bird population recovery 22 years after intensive logging near Eden, New South Wales. *Emu* **103**(3): 221–231.
- Kavanagh, R.P. & Turner, R.J. (1994). Birds in eucalypt plantations: the likely role of retained habitat trees. *Austr. Birds* **28**(2): 32–40.
- Kavanagh, R.P., Shields, J.M., Recher, H.F. & Rohan-Jones, W.G. (1985). Bird populations of a logged and unlogged forest mosaic at Eden, New South Wales. Pp. 273–281 in: Keast *et al.* (1985).
- Kavanagh, R.P., Stanton, M.A. & Herring, M.W. (2007). Eucalypt plantings on farms benefit woodland birds in south-eastern Australia. *Austr. Ecol.* **32**(6): 635–650.
- Kawakami, K. & Higuchi, H. (2002). The first record of cavity nesting in the Ogasawara Islands Honeyeater *Apalopteron familiare* on Hahajima, Bonin Islands, Japan. *Orn. Sci.* **1**(2): 153–154.
- Kawakami, K. & Higuchi, H. (2003). Interspecific interactions between the native and introduced white-eyes in the Bonin Islands. *Ibis* **145**(4): 583–592.
- Kazmierczak, K. (2000). *A Field Guide to the Birds of the Indian Subcontinent*. Pica Press, Robertsbridge, UK.
- Keast, A.J. (1961). Bird speciation on the Australian continent. *Bull. Mus. Comp. Zool. Harvard* **123**: 305–495.
- Keast, A.J. (1968a). Seasonal movements in the Australian honeyeaters (Meliphagidae) and their ecological significance. *Emu* **67**(3): 159–209.
- Keast, A.J. (1968b). Competitive interactions and the evolution of ecological niches as illustrated by the Australian honeyeater genus *Melithreptus* (Meliphagidae). *Evolution* **22**(4): 762–784.
- Keast, A.J. (1968c). Meliphagids and lorikeets nectar-feeding in the Mount Lofty Ranges. *South Austr. Orn.* **25**(2): 52.
- Keast, A.J. (1968d). Food plants of four species at Wilderness and Knysna, Cape Province. *Ostrich* **39**(1): 41.
- Keast, A.J. (1970). Adaptive evolution and shifts in niche occupation in island birds. *Biotropica* **2**(2): 61–75.
- Keast, A.J. (1975). Zonal feeding of birds of Culeenup Island, Yundurup. *West. Austr. Nat.* **13**(2/3): 25–29.
- Keast, A.J. (1976). The origins of adaptive zone utilizations and adaptive radiations, as illustrated by the Australian Meliphagidae. Pp. 71–82 in: Frith, H.J. & Calaby, J.H. eds. (1976). *Proceedings of the 16th International Ornithological Congress, 1974, Canberra*. Australian Academy of Science, Canberra.
- Keast, A.J. (1981). The evolutionary biogeography of Australian birds. Pp. 1585–1635 in: Keast, A.J. ed. (1981). *Ecological Biogeography of Australia*. Junk, The Hague, The Netherlands.
- Keast, A.J. (1984). Contemporary ornithogeography: the Australian avifauna, its relationships and evolution. Pp. 457–468 in: Archer, M. & Clayton, G. eds. (1984). *Vertebrate Zoogeography and Evolution in Australasia*. Hesperian Press, Carlisle, Western Australia.
- Keast, A.J. (1985a). Bird community structure in southern forests and northern woodlands: a comparison. Pp. 97–116 in: Keast *et al.* (1985).
- Keast, A.J. (1985b). Springtime song, periodicity and sequencing, a comparison of a southern forest and northern woodland bird community. Pp. 119–128 in: Keast *et al.* (1985).
- Keast, A.J. (1985c). Australia's forest and woodland avifauna: an ecological and evolutionary perspective. Pp. 11–15 in: Keast *et al.* (1985).
- Keast, A.J. (1993). Song structures and characteristics: members of a eucalypt forest bird community compared. *Emu* **93**(4): 259–268.
- Keast, A.J. (1994a). Temporal vocalisation patterns in members of a eucalypt forest bird community: the effects of weather on song production. *Emu* **94**(3): 172–180.
- Keast, A.J. (1994b). The dawn chorus in a eucalypt forest bird community, seasonal shifts in timing and contribution of individual species. *Corella* **18**(5): 133–140.
- Keast, A.J. (1995). Diel temporal vocalization patterns in the Mistletoebird (*Dicaeum hirundinaceum*) and seasonal abundance relative to the flowering and fruiting of the mistletoe *Dendrophloe vitellina*. *Corella* **19**(1): 2–7.
- Keast, A.J. (1996). Avian geography: New Guinea to the eastern Pacific. Pp. 373–398 in: Keast, A.J. & Miller, S.E. eds. (1996). *The Origin and Evolution of Pacific Island Biotas, New Guinea to Eastern Polynesia: Patterns and Processes*. SPB Academic Publishing, Amsterdam, The Netherlands.
- Keast, A.J. & Condon, H.T. (1968). Honeyeaters relative to nectar feeding on Kangaroo Island. *Rec. South Austr. Mus.* **15**: 699–703.
- Keast, A.J., Recher, H.F., Ford, H.A. & Saunders, D. eds. (1985). *Birds of Eucalypt Forests and Woodlands: Ecology, Conservation, Management*. Surrey Beatty & Sons & Royal Australasian Ornithologists Union, Chipping Norton & Melbourne.
- Keinath, D.A. & Schneider, C. (2005). *Species Assessment for Loggerhead Shrike* (*Lanius ludovicianus*) in Wyoming. United States Department of the Interior, Bureau of Land Management & Wyoming State Office, Cheyenne, Wyoming. 84 pp.
- Keith, G.S. (1968). Notes on birds of East Africa, including additions to the avifauna. *Amer. Mus. Novit.* **2321**: 1–15.
- Keller, F.C. (1885). Aus dem Leben des Alpenmauerläufers. *Zeitschr. Gesam. Orn.* **2**: 329–340. In German.
- Kennedy, R.S., Gonzales, P.C., Dickinson, E.C., Miranda, H.C. & Fisher, T.H. (2000). *A Guide to the Birds of the Philippines*. Oxford University Press, Oxford, UK.
- Kennedy, R.S., Gonzales, P.C. & Miranda, H.C. (1997). New *Aethopyga* sunbirds (Aves: Nectariniidae) from the island of Mindanao, Philippines. *Auk* **114**(1): 1–10, frontispiece.
- Kerlinger, P. (1989). *Flight Strategies of Migrating Hawks*. University Press, Chicago.
- Ketterson, E.D. & Nolan, V. (1986). A possible role for experience in the regulation of the timing of bird migration. Pp. 2169–2179 in: Ouellet, H. ed. (1988). *Proceedings of the 19th International Ornithological Congress, 1986, Ithaca, New York*. University of Ottawa Press, Ottawa, Ontario.
- Ketterson, E.D. & Nolan, V. (1990). Site attachment and site fidelity in migratory birds: experimental evidence from the field and analogies from neurobiology. Pp. 117–129 in: Gwinner (1990a).
- Keulemans, J.G. (1866). Opmmerkingen over de vogels van de Kaap-verdische Eilanden en van Prins-Eiland (Ilho do Principe) in de Bogt van Guinea gelegen. *Ned. Tijdschr. Dierk.* **3**: 363–401. In Dutch.
- Khan, M.A.R. (1977). Local movements of the Small Sunbird *Nectarinia minima*. *Bangladesh J. Zool.* **5**: 77–78.
- Khan, M.M.H. (2004). Fire-breasted Flowerpecker *Dicaeum ignipectus*: the first record for Bangladesh. *Forktail* **20**: 120.
- Kharchenko, V.I. (1965). [Wallcreeper on the eastern Azov Sea coast]. *Ornitologiya* **7**: 494–495. In Russian.
- Kikkawa, J. (1961). Social behaviour of the White-eye *Zosterops lateralis* in winter flocks. *Ibis* **103A**: 428–442.
- Kikkawa, J. (1962). Wintering Silvereyes at bird tables in the Dunedin area. *Notornis* **9**: 280, 284–291.
- Kikkawa, J. (1963). A sexual difference in plumage of the Silvereye, *Zosterops lateralis*. *Emu* **63**: 32–34.
- Kikkawa, J. (1964). Breeding density of land birds on Little Barrier Island. *Physiol. Ecol. Japan* **12**: 127–138.
- Kikkawa, J. (1966). Population distribution of land birds in temperate rainforest of southern New Zealand. *Trans. Roy. Soc. New Zealand (Zool.)* **7**: 215–277.
- Kikkawa, J. (1968). Social hierarchy in winter flocks of the Grey-breasted Silvereye *Zosterops lateralis*. *Jap. J. Ecol.* **18**: 235–246.
- Kikkawa, J. (1970). Birds recorded at Heron Island. *Sunbird* **1**: 34–48.
- Kikkawa, J. (1973). The status of Silvereyes *Zosterops* on the islands of the Great Barrier Reef. *Sunbird* **4**: 30–37.
- Kikkawa, J. (1975). Birds of Weipa, Cape York Peninsula. *Sunbird* **6**(2): 43–47.
- Kikkawa, J. (1976). The birds of the Great Barrier Reef. Pp. 279–341 in: Jones, O.A. & Edean, R. eds. (1976). *Biology and Geology of Coral Reefs*. Vol. 3. Biology 2. Academic Press, New York.
- Kikkawa, J. (1977). Ecological paradoxes. *Austr. J. Ecol.* **2**: 121–136.
- Kikkawa, J. (1980a). Weight changes in relation to social hierarchy in captivity flocks of Silvereyes. *Zosterops lateralis. Behaviour* **74**: 92–100.
- Kikkawa, J. (1980b). Winter survival in relation to dominance classes among Silvereyes *Zosterops lateralis chlorocephala* of Heron Island, Great Barrier Reef. *Ibis* **122**: 437–446.
- Kikkawa, J. (1982). Ecological association of birds and vegetation structure in wet tropical forests of Australia. *Austr. J. Ecol.* **7**(4): 325–345.
- Kikkawa, J. (1987). Social relations and fitness in Silvereyes. Pp. 253–266 in: Ito, Y., Brown, J.L. & Kikkawa, J. eds. (1987). *Animal Societies – Theories and Facts*. Japan Scientific Press, Tokyo.
- Kikkawa, J. (1997a). Range extension of the Capricorn Silvereye *Zosterops lateralis chlorocephala*, with a note on the birds of Bushy Island. *Sunbird* **27**: 45–48.
- Kikkawa, J. (1997b). Individual colour banding for 8000 birds. *Corella* **21**: 26–31.
- Kikkawa, J. & Catterall, C.P. (1991). Are winter dominance, spacing and foraging behaviours related to breeding success in Silvereyes? Pp. 1204–1213 in: Bell, B.D., Cosse, R.O., Flux, J.E.C., Heather, B.D., Hitchmough, R.A., Robertson, C.J.R. & Williams, M.J. eds. (1991). *Acta XX Congressus Internationalis Ornithologici*. New Zealand Ornithological Congress Trust Board, Wellington, New Zealand.
- Kikkawa, J. & Kakizawa, R. (1981). Agonistic behaviour of Japanese White-eyes *Zosterops japonica* on Miyake island. *J. Yamashina Inst. Orn.* **13**: 60–70.
- Kikkawa, J. & Nuttall, R.K. (1998). Evolution within Zosteropidae (white-eyes) and conservation of island populations. *Ostrich* **69**: 172.
- Kikkawa, J. & Wilson, J.M. (1983). Breeding and dominance among the Heron Island Silvereyes *Zosterops lateralis chlorocephala*. *Emu* **83**: 181–198.
- Kikkawa, J. & Wilson, J.M. (2002). Fighting strategies of Silvereyes, *Zosterops lateralis*. *J. Yamashina Inst. Orn.* **34**: 60–65.
- Kikkawa, J., Hore-Lacey, I. & Le Gay Brereton, J. (1965). A preliminary report on the birds of the New England National Park. *Emu* **65**(2): 139–143.
- Kikkawa, J., Smith, J.N.M., Prys-Jones, R., Fisk, P. & Catterall, C. (1986). Determinants of social dominance and inheritance of agonistic behavior in an island population of Silvereyes *Zosterops lateralis*. *Behav. Ecol. Sociobiol.* **19**: 165–169.
- Kikkawa, J., Webb, L.J., Dale, M.B., Monteith, G.B., Tracey, J.G. & Williams, W.T. (1981). Gradients and boundaries of monsoon forests in Australia. *Proc. Ecol. Soc. Austr.* **11**: 39–52.
- Kilburn, M. (2004). Silver Oriole *Oriolus melianus* – male: Nanling National Nature Reserve, Guangdong, China. URL: http://www.orientalbirdimages.org/search.php?p=4&action=searchresult&Bird_ID=2272&Bird_Family_ID=&pagesize=1 (download 25 November 2007).
- Kilham, L. (1968). Reproductive behaviour of White-breasted Nuthatches. 1. Distraction display, bill-sweeping, and nest hole defence. *Auk* **85**: 477–492.
- Kilham, L. (1971). Roosting habits of White-breasted Nuthatches. *Condor* **73**: 113–114.
- Kilham, L. (1972). Reproductive behaviour of White-breasted Nuthatches. 2. Courtship. *Auk* **89**(1): 115–129.
- Kilham, L. (1973). Reproductive behaviour of the Red-breasted Nuthatch. 1. Courtship. *Auk* **90**(3): 597–609.
- Kiliaan, H.P.L. (1996). An unusual Loggerhead Shrike nest location. *Blue Jay* **54**: 107–108.
- King, B.F. (1984a). Bird notes from the Anyemaquen Shan range, Qinghai province, China. *Gerfaul* **74**: 227–241.
- King, B.F. (1984b). Immigrant Golden Orioles feeding on ground. *British Birds* **77**: 488.
- King, B.F. (1989a). Some bird observations at Kangwu Liangsi, southwest Sichuan province, China. *Hong Kong Bird Rep.* **1988**: 102–110.
- King, B.F. (1989b). Birds observed at Dafengding Panda Reserve, Mabian County, southern Sichuan, China. *Forktail* **4**: 69–76.
- King, B.F. & Liao Weiping (1989). Hainan Island bird notes. *Hong Kong Bird Rep.* **1988**: 88–101.
- King, B.F. & Peng Jitai (1991). Some bird observations in Ganzi prefecture of extreme north-west Sichuan province, China. *Forktail* **6**: 15–23.
- King, B.F., Buck, H., Ferguson, R., Fisher, T., Goblet, C., Nickel, H. & Suter, W. (2001). Birds recorded during two expeditions to new Myanmar (Burma). *Forktail* **17**: 29–40.
- King, B.F., Dickinson, E.C. & Woodcock, M.W. (1975). *A Field Guide to the Birds of South-East Asia*. Collins, London.
- King, J.R. (1972). Adaptive periodic fat storage in birds. Pp. 200–217 in: Voous, K.H. ed. (1972). *Proceedings of the 15th International Ornithological Congress, 30 Aug.–5 Sept. 1970, The Hague*. E.J. Brill, Leiden, The Netherlands.
- King, J.R. & Mewaldt, L.R. (1981). Variation of body weight in Gambel's White-crowned Sparrows in winter and spring: latitudinal and photoperiodic correlates. *Auk* **98**: 752–764.
- King, T. & Dallimer, M. (2003). Daily activity, moult and morphometrics of the birds of São Tomé and Príncipe. *Bull. Afr. Bird Club* **10**: 84–93.
- King, T., Tyler, S. & Dallimer, M. (2004). Timing of moult and new species records of birds in the Lesio-Louna Reserve, Republic of Congo. *Malimbus* **26**(1/2): 1–10.
- Kingery, H.E. ed. (1998). *Colorado Breeding Bird Atlas*. Colorado Bird Atlas Partnership & Colorado Division of Wildlife, Denver, Colorado.
- Kingery, H.E. & Ghalambor, C.K. (2001). Pygmy Nuthatch *Sitta pygmaea*. No. 567 in: Poole, A. & Gill, F. eds. (2001). *The Birds of North America*. Vol. 15. The Birds of North America Inc., Philadelphia, Pennsylvania.
- Kinnear, N.B. (1936). [Description of *Sitta castanea tonkinensis*]. *Bull. Brit. Orn. Club* **56**: 70–71.
- Kinzelbach, R. (1984). Penduline tits. Pp. 311–314 in: Grzimek *et al.* (1984).
- Kinzelbach, R. (2002). Areal und Ausbreitung der Beutelmäuse *Remiz pendulinus* (L., 1758) vor dem 19. Jahrhundert. *Ökol. Vögel* **24**: 65–95. In German with English summary.
- Kipp, F.A. (1959). Der Handflügel-Index als flugbiologisches Maß. *Vogelwarte* **20**: 77–86. In German.
- Kipp, F.A. (1961). Zur Flugbiologie von Mauerläufer und Wiedehopf. *J. Orn.* **102**: 273–280. In German.
- Kirchhofer, E. (1981). Die Zucht des Tacazze-Nektarvogels (*Nectarinia tacazze*). *Gefiederte Welt* **105**(1): 3–6. In German.
- Kirkup, D. (1998). Pollination mechanisms in African Loranthaceae. Pp. 37–60 in: Polhill, R. & Wiens, D. eds. (1998). *Mistletoes of Africa*. The Royal Botanic Gardens, Kew, UK.
- Kirwan, G.M. (2007). Studies of Socotran birds IV. Synonymization of six endemic bird taxa, with comments on the name *Onychognathus blythii creaghi*. *Sandgrouse* **29**(2): 135–148.

Kitchener, D.J., Chapman, A. & Dell, J. (1975). A biological survey of Cape Le Grand National Park. *Records West. Austr. Mus.* 1: 1–48.

Kittlitz, F.H. von (1830). Über die Vögel der Inselgruppe von Boninsima. Beobachtet zu Anfang May 1828. [Part 1]. *Mém. Acad. Imp. Sci. St. Pétersbourg Ser. 2, no. 1*: 231–248, plate 13–16. In German.

Kittlitz, F.H. von (1832). *Kupfertafeln zur Naturgeschichte der Vögel*. Part 1. Frankfurt am Main, Germany. In German.

Kiyosu, Y. (1952). *The Birds of Japan*. Kodansha, Tokyo.

Klapste, J. (1982). Olive-backed Oriole *Oriolus sagittatus* in south-central Queensland. *Austr. Bird Watcher* 9: 176–177.

Kleefisch, T. (1971). Einige meiner Zuchterfolge. *Gefiederte Welt* 95: 50–53. In German.

Kleefisch, T. (1975). Seltener Bruterfolg bei Nektarvögeln. *Gefiederte Welt* 99(6): 105–106. In German.

Kleindorfer, S., Lambert, S. & Paton, D.C. (2006). Ticks (*Ixodes* sp.) and blood parasites (*Haemoproteus* spp.) in New Holland Honeyeaters (*Phylidonyris novaehollandiae*): evidence for site specificity and fitness costs. *Emu* 106(2): 113–118.

Kleinschmidt, O., Weigold, H. & Hartert, E.J.O. (1922). Zoologische Ergebnisse der Walter Stötznerschen Expeditionen nach Szetschwan, Osttibet und Tschili. 1. Corvidae, Certhiidae, Sittidae, Paridae, Cincidae. *Abh. Ber. Zool. u. Anthro.-Ethnogr. Mus. Dresden* 15: 1–34.

Klose, A. (1985). Eigenartiges Verhalten eines Pirols *Oriolus oriolus*. *Anz. Orn. Ges. Bayern* 24: 183–184. In German.

Knight, T.A. & Robinson, F.N. (1978). A possible method of protecting grape crops by using an acoustic device to interfere with communication calls of Silvereyes. *Emu* 78: 235–236.

Knorr, O.A. (1957). Communal roosting of the Pygmy Nuthatch. *Condor* 59: 398.

Knystautas, A. (1993). *Birds of Russia*. HarperCollins, London.

Kobayashi, K. (1980). The insecta impaled by the Bull-headed Shrike *Lanius bucephalus bucephalus* and the weekly variation of the number of prey. *Genisei* 37: 1–6.

Koehler, A., Verburg, L. & Nicolson, S.W. (2006). Short-term energy regulation of Whitebellied Sunbirds (*Nectarinia latata*): effects of food concentration on feeding frequency and duration. *J. Exper. Biol.* 209(15): 2880–2887.

Koenig, L. (1956). Zum Vorkommen einiger Spinte zwischen Tessalit und Niamey (Französisch-Westafrika). *J. Orn.* 97(4): 384–402. In German.

Koh Chaonien (1998). [Report on the bird fauna in the Taipei Botanical Garden]. *Taiwan J. Forestry Sci.* 13: 69–78. In Chinese.

Kondo, K., Nakamura, T., Piyakarnchana, T. & Mechvichai, W. (1991). Pollination in *Bruguiera gymnorhiza* (Rhizophoraceae) in Miyara River, Ishigaki island, Japan, and Phangnga, Thailand. *Plant Species Biol.* 6(2): 105–109.

Kontorschikov, V.V. (1997). [Foraging behaviour of Temminck's Willow Warbler *Phylloscopus coronatus*, the Coal Tit *Parus ater* and the Chinese White-eye *Zosterops erythroleura* in Primorye]. *Russ. Orn. Zhurnal Ekspress Vypusk* 22: 3–8. In Russian.

Koopman, K.F. (1957). Evolution in the genus *Myzomela* (Aves: Meliphagidae). *Auk* 74(1): 49–72.

Kopij, G. (1999). Breeding ecology of the Fiscal Shrike *Lanius collaris* in a peri-urban environment in Bloemfontein, South Africa. *Navors. Nas. Mus. Bloemfontein* 15(3): 45–63.

Kopij, G. (2004a). Breeding-season density of Fiscal Shrike (*Lanius collaris*) in Lesotho. *Biol. Letters (Poznan)* 41(2): 77–85.

Kopij, G. (2004b). Summer and winter diet of the Cape White-eye *Zosterops pallidus* in South African grassland. *Afr. J. Ecol.* 42(3): 237–238.

Kopij, G. (2005). Diet of some insectivorous passerines in semi-arid regions of South Africa. *Ostrich* 76(1/2): 85–90.

Kortner, W. (2004). Schwanzmeisen *Aegithalos caudatus* brüten in einem Beutelmisennest. *Orn. Anz.* 43(1): 69–70. In German.

Koskimies, P. (2004). [Study on bird species nesting in transmission line areas of southern Finland in 2002 and 2003]. Report to Fingrid Oyi, Helsinki, Finland. Unpubl. In Finnish.

Kostin, Y.V. (1983). *Ptitsy Kryma. [Birds of the Crimea]*. Nauka, Moscow. In Russian.

Kotagama, S.W. & Goodale, E. (2004). The composition and spatial organisation of mixed-species flocks in a Sri Lankan rainforest. *Forktail* 20: 63–70.

Kottek, E. (1965). Die Aufzucht junger Mauerläufer, *Tichodroma muraria* (L.) 1766. *Beitr. Vogelkd.* 11: 48–54. In German.

Kovshar, A.F. (1966). *Ptitsy Talasskogo Alatau. [Birds of the Talas Ala-Too]*. Trudy zapovednikov Kazakhstana 1. Nauka, Alma-Ata. In Russian.

Kovshar, A.F. (1977). [On some rare birds in the Kazakh part of Tien-Shan]. Pp. 190–193 in: Sludskiy, A.A. ed. (1977). *[Rare and Vanishing Mammals and Birds of Kazakhstan]*. Nauka, Alma-Ata. In Russian.

Kovshar, A.F. (1978). [White-browed Tit-warbler *Leptopoeile sophiae*]. Pp. 164–166 in: Gvozdev, E.V. & Kovshar, A.F. eds. (1978). *[Red Data Book of the Kazakh SSR]*. Kainar, Alma-Ata. In Russian.

Kovshar, A.F. (1991). [White-browed Tit-warbler *Leptopoeile sophiae*]. Pp. 243–245 in: Gvozdev, E.V. ed. (1991). *[Red Data Book of the Kazakh SSR]*. Vol. 1. [Animals]. Revised and enlarged edition. Gilim, Alma-Ata. In Russian.

Kovshar, A.F., Sklyarenko, S.L. & Gubin, B.M. (1982). *Leptopoeile sophiae* Sev. in the Zailiisky Alatau: abundance and some aspects of nesting biology. *Byull. Mosk. Obsh. Ispyt. Priro. (Old. Biol.)* 87(6): 74–85. In Russian with English summary.

Kowalski, H. (1993). Bestandssituation der Würger (Laniidae) in Deutschland zu Anfang der 1990er Jahre. *Limicola* 7: 130–139. In German.

Kozlova, E.V. (1930). *Ptitsy yuzozapadnogo Zabaikal'ya severnoi Mongolii i tsentral'noi Gobi. [The Birds of Southwest Transbaikalia, Northern Mongolia and Central Gobi]*. Nauka, Leningrad [St. Petersburg]. In Russian.

Kozlova, E.V. (1933). The birds of south-west Transbaikalia, northern Mongolia, and central Gobi. *Ibis Ser. 13, no. 3*: 301–332.

Kramer, G. (1952). Experiments on bird orientation. *Ibis* 94: 265–285.

Kramer, G. (1957). Experiments on bird orientation and their interpretation. *Ibis* 99: 196–227.

Kramer, G. (1975). Nischentrennung beim Grünkopfnektarvogel (*Cyanomitra verticalis*) und Bronzenektarvogel (*Nectarinia kilimensis*) (Fam. Nectariniidae, Aves) im Kivuhoehland (Republik Zaire, Afrika). *Oecologia* 20(2): 143–156. In German.

Krapu, G.L., Iverson, G.C., Reinecke, K.J. & Boise, C.M. (1985). Fat deposition and usage by arctic-nesting Sandhill Cranes during spring. *Auk* 102: 362–368.

Kratter, A.W., Kirchman, J.J. & Steadman, D.W. (2006). Upland bird communities on Santo, Vanuatu, southwest Pacific. *Wilson J. Orn.* 118(3): 295–308.

Kratter, A.W., Steadman, D.W., Smith, C.E. & Filardi, C.E. (2001). Reproductive condition, moult, and body mass of birds from Isabel, Solomon Islands. *Bull. Brit. Orn. Club* 121: 128–144.

Kratter, A.W., Steadman, D.W., Smith, C.E., Filardi, C.E. & Webb, H.P. (2001). Avifauna of a lowland forest site on Isabel, Solomon Islands. *Auk* 118: 472–483.

Kraus, K. (1986a). Der Fahlkehl-Nektarvogel (*Chalcomitra adalberti*) – Haltungserfahrungen und Beobachtungen beim Nestbau. *Throchilus* 7(2): 66–70. In German with English summary.

Kraus, K. (1986b). *Dicaeum australe* – ein wenig bekannter Blütenpicks von den Philippinen. *Throchilus* 7(3): 100–101. In German with English summary.

Kren, J. (2000). *Birds of the Czech Republic*. Christopher Helm & A&C Black, London.

Kridelbaugh, A. (1983). Nesting ecology of the Loggerhead Shrike in central Missouri. *Wilson Bull.* 95: 303–308.

Krienke, W. (1941). Nesting of the Nyasa Violet-backed Sunbird on Elvington farm, Beatrice district, Southern Rhodesia. *Ostrich* 12: 24–25.

Kristin, A. (1991). Brutbestand und Brutbiologie des Schwarzstirnwürgers (*Lanius minor* L.) in der Mittelslowakei (Tschechoslowakei). *Orn. Mitt.* 43: 131–133. In German.

Kristin, A. (1995). Why the Lesser Grey Shrike (*Lanius minor*) survives in Slovakia: food and habitat preferences, breeding biology. *Folia Zool. (Brno)* 44: 325–334.

Kristin, A. & Zilinec, M. (1998). Lesser Grey Shrike (*Lanius minor*) diet and foraging strategies during and after cockchafer (*Melolontha melolontha*; Insecta, Coleoptera) swarming. Pp. 34–37 in: Yosef & Lohrer (1998).

Kristin, A., Hoi, H., Valera, F. & Hoi, C. (1999). Nest site fidelity and breeding biology in the Lesser Grey Shrike (*Lanius minor*) in Central Slovakia. *Ring* 21: 74.

Kristin, A., Hoi, H., Valera, F. & Hoi, C. (2000). Breeding biology and breeding success of the Lesser Grey Shrike (*Lanius minor*) in a stable and dense population. *Ibis* 142: 305–311.

Kristin, A., Hoi, H., Valera, F. & Hoi, C. (2007). Philopatry, dispersal patterns and nest-site reuse in Lesser Grey Shrikes (*Lanius minor*). *Biodiversity & Conservation* 16(4): 987–995.

Kristin, A., Valera, F., Hoi, H. & Hoi, C. (2007). Do melanin-based tail patterns predict individual quality and sex in Lesser Grey Shrikes *Lanius minor*? *J. Orn.* 148(1): 1–8.

Kristin, A., Vanhinsbergh, D., Valera, F. & Hoi, H. (1998). A comparison of the habitat use and diet composition of two related shrike species *Lanius collurio* and *Lanius minor*: implications for conservation. *Ostrich* 69(3/4): 293.

Kryukov, A.P. (1995). Systematics of small Palearctic shrikes of the “*cristatus* group”. *Proc. West. Found. Vert. Zool.* 6: 22–25.

Kuczynski, L., Tryjanowski, P., Antczak, M., Skoracki, M. & Hromada, M. (2003). Repeatability of measurements and shrinkage after skinning: the case of the Great Grey Shrike *Lanius excubitor*. *Bonn. Zool. Beitr.* 51(2/3) (2002): 127–130.

Kuehler, C.M., Lieberman, A., McIlraith, B., Everett, W., Scott, T.A., Knight, R.L., Camp, R.J., Boorman, W.I. & Knight, H.A.L. (1999). Predatory bird populations in the east Mojave Desert, California. *Great Basin Nat.* 59: 331–338.

Kuehler, C.M., Lieberman, A., McIlraith, B., Everett, W., Scott, T.A., Morrison, M.L. & Winchell, C. (1993). Artificial incubation and hand-rearing of Loggerhead Shrikes. *Wildl. Soc. Bull.* 21: 165–171.

Kullberg, C., Fransson, T. & Jakobsson, S. (1996). Impaired predator evasion in fat Blackcaps (*Sylvia atricapilla*). *Proc. Royal Soc. London (Ser. B Biol. Sci.)* 263: 1671–1675.

Kullberg, C., Lind, J., Fransson, T., Jakobsson, S. & Vallin, A. (2003). Magnetic cues and time of season affect fuel deposition in migratory Thrush Nightingales (*Luscinia luscinia*). *Proc. Royal Soc. London (Ser. B Biol. Sci.)* 270: 373–378.

Kumar, A., Bhatt, D. & Joshi, V.D. (1999). Breeding ecology of Purple Sunbird *Nectarinia asiatica* with special reference to song behaviour. *Ann. Forestry* 7(2): 192–198.

Kumar, S.T. (1980). Slugs as food for the Grey Shrike. *Mayura* 1: 22.

Kumar, S.T., Reddy, A.R. & Lakshminarayana, K. (1984). A new record of sunbirds as avian pests on grape around Hyderabad. *J. Bombay Nat. Hist. Soc.* 81(2): 475–476.

Kumerloeve, H. (1958). Sur la présence en Asie mineure de la Sittelle naine de Krüper (*Sitta canadensis krüperi* Pelzeln). *Aulauda* 26: 81–85. In French.

Kumerloeve, H. (1960). On the occurrence and breeding habits of the Palestine Sun-bird, *Cinnyris osea osea* (Bonaparte) in Beirut. *Aulauda* 28: 30–33.

Kumerloeve, H. (1961). Sur la distribution en Turquie de la Pie-grièche masquée *Lanius nubicus*. *Aulauda* 29: 134–137. In French.

Kunkel, P. (1962). Bewegungsformen, Sozialverhalten, Balz und Nestbau des Gangesbrillenvogels (*Zosterops palpebrosa* Temm.). *Zeitschr. Tierpsychol.* 19: 559–576. In German.

Kunkel, P. (1964). Ausdrucksbewegungen des Grünkopfnektarvogels *Cyanomitra verticalis* (Latham). *Vogelwelt* 85(5): 150–158. In German.

Kunkel, P. (1966). Observations on some montane sunbirds (Nectariniidae) in the Rugege Forest (Rwanda) during the dry season. *Rev. Zool. Bot. Afr.* 74(3/4): 275–286.

Kunkel, P. (1975). Some feeding adaptations and postures of the Yellow White-eye (*Zosterops senegalensis*). *Zool. Afr.* 10: 109–121.

Kuper, J., van Duinen, G.J., Nijssen, M., Geertsma, M. & Esselink, H. (2000). Is the decline of the Red-backed Shrike in the Dutch coastal dune area caused by a decrease in insect diversity? *Ring* 22(1): 11–25.

Kurata, A. (1967). The social structure of Bull-headed Shrike with special reference to the territoriality of its breeding season. *Tori* 18: 153–164. In Japanese with English summary.

Kuroda, N. (1920). Notes on and descriptions of the flower-peckers of Formosa. *Tori* 2: 230–232. In Japanese and English.

Kuroda, N. (1933a). *Birds of the Island of Java*. Vol. 1. Passeres. Published privately, Tokyo.

Kuroda, N. (1933b). *Birds in Life Colours*. Vol. 1. Shukyo-sha Book Store, Tokyo.

Kuroda, N. (1936). *Birds of the Island of Java*. Part 2. Passeres. Published privately, Tokyo.

Kuschel, M. (1895). Zur Oologie Javas. *Orn. Monatsberichte* 3: 153–156. In German.

Kutt, A.S. (1996). Bird populations density in thinned, unthinned and old lowland regrowth forest, East Gippsland, Victoria. *Emu* 96(4): 280–284.

Kuzniak, S. & Tryjanowski, P. (2003). *Gasiorek. [The Red-backed Shrike]*. Seria ‘Monografie Przyrodnicze’ 12. Wydawnictwo Klubu Przyrodników, Swiebodzin, Poland. 128 pp. In Polish.

Kwok Honkai & Corlett, R.T. (1999). Seasonality of a forest bird community in Hong Kong, South China. *Ibis* 141(1): 70–79.

Lachenaud, O. (2006a). Les oiseaux de la région de Sassandra, Côte d’Ivoire. *Malimbus* 28(1): 18–34. In French with English summary.

Lachenaud, O. (2006b). Les oiseaux du Parc National du Banco et de la Forêt Classée de l’Anguédédou, Côte d’Ivoire. *Malimbus* 28(2): 107–133. In French with English summary.

Lack, D. (1954). *The Natural Regulation of Animal Numbers*. Oxford University Press, Oxford, UK.

Lack, D. (1960). The influence of weather on passerine migration. A review. *Auk* 77: 171–209.

Lack, D. (1971). *Ecological Isolation in Birds*. Blackwell Scientific Publications, Oxford & Edinburgh, UK.

Lack, P. (1976). Nesting of Hunter’s Sunbird. *Bull. East Afr. Nat. Hist. Soc.* 7: 49.

Lack, P. (1985). The ecology of the land-birds of Tsavo East National Park, Kenya. [Part 2]. *Scopis* 9(3): 57–96.

Ladley, J.J. & Kelly, D. (1995). Explosive New Zealand mistletoe. *Nature (London)* 378: 766.

Ladley, J.J. & Kelly, D. (1996). Dispersal, germination and survival of New Zealand mistletoes (*Loranthaceae*): dependence on birds. *New Zealand J. Ecol.* 20: 69–79.

Lamba, B.S. (1978). Nidification of some common Indian birds. 13. The Purple-rumped Sunbird, *Nectarinia zeylonica* Linnaeus. *Indian J. Forestry* 1: 329–344.

Lambert, F.R. (1991). Fruit-eating by Purple-naped Sunbirds *Hypogramma hypogrammicum* in Borneo. *Ibis* 133(4): 425–426.

Lambert, F.R. (1992). The consequences of selective logging for Bornean lowland forest birds. *Phil. Trans. Roy. Soc. London (Ser. B)* 335: 443–457.

Lambert, F.R. (1994). Notes on the avifauna of Bacan, Kasiruta and Obi, North Moluccas. *Kukila* 7(1): 1–9.

Lambert, F.R. & Collar, N.J. (2002). The future for Sundaic lowland forest birds: long-term effects of commercial logging and fragmentation. *Forktail* 18: 127–146.

Lambert, F.R. & Young, D. (1989). Some recent bird observations from Halmahera. *Kukila* 4(1/2): 30–33.

Lambert, S. & Kleindorfer, S. (2006). Nest concealment but not human visitation predicts predation of New Holland Honeyeater nests. *Emu* 106(1): 63–68.

Lamm, D.W. & Calaby, J.H. (1950). Seasonal variation of bird populations along the Murrumbidgee in the Australian Capital Territory. *Emu* 50(2): 114–122.

Lamm, D.W. & Wilson, S.J. (1966). Seasonal fluctuations of birds in the Brindibella Range, Australian Capital Territory. *Emu* 65: 183–207.

Lamm, D.W., Wilson, S.J. & Belton, W. (1963). New information on birds of the Australian Capital Territory. *Emu* 63(1): 57–65.

Lamont, B.B. & Collins, B.G. (1988). Flower colour change in *Banksia ilicifolia*: a signal for pollinators. *Austr. J. Ecol.* 13(2): 129–135.

- Lamothe, L. (1979). Diet of some birds in *Araucaria* and *Pinus* forests in Papua New Guinea. *Emu* **79**(1): 36–37.
- Landmann, A., Winding, N., Böhm, C. & Weigl, S. (1991). Zur Höhenverbreitung von Nektarvögeln im Nepal-Himalaya mit Bemerkungen zur Biometrie des Feuerschwanz-Nektarvogels (*Aethopyga ignicauda*). *Trop. Vögel* **12**(2): 39–45. In German with English summary.
- Lane, R. (1987). Extinction thresholds in demographic models of territorial populations. *Amer. Nat.* **130**: 624–635.
- Lane, S. (1992). Miombo Doublecollared Sunbird in Limbe. *Safring News* **21**(1): 39–40.
- Lane, S. (1996). Eclipse plumage in Yellow-bellied Sunbird *Nectarinia venusta*. *Nyala* **19**: 54–55.
- Lane, S.G. (1967). Habits of Spotted Pardalotes. *Austr. Bird Bander* **5**: 27–29.
- Lane, S.G. ed. (1974). *Bird in the Hand*. The Bird Banders' Association of Australia, Sydney South, New South Wales.
- Lane, S.G. (1983). Bird in the hand. Fuscous Honeyeater *Lichenostomus fuscus*. *Corella* **7**(3): 64–65.
- Lane, S.G. (1986). Yellow White-eye. Page 556 in: Schodde, R. & Tidemann, S.C. eds. (1986). *Reader's Digest Complete Book of Australian Birds*. Reader's Digest Service, Sydney.
- Lang, C.L. (1927). Nesting of the White-naped Honeyeater. *Emu* **26**: 306–307.
- Langham, N.P.E. (1984). Nest of the Giant Forest Honeyeater. *Notornis* **31**(1): 29–30.
- Langham, N.P.E. (1987). Morphometrics and moult in Fijian passerines. *New Zealand J. Zool.* **14**: 463–475.
- Langham, N.P.E. (1989). The stratification of passerines in Fijian forests. *Notornis* **36**(4): 267–279.
- Langrand, O. (1990). *Guide to the Birds of Madagascar*. Yale University Press, New Haven, Connecticut.
- Lansley, P.S. (1977). Trip report, Christmas Island, 27 December 1996–3 January 1997. Birdwatcher report. Unpubl.
- Lansley, P.S. (2004). A Red-capped Flowerpecker *Dicaeum (pectorale) geelvinkianum* on Saibai Island, Torres Strait, Australia. *Austr. Field Orn.* **21**(1): 33–36.
- LaRosa, A.M., Smith, C.W. & Gardner, D.E. (1985). Role of alien and native birds in the dissemination of firetree (*Myrica faya* Ait.-Myricaceae) and associated plants in Hawaii. *Pacific Sci.* **39**: 372–378.
- Laudenslayer, W.F. & Balda, R.P. (1976). Breeding bird use of a pinyon-juniper-ponderosa pine ecotone. *Auk* **93**(3): 571–586.
- Laurance, W.F., Gordon, C.E. & Perry, E. (1996). Structure of breeding bird communities in rainforest and regrowth forest in tropical Queensland. *Sunbird* **26**(1): 1–15.
- Lavery, H.J. (1986). Breeding seasons of birds in north-eastern Australia. First supplement, 1967–74. *Emu* **86**(2): 111–113.
- Lavery, H.J. & Gimes, R.J. (1974). The Yellow White-eye in north-east Queensland. *Sunbird* **5**: 42–43.
- Lavery, H.J. & Hopkins, N. (1963). Birds of the Townsville district of North Queensland. *Emu* **63**(3): 242–252.
- Lavery, H.J., Seton, D. & Bravery, J.A. (1968). Breeding seasons of birds in north-eastern Australia. *Emu* **68**(2): 133–147.
- Law, B., Chidel, M. & Turner, G. (2000). The use by wildlife of paddock trees in farmland. *Pacific Conserv. Biol.* **6**(2): 130–143.
- Law, S.C. (1948). On the occurrence of *Sitta frontalis* Swains. and *Sitta castanea* Lers. in Khulra Sunderbans. *J. Bombay Nat. Hist. Soc.* **47**: 733–734.
- Lawson, W.J. (1961). Comments on the geographical variation of Carol's Penduline Tit *Anthoscopus caroli* (Sharpe) in Southern Africa. *Bull. Brit. Orn. Club* **81**(8): 149–150.
- Lawson, W.J. (1966). A note on the white-eyes (Genus *Zosterops*) in Zululand. *Ostrich* **37**: 233.
- Layard, E.L. (1876a). Notes on some little-known birds of the new colony of the Fiji Islands. *Ibis Ser. 3*, no. 6: 137–152.
- Layard, E.L. (1876b). Notes on the ornithology of Fiji, with descriptions of new or little-known species. *Ibis Ser. 3*, no. 6: 152–157.
- Layard, E.L. (1876c). Descriptions of a new species of flycatchers (Myiagra) from the Fijis, and some remarks on the distribution of the birds found on those islands. *Ibis Ser. 3*, no. 6: 387–394.
- Layard, E.L. & Layard, E.L.C. (1878). Notes on some birds collected or observed by Mr. E. Leopold C. Layard in the New Hebrides. *Ibis Ser. 4*, no. 2: 267–280.
- Layard, E.L. & Layard, E.L.C. (1880). Notes on the avifauna of the Loyalty Islands. *Ibis Ser. 4*, no. 4: 220–234.
- Layard, E.L. & Layard, E.L.C. (1882). Notes on the avifauna of New Caledonia. A catalogue of the birds of the island known to E.L. & E.L.C. Layard. With remarks by the Rev. Cannon Tristram. *Ibis Ser. 4*, no. 6: 493–546.
- Layton, L. (1991). *Songbirds in Singapore. The Growth of a Pastime*. Oxford University Press, Singapore.
- Le Souëf, A.S. & Macpherson, J. (1920). The birds of Sydney. *Emu* **20**: 82–91.
- Le Souëf, W.H.D. (1900). Description of some nests and eggs from New Guinea. *Ibis Ser. 7*, no. 6: 612–617.
- Le Souëf, W.H.D. (1902a). Descriptions of birds'-eggs from the Port Darwin district, northern Australia. Part 1. *Emu* **2**: 85–96.
- Le Souëf, W.H.D. (1902b). A visit to the Furneaux Group of islands. *Victorian Naturalist* **18**(12): 181–188.
- Le Souëf, W.H.D. (1903). Descriptions of birds'-eggs from the Port Darwin district, northern Australia. Part 2. *Emu* **2**(3): 139–159.
- Lea, A.H. & Gray, J.T. (1936). The food of Australian birds. An analysis of the stomach contents. Part 4. *Emu* **35**(3): 251–280.
- Leach, G.J. (1988). Birds of Narayan Research Station, Mundubbera, south-east Queensland. *Sunbird* **18**(3): 55–75.
- Leach, G.J. (1995). Relative abundance of bird species in roadside vegetation at Marburg, south-east Queensland. *Corella* **19**(4): 118–126.
- Leach, G.J. & Hines, H.B. (1987). Birds of the Marburg district, south-east Queensland. *Sunbird* **17**(4): 65–95.
- Leach, G.J. & Watson, D.J. (1994). Detectability of birds through the day in softwood scrub remnants and open eucalypt forest along roadsides at Tallegalla, south-east Queensland. *Corella* **18**(5): 155–161.
- Leach, H.A.C. (1928). The birds of central northern Victoria. *Emu* **28**(2): 83–99.
- Leader, N., Wright, J. & Yom-Tov, Y. (2000). Microgeographic song dialects in the Orange-tufted Sunbird (*Nectarinia osea*). *Behaviour* **137**: 1613–1627.
- Leader, N., Wright, J. & Yom-Tov, Y. (2005). Acoustic properties of two urban song dialects in the Orange-tufted Sunbird (*Nectarinia osea*). *Auk* **122**(1): 231–245.
- Leader, P.J. (2007). The first records of the nominate race of Brown Shrike *Lanius cristatus cristatus* in Hong Kong. Pp. 188–189 in: Thurnbull, M., Carey, G.J. & Lockey, H. eds. (2007). *The Hong Kong Bird Report 2001–02*. The Hong Kong Bird Watching Society, Hong Kong.
- Leandri, J. (1950). Points de vue sur le problème de l'ornithophilie. *Terre et Vie* **97**(2): 86–100. In French.
- Leavesley, A. & Leavesley, M. (2000a). Birds reported on Tingwon Island, New Ireland 18–20 May 1999. *Muruk* **8**(2): 60–63.
- Leavesley, A. & Leavesley, M. (2000b). New Hanover bird report, March–May 1999. *Muruk* **8**(2): 63–73.
- Lebreton, P. (1981). Sur le grégorisme interuptual du Tichodrome. *Nos Oiseaux* **36**(3): 128. In French.
- LeCroy, M. (2000). Papual Flowerpecker leaves young asleep for the night. *Austr. Bird Watcher* **18**(5): 206.
- LeCroy, M. & Peckover, W.S. (1983). Birds of the Kimbe Bay area, West New Britain, Papua New Guinea. *Condor* **85**: 297–304.
- LeCroy, M. & Peckover, W.S. (1998). Misima's missing birds. *Bull. Brit. Orn. Club* **118**(4): 217–238.
- LeCroy, M. & Peckover, W.S. (1999). Plumages of the Red-collared Honeyeater *Myzomela rosenbergii longirostris* from Goodenough Island, D'Entrecasteaux Islands, Papua New Guinea. *Bull. Brit. Orn. Club* **119**(1): 62–65.
- LeCroy, M. & Peckover, W.S. (2000). Birds observed on Goodenough and Wafiga Islands, Milne Bay province. *Muruk* **8**(2): 41–44.
- Ledant, J.P. (1977). La Sittelle kabyle (*Sitta ledanti* Vieilliard), espèce endémique montagnarde récemment découverte. *Aves* **14**: 83–85. In French.
- Ledant, J.P. (1978). Données comparées sur la Sittelle corse (*Sitta whiteheadi*) et sur la Sittelle kabyle (*Sitta ledanti*). *Aves* **15**: 154–157. In French.
- Ledant, J.P. (1981). Conservation et fragilité de la forêt de Babor, habitat de la Sittelle kabyle. *Aves* **18**: 1–9. In French.
- Ledant, J.P. & Jacobs, P. (1977). La Sittelle kabyle (*Sitta ledanti*): données nouvelles sur sa biologie. *Aves* **14**: 233–242. In French.
- Ledant, J.P., Jacobs, P., Ochando, B. & Renault, J. (1985). Dynamique de la forêt du Mont Babor et préférences écologiques de la Sittelle kabyle (*Sitta ledanti*). *Biol. Conserv.* **32**(3): 231–254. In French with English summary.
- Lee, M. (2005). Failed attempts to reintroduce Bellbirds (*Anthornis melanura*) to Waiheke Island, Hauraki Gulf, 1988–91. *Notornis* **52**(3): 150–157.
- Lee Kisup ed. (2002). *Conservation Plan for Birds and Study for Establishment of Sustainable Development Strategy*. Report to Cheorwon-Gun Province, Cheorwon-Gun, Korea.
- Lee Kwok Shing, Lau Waineng, M., Fellowes, J.R. & Pui Lok, C.B. (2006). Forest bird fauna of South China: notes on current distribution and status. *Forktail* **22**: 23–38.
- Lee Sang Don & Jablonski, P.G. (1999). Species composition and use of coniferous and deciduous trees in mixed-species flocks wintering near Seoul (Korea). *Acta Orn. (Warszawa)* **34**(1): 81–84.
- Lee Woo-Shin, Koo Tae-Hoe & Park Jin-Young (2000). *A Field Guide to the Birds of Korea*. LG Evergreen Foundation, Seoul.
- Lees, S.G. (1999). Scarlet-chested Sunbird pirating nesting material from Yellow-bellied Sunbird. *Honeyguide* **45**: 27.
- Lefranc, N. (1978). La Pie-grièche à poitrine rose *Lanius minor* en France. *Alauda* **46**: 193–208. In French.
- Lefranc, N. (1979). Contribution à l'écologie de la Pie-grièche écorcheur *Lanius collurio* L. dans les Vosges Moyennes. *Oiseau et RFO* **49**: 245–298. In French.
- Lefranc, N. (1993). *Les Pie-grièches d'Europe, d'Afrique du Nord et du Moyen-Orient*. Delachaux et Niestlé, Lausanne & Paris. In French.
- Lefranc, N. (1995). Decline and current status of the Lesser Grey Shrike (*Lanius minor*) in Western Europe. *Proc. West Found. Vert. Zool.* **6**: 93–97.
- Lefranc, N. (1997). Shrikes and the farmed landscape in France. Pp. 268–268 in: Pain, D.J. & Pienkowski, M.W. eds. (1997). *Farming and Birds in Europe*. Academic Press, London.
- Lefranc, N. (1999a). Le complexe Pie-grièche grise *Lanius excubitor*/Pie-grièche méridionale *Lanius meridionalis*. *Alauda* **67**: 339–340. In French.
- Lefranc, N. (1999b). Les pies-grièches en France: répartition et statut actuels, histoire récente, habitats. *Ornithos* **6**: 58–82. In French.
- Lefranc, N. (2008). *La Pie-grièche écorcheur*. Collection approche **29**. Belin Eveil Nature, Paris. 95 pp. In French.
- Lefranc, N. (2007). La Pie-grièche isabelle *Lanius isabellinus*: taxonomie, identification, statut en France. *Ornithos* **14**(4): 201–228. In French with English summary.
- Lefranc, N. & Worfolk, T. (1997). *Shrikes: a Guide to the Shrikes of the World*. Pica Press, Robertsbridge, UK.
- Lefranc, N., Boet, M. & Boet, M. (1989). Observations de couples mixtes *Lanius senator*/*Lanius collurio* en France. Brève synthèse des cas d'hybridation connus chez les Laniides d'Europe. *Alauda* **57**: 109–118. In French.
- Legge, W.V. (1874). On the distribution of birds in the southern hill-region of Ceylon. *Ibis Ser. 3*, no. 4: 7–34.
- Legge, W.V. (1880). *A History of the Birds of Ceylon*. Published privately, London.
- Legge, W.V. (1983). *A History of the Birds of Ceylon*. Vol. 3. 2nd edition. Tisara Prakasakaya, Dehiwala, Sri Lanka.
- Lei Fumin, Kristin, A. & Zhao Hongfeng (2004). Morphology and distribution of the Chinese Grey Shrike (*Lanius shphencercus*) in China. *Biol. Letters (Poznan)* **41**(2): 175–180.
- Lei Jinyu & Liu Yang eds. (2006). *China Bird Report 2005*. China Ornithological Society, Beijing.
- Leishman, A.J. (1994). The birds of Humewood/Beulah Forest, Campbelltown NSW. *Austr. Birds* **28**(1): 14–26.
- Lekagul, B. & Round, P.D. (1991). *A Guide to the Birds of Thailand*. Saha Karn Bhaet, Bangkok.
- London, A. (1966). Notes on Northern Territory birds. *Austr. Bird Watcher* **2**(7): 191–206.
- Lenz, M. (1981). Late breeding record of White-eared Honeyeater. *Canberra Bird Notes* **6**(4): 114.
- Lenz, M. (1990). The breeding bird communities of three Canberra suburbs. *Emu* **90**(3): 145–153.
- Lenz, M. & Dabb, G. (2003). Breeding by Painted Honeyeaters in the Canberra region during the 2002–03 influx. *Canberra Bird Notes* **28** (1): 1–9.
- Leon, B. & Nicolson, S.W. (1997). Metabolic rate and body temperature of an African sunbird, *Nectarinia chalybea*: daily rhythm and the effect of ambient temperature. *South Afr. J. Zool.* **32**: 31–36.
- Leonard, H. (1978). Black-headed Honeyeaters dismantling previous nest. *Austr. Bird Watcher* **7**(8): 279–280.
- Leonovich, V.V. & Veprintsev, B.N. (1986). [New faunistic records for Sakhalin]. *Ornitologiya* **21**: 137. In Russian.
- Leonovich, V.V., Demina, G.V. & Veprintseva, O.D. (1996a). *Sitta europaea* L. and “small” nuthatches *S. villosa* Verreaux and *S. krueperi* Pelzeln: problems of taxonomy and phylogeny. *Byull. Mosk. Obsh. Ispyt. Prir. (Ord. Biol.)* **101**(1): 37–49. In Russian with English summary.
- Leonovich, V.V., Demina, G.V. & Veprintseva, O.D. (1996b). To the taxonomy and phylogeny of rock nuthatches: *Sitta neumayer rupicola* Blandford, *Sitta (tephronota) obscura* Zarudny et Loudon, *Sitta tephronota iranica* Buturlin and *Sitta tephronota tephronota* Sharpe. *Byull. Mosk. Obsh. Ispyt. Prir. (Ord. Biol.)* **101**(4): 29–38. In Russian with English summary.
- Lepage, D. (2008). Avibase – bird checklists of the world: Malawi. URL: <http://www.bsc-eoc.org/avibase/checklist.jsp?lang=EN®ion=mw&list=clements> (download 10 March 2008).
- Lepley, M., Guillaume, C.P., Newton, A. & Thévenot, M. (2000). Biologie de la reproduction de la Pie-grièche méridionale *Lanius meridionalis* en Crau sèche (Bouches-du-Rhône, France). *Alauda* **68**: 35–43. In French.
- Lepley, M., Ranc, S., Isenmann, P., Bara, T., Ponel, P. & Guillemain, M. (2004). Diet and gregarious breeding in Lesser Grey Shrike *Lanius minor* in Mediterranean France. *Rev. Écol. (Terre Vie)* **59**: 591–602.
- Lepley, M., Thévenot, M., Guillaume, C.P., Ponel, P. & Bayle, P. (2004). Diet of the nominate Southern Grey Shrike *Lanius meridionalis meridionalis* in the north of its range (Mediterranean France). *Bird Study* **51**: 156–162.
- Lepschi, B.J. (1989). Some notable records from Copoparra National Park, NSW. *Austr. Birds* **22**(3/4): 83–85.
- Lepschi, B.J. (1993). Food of some birds in eastern New South Wales: additions to Barker & Vestjens. *Emu* **93**(3): 195–199.
- Ler, P.A. ed. (1989). *Redkie pozvonochnye zhivotnye sovetskogo Dal'nego Vostoka i ikh okhrana*. [Rare Vertebrates of the Soviet Far East and their Protection]. Nauka, Leningrad [St. Petersburg], Russia. In Russian with English summary.
- Leshem, Y. & Yom-Tov, Y. (1996a). The magnitude and timing of migration by soaring raptors, pelicans and storks over Israel. *Ibis* **138**: 188–203.
- Leshem, Y. & Yom-Tov, Y. (1996b). The use of thermals by soaring migrants in Israel. *Ibis* **138**: 667–674.
- Leuthaby, N. (1998). Identification of Chestnut-flanked and Japanese White-eyes. *Dutch Birding* **20**: 57–61.
- Leven, M.R. (1993). Velvet-fronted Nuthatches in Hong Kong. *Hong Kong Bird Rep.* **1992**: 188–191.
- Lever, C. (1987). *Naturalized Birds of the World*. Longman, New York & Harlow.
- Lewis, A. (1993). Birding in Tanimbar and Kai. *Bull. Oriental Bird Club* **18**: 52–54.
- Lewis, A.D. & Pomeroy, D.E. (1989). *A Bird Atlas of Kenya*. A.A. Balkema, Rotterdam.
- Lewis, R.A. & Farner, D.S. (1973). Temperature modulation of photoperiodically induced vernal phenomena in White-crowned Sparrows (*Zonotrichia leucophrys*). *Condor* **75**: 279–286.

- Ley, A.J. (1990). Notes on the Regent Honeyeater *Xanthomyza phrygia*. *Austr. Bird Watcher* **13**(6): 171–173.
- Ley, A.J. & Davie, P. (1995). Birds of Currawinya National Park, south-west Queensland. *Sunbird* **25**: 31–43.
- Ley, A.J. & Williams, M.B. (1992). The conservation status of the Regent Honeyeater near Armidale, New South Wales. *Austr. Bird Watcher* **14**(7): 277–281.
- Ley, A.J. & Williams, M.B. (1994). Breeding behaviour and morphology of the Regent Honeyeater *Xanthomyza phrygia*. *Austr. Bird Watcher* **15**(8): 366–376.
- Ley, A.J. & Williams, M.B. (1998). Nesting of the Regent Honeyeater *Xanthomyza phrygia* near Armidale, New South Wales. *Austr. Bird Watcher* **17**(7): 328–336.
- Ley, A.J., Cook, S.M. & Williams, M.B. (2002). Unusual nest-site of Regent Honeyeater *Xanthomyza phrygia*. *Austr. Bird Watcher* **19**(6/7): 198–200.
- Ley, A.J., Oliver, D.L. & Williams, M.B. (1996). Observations on colour-banded Regent Honeyeaters *Xanthomyza phrygia*. *Corella* **20**(3): 88–92.
- Ley, A.J., Oliver, D.L. & Williams, M.B. (1997). Theft of nesting material involving honeyeaters (Meliphagidae). *Corella* **21**(4): 119–123.
- Li Dehao & Wang Xuzhang (1979). [New records of subspecies of Chinese birds from Xizang]. *Acta Zootaxonomica Sinica* **4**(2): 190–191. In Chinese.
- Li Guiyuan (1995). A new subspecies of *Certhia familiaris* (Passeriformes: Certhiidae). *Acta Zootaxonomica Sinica* **20**(3): 373–376. In Chinese with English summary.
- Li Guiyuan, Liu Liangcai, Zhang Ruiyun & Zhang Qingmao (1976). [On the avifauna of Baoxing, Sichuan]. *Acta Zool. Sinica* **22**(1): 101–114. In Chinese.
- Li Guiyuan, Zheng Baolai & Liu Guangzuo (1982). *Fauna Sinica, Aves*. Vol. 13. Passeriformes (Paridae–Zosteropidae). Science Press, Beijing. In Chinese.
- Li Qingwei & Bian Xiaozhuang (1988). Studies on the karyotypes of birds. 2. The 19 species of 12 families of passerine birds (Passeriformes, Aves). *Zool. Res.* **9**(4): 321–326. In Chinese with English summary.
- Liang Wei, Guo Dongsheng & Song Jie (2000). [Albinism in Long-tailed Tit *Aegithalos caudatus vinaceus* in Xiaolongmen area of Beijing]. *Chinese J. Zool.* **35**(1): 58. In Chinese.
- Liddy, J. (1962). Honeyeaters of north-west Queensland. *Emu* **61**(4): 285–291.
- Liddy, J. (1965). Mass movement of honeyeaters. *Austr. Bird Bander* **3**: 8.
- Liddy, J. (1966). Annual migration of the Yellow-faced Honeyeater. *Emu* **66**(2): 87–103.
- Liddy, J. (1982a). Food of the Mistletoebird near Pumicestone Passage, southeastern Queensland. *Corella* **6**: 11–15.
- Liddy, J. (1982b). The Olive-backed Oriole: an occasional disseminator of mistletoe. *Corella* **6**: 93.
- Liddy, J. (1984). Ageing and moult variations in Mistletoebirds. *Corella* **8**(2): 42–45.
- Liddy, J. (1989). Brown Honeyeaters *Lichmera indistincta* at a banding station in south-eastern Queensland. *Corella* **13**(3): 65–72.
- Liechti, F. (2006). Birds: blown by the wind? *J. Orn.* **147**: 202–211.
- Lill, A. & Fell, P.J. (1990). Egg composition in some Australian birds. *Emu* **90**(1): 33–39.
- Lim Hsingyu (1995). *Seed Dispersal of Mistletoes by Flowerpeckers at Lien-Hua-Chih Area, Nan-tou County*. MSc thesis, Tunghai University, Taichung, Taiwan.
- Lim Kim Seng (1992). *Vanishing Birds of Singapore*. The Nature Society (Singapore), Singapore.
- van der Linde, M. (1995). A further record of the Isabela Oriole *Oriolus isabellae* from Baggao, Cagayan province, northern Philippines. *Forktail* **11**: 171.
- Lindsey, G.D., Pratt, T.K., Reynolds, M.H. & Jacobi, J.D. (1997). Response of six species of Hawaiian forest birds to a 1991 Niño drought. *Wilson Bull.* **109**: 339–343.
- Lindström, A. (1991). Maximum fat deposition rates in migrating birds. *Ornis Scand.* **22**: 12–19.
- Linsley, M.D. (1995). Some bird records from Obi, Maluku. *Kukila* **7**(2): 142–151.
- Linsley, M.D., Jones, M.J. & Marsden, S.J. (1999). A review of the Sumba avifauna. *Kukila* **10** (1998): 60–90.
- Lippens, L. & Wille, H. (1976). *Les Oiseaux du Zaïre*. Lannoo, Tielt, Belgium. In French.
- Little, R.M. & Bainbridge, W.R. (1992). *Birds of the Natal Drakensberg Park*. Wildlife Society of Southern Africa, Natal.
- Littler, F.M. (1903a). Birds in the Launceston district. *Emu* **2**: 168–171.
- Littler, F.M. (1903b). Notes on some birds peculiar to Tasmania. *Emu* **3**: 81–89.
- Littler, F.M. (1910). *A Handbook of the Birds of Tasmania and its Dependencies*. Published privately, Launceston, Tasmania.
- Liu Aizhong, Li Dezhu, Wang Hong & Kress, W.J. (2002). Ornithophilous and chiropterophilous pollination in *Musa itinerans* (Musaceae), a pioneer species in tropical rain forests of Yunnan, southwestern China. *Biotropica* **34**(2): 254–260.
- Liu Yang & Lei Jinyu eds. (2005). *China Bird Report 2004*. China Ornithological Society, Beijing.
- Livesey, T.R. (1933). Nidification of the Giant Nuthatch (*Sitta magna* Wardlaw Ramsay). *J. Bombay Nat. Hist. Soc.* **36**: 993.
- Lloyd, P. (1989). Sucrose concentration preferences of two Southern African sunbirds. *Ostrich* **60**: 134–135.
- Lloyd, P. (1991). Feeding responses of captive Greater Double-collared Sunbirds (*Nectarinia afra*) to changes in sucrose food concentrations, and their relation to optimal foraging models. *South Afr. J. Sci.* **87**: 67–68.
- Lloyd, P. & Craig, A.J.F.K. (1989). Morphometrics, moult and taxonomy of the *Nectarinia afra*/*Nectarinia chalybea* complex of South African double-collared sunbirds. *Ann. Cape Prov. Mus. (Nat. Hist.)* **18**(6): 135–150.
- Loaring, W.H. & Serventy, D.L. (1952). The birds of the Moore River Gorge country. *West. Austr. Nat.* **3**(5): 107–116.
- Lobkov, E.G. (1986). *Gnezdyashchiesya ptitsy Kamchatki*. [The Breeding Birds of Kamchatka]. Dal'nevost. nauch. tsentr, Akademiya nauk SSSR, Vladivostok, Russia. In Russian [Japanese translation by Fujimaki, Y. 1989].
- Lofts, B. & Merton, R.K. (1968). Photoperiodic and physiological adaptations regulating avian breeding cycles and their ecological significance. *J. Zool., London* **155**: 327–394.
- Lofts, B., Marshall, A.J. & Wolfson, A. (1963). The experimental demonstration of pre-migratory activity in the absence of fat deposition in birds. *Ibis* **105**: 99–105.
- Lohrer, F.E. (1974). Some techniques used in a field study of Loggerhead Shrikes. *Bird-Banding* **45**: 361–362.
- Löhrl, H. (1958). Das Verhalten des Kleibers. *Z. Tierpsychol.* **15**: 191–252. In German.
- Löhrl, H. (1960). Vergleichende Studien über Brutbiologie und Verhalten der Kleiber *Sitta whiteheadi* Sharpe und *Sitta canadensis* L. [Part 1]. *J. Orn.* **101**(3): 245–264. In German.
- Löhrl, H. (1961). Vergleichende Studien über Brutbiologie und Verhalten der Kleiber *Sitta whiteheadi* Sharpe und *Sitta canadensis*. [Part 2]. *J. Orn.* **102**(2): 111–132. In German.
- Löhrl, H. (1962). Artkenzeichen von *Sitta kriteri*. *J. Orn.* **103**(4): 418–419. In German.
- Löhrl, H. (1964). Verhaltensmerkmale der Gattungen *Parus* (Meisen), *Aegithalos* (Schwanzmeisen), *Sitta* (Kleiber), *Tichodroma* (Mauerläufer) und *Certhia* (Baumläufer). *J. Orn.* **105**(2): 153–181. In German with English summary.
- Löhrl, H. (1967a). Bewegungsweisen des Mauerläufers *Tichodroma muraria* im Hinblick auf die Anpassung an seinen Biotop. *J. Orn.* **108**: 165–186. In German with English summary.
- Löhrl, H. (1967b). Das Brutkleid des weiblichen Mauerläufers (*Tichodroma muraria*). *J. Orn.* **108**: 221–223. In German with English summary.
- Löhrl, H. (1967c). Zur verwandtschaftlichen Stellung von *Cephalopyrus flammiceps* auf Grund des Verhaltens. *Bonn. Zool. Beitr.* **18**: 127–138. In German.
- Löhrl, H. (1970). Studies of less familiar birds: 158 Wallcreeper. *British Birds* **63**: 163–168.
- Löhrl, H. (1971). *Tichodroma muraria (Sittidae) – Sand- und Sonnenbaden*. Vol. E1085/1966 Encyclopaedia Cinematographica. Institut für den wissenschaftlichen Film, Göttingen, Germany. In German.
- Löhrl, H. (1974a). Zum Jugendkleid des Mauerläufers (*Tichodroma muraria*). *J. Orn.* **115**: 236–239. In German.
- Löhrl, H. (1974b). Die Frühjahrsmäuser des Mauerläufers (*Tichodroma muraria*). *J. Orn.* **115**: 239. In German.
- Löhrl, H. (1975). Brutverhalten und Jugendentwicklung beim Mauerläufer (*Tichodroma muraria*). *J. Orn.* **116**: 229–262. In German with English summary.
- Löhrl, H. (1976). *Der Mauerläufer*. Die Neue Brehm-Bücherei **498**. A. Ziemsen, Wittenberg Lutherstadt, Germany. In German.
- Löhrl, H. (1979). Tagesaktivität, Nestbaumethode und Brutverhalten des Honigsaugers *Nectarinia (Aidemia) kilimensis* in Zentralafrika. *J. Orn.* **120**(4): 441–450. In German.
- Löhrl, H. (1981). Verhaltensmerkmale der Familie Remizidae (Beutelmeisen). *J. Orn.* **122**(3): 307–309. In German with English summary.
- Löhrl, H. (1985a). Die Rostkappenschwanzmeise (*Aegithalos concinnus*). *Gefiederte Welt* **109**(12): 334–335. In German.
- Löhrl, H. (1985b). Nuthatch. Pp. 400–401 in: Campbell & Lack (1985).
- Löhrl, H. (1985c). Wallcreeper. Pp. 638–639 in: Campbell & Lack (1985).
- Löhrl, H. (1988). *Etho-ökologische Untersuchungen an verschiedenen Kleiberarten (Sittidae)*. Eine vergleichende Zusammenstellung. Bonner Zoologische Monographien **26**. Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn, Germany. 208 pp. In German with English summary.
- Löhrl, H. (1990). Beobachtungen an Beutelmeisen (*Remiz pendulinus*) in der Voliere. *Vogelwarte* **35**(4): 311–320. In German with English summary.
- Löhrl, H. (1993a). *Sitta europaea* Linnaeus 1758 – Kleiber. Pp. 824–879 in: Glutz von Blotzheim & Bauer (1993).
- Löhrl, H. (1993b). *Tichodroma muraria* (Linnaeus 1766) – Mauerläufer. Pp. 881–918 in: Glutz von Blotzheim & Bauer (1993).
- Löhrl, H. & Thielcke, G. (1969). Zur Brutbiologie, Ökologie und Systematik einiger Waldvögel Afghanistans. *Bonn. Zool. Beitr.* **20**: 85–98. In German.
- Loke, W.T. (1958). *A Company of Birds*. Michael Joseph, London.
- Long, J.L. (1981). *Introduced Birds of the World*. A.H. & A.W. Reed, Sydney.
- Longmore, N.W. (1973). Birds of the alpine region, Kosciuszko National Park. *Austr. Birds (J. NSW Field Orn. Club)* **8**: 33–35.
- Longmore, N.W. (1978). Avifauna of the Rockhampton area, Queensland. *Sunbird* **9**(3/4): 25–53.
- Longmore, N.W. (1983). Nidification of the White-lined Honeyeater *Meliphaga albilineata*. *Emu* **83**(4): 275.
- Longmore, N.W. (1991a). *Honeyeaters and their Allies of Australia*. Angus and Robertson & HarperCollins, Sydney & London.
- Longmore, N.W. (1991b). The bird records. Pp. 141–283 in: Ingram, G.J. & Raven, R.J. eds. (1991). *An Atlas of Queensland's Frogs, Reptiles, Birds and Mammals*. Queensland Museum, Brisbane.
- Longmore, N.W. & Boles, W.E. (1983). Description and systematics of the Eungella Honeyeater *Meliphaga hindwoodi*, a new species of honeyeater from central eastern Queensland, Australia. *Emu* **83**(2): 59–65.
- Lord, E.A.R. (1943). Migratory notes (1941–1942) from the Murphy's Creek district, Queensland. *Emu* **43**(1): 18–23.
- Lord, E.A.R. (1956). The birds of the Murphy's Creek district, Southern Queensland. *Emu* **56**(2): 100–128.
- Lorek, G. (1991). Polygyny in the Great Grey Shrike, *Lanius excubitor* (L.). *Przegląd Zoologiczny* **35**: 349–353. In Polish with English summary.
- Lorek, G. (1995a). Breeding status of the Great Grey Shrike in Poland. *Proc. West. Found. Vert. Zool.* **6**: 98–104.
- Lorek, G. (1995b). Copulation behavior, mixed reproductive strategy, and mate guarding in the Great Grey Shrike. *Proc. West. Found. Vert. Zool.* **6**: 218–227.
- Lorek, G., Tryjanowski, P., Lorek, J. (2000). Birds as prey of the Great Grey Shrike (*Lanius excubitor*). *Ring* **22**(1): 37–44.
- Loskot, W.M., Sokolow, E.P. & Wunderlich, K. (1991). *Sitta tephronota* Sharpe. 17th instalment in: Dathe, H. & Neufeldt, I.A. eds. (1991). *Atlas der Verbreitung paläarktischer Vögel*. Akademie-Verlag, Berlin. In German.
- Lott, D.F. (1991). Bronzy Sunbirds tolerate intrusion on foraging territories by female Golden-winged Sunbirds that perform „begging“ display. *J. Field Orn.* **62**(4): 492–496.
- Lott, D.F. & Lott, D.Y. (1991). Bronzy Sunbirds *Nectarinia kilimensis* relax territoriality in response to internal changes. *Ornis Scand.* **22**(4): 303–307.
- Lotti, C. (1988). Möglicher Brutversuch des Schwarzstirnwürgers *Lanius minor* im Kanton Zürich. *Orn. Beoh.* **85**: 174–175. In German.
- Lotz, C.N. & Nicolson, S.W. (1996). Sugar preferences of a nectarivorous passerine bird, the Lesser Double-collared Sunbird (*Nectarinia chalybea*). *Functional Ecol.* **10**: 360–365.
- Lotz, C.N. & Nicolson, S.W. (1999). Energy and water balance in the Lesser Double-collared Sunbird (*Nectarinia chalybea*) feeding on different nectar concentrations. *J. Comp. Physiol.* **169**: 200–206.
- Louette, M. (1980). The populations of *Nectarinia preussi* in the Cameroon montane area. Pp. 9–16 in: Johnson, D.N. ed. (1980). *Proceedings of the Fourth Pan-African Ornithological Congress*. Southern African Ornithological Society, Mahé, Seychelles.
- Louette, M. (1981). *The Birds of Cameroon: an Annotated Check-List*. Verhandelungen van de Koninklijke Academie voor Wetenschappen, Letteren en Schone Kunsten van België **43**(163). Awlsc, Brussels. 295 pp.
- Louette, M. (1982). Allopatric species of birds approaching in western Cameroon: the *Nectarinia adelberti*, *N. rubescens* example. *Bonn. Zool. Beitr.* **33**(2–4): 303–312.
- Louette, M. (1987). Additions and corrections to the avifauna of Zaïre. [Part] 1. *Bull. Brit. Orn. Club* **107**(3): 137–143.
- Louette, M. (1988). *Les Oiseaux des Comores*. Annales de la Musée Royal de l'Afrique Centrale (Sciences Zoologiques) Ser. 8, no. 255. Koninklijk Museum voor Midden-Afrika, Tervuren. 192 pp. In French with English summary.
- Louette, M. (1989). Additions and corrections to the avifauna of Zaïre. [Part] 4. *Bull. Brit. Orn. Club* **109**(4): 217–225.
- Louette, M. (2001). Adaptation of Comoro birds to disturbed forest habitat. *Ostrich* (Suppl.) **15**: 48–55.
- Louette, M. & Stevens, J. (1992). Conserving the endemic birds on the Comoro Islands. 1. General considerations on survival prospects. *Bird Conserv. Int.* **2**: 61–80.
- Louette, M., Bijnsen, L., Stevens, J. & Janssens, L. (1989). Comparison of forest bird communities on Ngazidia and Mwali (Comoro Islands). *Ostrich* (Suppl.) **14**: 33–37.
- Louette, M., Meirte, D. & Jocué, R. (2004). La faune terrestre de l'archipel des Comores. *Studies in Afrotropical Zoology* **29**: 1–456. In French with English summary.
- Louette, M., Stevens, J., Bijnsen, L. & Janssens, L. (1988). *Survey of the Endemic Avifauna of the Comoro Islands*. Report 25. International Council for Bird Preservation, Cambridge, UK.
- Lovasz, P. & Moskát, C. (2003). Break-down of the arms race between the Red-backed Shrike and Common Cuckoo. *Behaviour* **141**: 245–262.
- Lovegrove, T.G. (1975). Bird notes from Hunua. *Notornis* **22**(4): 306.
- Lovegrove, T.G., Bell, B. & Hay, R. (1992). *The Indigenous Wildlife of Western Samoa – Impacts of Cyclone Val and a Recovery and Management Strategy*. New Zealand Department of Conservation, Wellington, New Zealand.
- Low, T. (1994). Invasion of the savage honeyeaters. *Austr. Nat. Hist.* **24**(10): 26–33.
- Lowther, E.H.N. (1949). *A Bird Photographer in India*. Oxford University Press, London.
- Lowther, P.E. (2007). Host list of avian brood parasites. 2. Cuculiformes: Cuculidae (version 07 Nov 2007). URL: <http://fm1.fieldmuseum.org/aa/Files/lowther/OwCList.pdf> (download 10 March 2008).
- Loyn, R.H. (1980). Bird populations in a mixed eucalypt forest used for production of wood in Gippsland. *Emu* **80**(3): 145–156.

- Loyn, R.H. (1985a). Ecology, distribution and density of birds in Victorian forests. Pp. 33–46 in: Keast *et al.* (1985).
- Loyn, R.H. (1985b). Birds in fragmented forests in Gippsland, Victoria. Pp. 323–331 in: Keast *et al.* (1985).
- Loyn, R.H. (1985c). Bird populations in successional forests of mountain ash *Eucalyptus regnans* in central Victoria. *Emu* **85**(4): 213–230.
- Loyn, R.H. (1987a). Effects of patch area and habitat on bird abundances, species numbers and tree health in fragmented Victorian forests. Pp. 65–77 in: Saunders, D.A., Arnold, G.W., Burbidge, A.A. & Hopkins, A.J.M. eds. (1987). *Nature Conservation: the Role of Remnants of Native Vegetation*. Surrey Beatty & Sons, Chipping Norton, New South Wales.
- Loyn, R.H. (1987b). The bird that farms the dell. *Nat. Hist. (New York)* **6**: 54–60.
- Loyn, R.H. (1993). *Effects of Previous Logging on Bird Populations in East Gippsland: Value-adding and Sivilicultural Systems Program Retrospective Study*. Value-adding and Sivilicultural Systems Program Technical Report 18. Victorian Department of Conservation and Natural Resources, Melbourne, Victoria.
- Loyn, R.H. (1995). Bell Miners and the farming hypothesis – a comment. *Emu* **95**(2): 145–146.
- Loyn, R.H. (1998). Birds in patches of old-growth ash forest, in a matrix of younger forest. *Pacific Conserv. Biol.* **4**(2): 111–21.
- Loyn, R.H., Runnalls, R.G., Forward, G.Y. & Tyers, J. (1983). Territorial Bell Miners and other birds affecting populations of insect prey. *Science (Washington, D.C.)* **221**: 1411–1413.
- Lu Changhu & Chang Jiachuan (1993). [Breeding behaviour of the Long-tailed Shrike]. *Chinese Wildl.* **4**: 19–21. In Chinese.
- Lucas, F.A. (1890). Notes on the osteology of the Paridae [Paridae], *Sitta*, and *Chamaea*. *Proc. US Natl. Mus.* **13**: 337–345.
- Luck, G.W., Possingham, H.P. & Paton, D.C. (1999). Bird responses at inherent and induced edges in the Murray Mallee, South Australia. 1. Differences in abundance and diversity. *Emu* **99**: 157–169.
- Lucking, R.S. (1996). Polygyny in the Seychelles Sunbird *Nectarinia dussumieri*. *Bull. Brit. Orn. Club* **116**(3): 178–179.
- Ludlow, F. (1950). The birds of Lhasa. *Ibis* **92**: 34–45.
- Ludlow, F. (1951). The birds of Kongo and Pome, south-east Tibet. *Ibis* **93**: 547–578.
- Ludlow, F. & Kinnear, N.B. (1933). A contribution to the ornithology of Chinese Turkestan. Part 2. *Ibis Ser.* **13**, no. 3: 440–473, pls. 14–15.
- Ludlow, F. & Kinnear, N.B. (1944). The birds of south-eastern Tibet. [Parts 1]. *Ibis* **86**(1): 43–86, pls. 1–7.
- Lukac, G., Stipevic, M., Crnkovic, R. & Bem, D. (1992). Characteristics of habitat and distribution of *Sitta neumayer* Mich. (Aves) in Croatia and neighbouring areas. *Natura Croatica* **1**: 81–91.
- van Lummel, L.E.-Æ. (1932). Brilvogels. *Tropische Natur* **21**: 222–224. In Dutch.
- Lunney, D., Curtin, A.L., Ayers, D., Cogger, H.G., Dickman, C.R., Maitz, W., Law, B. & Fisher, D. (2000). *The Threatened and Non-threatened Native Vertebrate Fauna of New South Wales: Status and Ecological Attributes*. New South Wales National Parks and Wildlife Service, Sydney.
- Lunt, N., Hulley, P.E. & Craig, A.J.F.K. (2004). Active anting in captive Cape White-eyes *Zosterops pallidus*. *Ibis* **146**(2): 360–362.
- Luo Shiyu, Zhang Yingmei & Yang Youtao (1992). [Observation on ecology of *Lanius tephronotus*]. *Sichuan J. Zool.* **11**(4): 12–13. In Chinese.
- Lusk, M.R. & Taisacan, E. (1997). Description of a Bridled White-eye nest from Rota, Mariana Islands. *Micronesica* **30**: 183–185.
- Luukkonen, D.R. (1987). *Loggerhead Shrike Status and Breeding Ecology in Virginia*. MSc thesis, Virginia Polytechnic Institute and State University, Blacksburg, Virginia.
- Lynn, N. & Temple, S.A. (1991). Land-use changes in the Gulf Coast region: links to declines in midwestern Loggerhead Shrike populations. *Passenger Pigeon* **53**: 315–325.
- Lynes, H. (1938). Contribution to the ornithology of the southern Congo basin: Lynes-Vincent Tour of 1933–34. *Rev. Zool. Bot. Afr.* **31**(1): 1–129.
- Lynn, S., Martin, J.A. & Garcelon, D.K. (2006). Can supplemental foraging perches enhance habitat for endangered San Clemente Loggerhead Shrikes? *Wilson J. Orn.* **118**(3): 333–340.
- Ma Ming (1993). The reproductive ecology of *Lanius isabellinus isabellinus* and *Lanius excubitor pallidirostris*. *Arid Zone Res.* **4**: 66–68. In Chinese with English summary.
- Mabberley, D.J. (1997). *The Plant-book. A Portable Dictionary of the Vascular Plants*. 2nd edition. Cambridge University Press, Cambridge, UK.
- Mac Nally, R. (1994). Habitat-specific guild structure of forest birds in south-eastern Australia: a regional scale perspective. *J. Anim. Ecol.* **63**(4): 988–1001.
- Mac Nally, R. (1997). Population densities in a bird community of a wet sclerophyllous Victorian forest. *Emu* **97**(3): 253–258.
- Mac Nally, R. & Bennett, A.F. (1997). Species-specific predictions of the impact of habitat fragmentation: local extinction of birds in the box-ironbark forests of central Victoria, Australia. *Biol. Conserv.* **82**: 147–155.
- Mac Nally, R. & Timewell, C.A.R. (2005). Resource availability controls bird-assembly composition through interspecific aggression. *Auk* **122**(4): 1097–1111.
- Macarthur, A.J. (1930). Bird notes from Terrigal, N.S.W. *Emu* **30**: 143.
- MacColl, A.D.C. & Hatchwell, B.J. (2002). Temporal variation in fitness payoffs promotes cooperative breeding in Long-tailed Tits *Aegithalos caudatus*. *Amer. Naturalist* **160**(2): 186–194.
- MacColl, A.D.C. & Hatchwell, B.J. (2003). Sharing of caring: nestling provisioning behaviour of Long-tailed Tit, *Aegithalos caudatus*, parents and helpers. *Anim. Behav.* **66**(5): 955–964.
- Macdonald, D. (1985). Greater Doublecollared Sunbird. *WBC News* **128**: 9.
- Macdonald, J.D. (1958). Notes on *Cinnyris manoensis* Reichenow. *Bull. Brit. Orn. Club* **78**: 7–9.
- Macdonald, J.D. (1969). Hybridization in *Pardalotus*. *Emu* **69**(1): 41–44.
- Macdonald, J.D. (1973). *Birds of Australia: a Summary of Information*. H.F. & G. Witherby, London.
- Macdonald, M.A. (1980). The ecology of the Fiscal Shrike in Ghana, and a comparison with studies from Southern Africa. *Ostrich* **51**: 65–74.
- MacGillivray, W. (1910a). The region of the Barrier Range. An oologist's holiday. Part 1. *Emu* **10**(1): 16–34.
- MacGillivray, W. (1910b). Along the Great Barrier Reef. *Emu* **10**(3): 216–233.
- MacGillivray, W. (1912). Descriptions of nests and eggs from Cape York. *Emu* **11**(3): 213–214.
- MacGillivray, W. (1914). Notes on some North Queensland birds. *Emu* **13**(3): 132–186.
- MacGillivray, W. (1915). A new honey-eater: *Macgillivrayornis claudi*. *Emu* **15**(2): 77–78.
- MacGillivray, W. (1917). Ornithologists in North Queensland. Part 1. *Emu* **17**(2): 63–87.
- MacGillivray, W. (1918). Ornithologists in North Queensland. Part 3. *Emu* **17**(4): 180–212.
- MacGillivray, W. (1924). A spring excursion into south-western Queensland. Part 2. *Emu* **24**(2): 90–101.
- MacGillivray, W. (1929). Through a drought-stricken land. [Part 2]. *Emu* **29**(2): 113–129.
- Mack, A.L. (1994). Notes on the nests and eggs of some birds at the Crater Mountain Research Station, Papua New Guinea. *Bull. Brit. Orn. Club* **114**(3): 176–181.
- Mack, A.L. ed. (1998). *A Biological Assessment of the Lakekamu Basin, Papua New Guinea*. Rapid Assessment Program Working Papers 9. Conservation International, Washington, D.C.
- Mack, A.L. & Alonso, L.E. eds. (2000). *A Biological Assessment of the Wapoga River Area of North-western Irian Jaya, Indonesia*. Rapid Assessment Program Bulletin of Biological Assessment 14. Conservation International, Washington, D.C.
- Mack, A.L. & Wright, D.D. (1996). Notes on occurrence and feeding of birds at Crater Mountain Biological Research Station, Papua New Guinea. *Emu* **96**(2): 89–101.
- Mack, D.B. (1961). Birds of the Upper Murray of South Australia. *South Austr. Orn.* **23**: 69–79.
- Mack, K.J. (1970). Birds of the north east of South Australia. *South Austr. Orn.* **25**: 126–141.
- Mackay, R.D. (1977). Birds recorded in Manus and New Ireland provinces between 21/2/77 and 11/3/77. *Papua New Guinea Bird Soc. Newsl.* **137**: 4–8.
- Mackay, R.D. (1980). A list of the birds of the Baiyer River Sanctuary and adjacent areas. *Papua New Guinea Bird Soc. Newsl.* **167/168**: 28–46.
- Mackay, R.D. (1981). Nesting and description of young of Long-billed Honeyeater (*Melilestes megarrhynchus*). *Papua New Guinea Bird Soc. Newsl.* **181/182**: 15–17.
- Mackay, R.D. (1991). Additions to the avifauna of the Adelbert Range, PNG. *Muruk* **5**(1): 12–15.
- Mackay, R.D. & Martin, D. (1976). Observations. *Papua New Guinea Bird Soc. Newsl.* **126**: 9–10.
- MacKenzie, N.A. (1981). *A Faunal Inventory of Samunsum Wildlife Sanctuary*. National Parks and Wildlife Office, Sarawak Forestry Department, Kuching, Malaysia.
- MacKinnon, J.R. (1988). *Field Guide to the Birds of Java and Bali*. Gadjah Mada University Press, Yogyakarta, Indonesia.
- MacKinnon, J.R. & Philipps, K. (1993). *A Field Guide to the Birds of Borneo, Sumatra, Java, and Bali*. Oxford University Press, Oxford, New York & Tokyo.
- MacKinnon, J.R. & Philipps, K. (2000). *A Field Guide to the Birds of China*. Oxford University Press, Oxford, UK.
- Mackworth-Praed, C.W. & Grant, C.H.B. (1945). On the plumages and moults of males of sunbirds occurring in East Africa. *Ibis* **87**: 145–158.
- Mackworth-Praed, C.W. & Grant, C.H.B. (1945a). On the races and distribution of the white-eyes belonging to the *Zosterops senegalensis* and *Zosterops virens* groups. *Ibis* **87**(1): 1–11.
- Mackworth-Praed, C.W. & Grant, C.H.B. (1945b). On the races and distribution of the white-eyes belonging to the *Zosterops senegalensis* and *Zosterops virens* groups. [Short notes]. *Ibis* **87**(4): 575–576.
- Mackworth-Praed, C.W. & Grant, C.H.B. (1946). On the races and distribution of the white-eyes belonging to the *Zosterops senegalensis* and *Zosterops virens* groups. [Short notes]. *Ibis* **88**(2): 236.
- Mackworth-Praed, C.W. & Grant, C.H.B. (1960). *Birds of Eastern and North Eastern Africa*. 2nd edition. Vol. 2. African Handbook of Birds Series 1. Longmans, Green and Co., London.
- Mackworth-Praed, C.W. & Grant, C.H.B. (1963). *Birds of the Southern Third of Africa*. Vol. 2. African Handbook of Birds Series 2. Longmans, Green and Co., London.
- Mackworth-Praed, C.W. & Grant, C.H.B. (1973). *Birds of West Central and Western Africa*. Vol. 2. African Handbook of Birds Series 3. Longmans, Green and Co., London.
- Maclean, G.L. (1993). *Roberts' Birds of Southern Africa*. 6th edition. John Voelcker Bird Book Fund & New Holland, Cape Town & London.
- MacMillen, R.E. & Carpenter, F.L. (1977). Daily energy costs and body weight in nectarivorous birds. *Comp. Biochem. Physiol.* **56A**: 439–441.
- Macoun, J. & Macoun, J.M. (1909). *Catalogue of Canadian Birds*. Government Printing Bureau, Ottawa.
- Madarász, G. (1899). Ornithologische Sammel-Ergebnisse Ludwig Biró's in Neu-Guinea. *Természettud. Füzetek* **22**: 375–428. In German with Hungarian summary.
- Maddocks, T.A. & Geiser, F. (1997). Energetics, thermoregulation and nocturnal hypothermia in Australian Silvereyes. *Condor* **99**: 104–112.
- Maddocks, T.A. & Geiser, F. (2000). Seasonal variations in thermal energetics of Australian Silvereyes (*Zosterops lateralis*). *J. Zoology (London)* **252**: 327–333.
- Madge, S.G. (1987). Display of Thickbilled Flowerpecker *Dicaeum agile*. *J. Bomb. Nat. Hist. Soc.* **83** (Suppl.): 213.
- Madoe, G.C. (1956). *An Introduction to Malayan Birds*. Revised edition. Malayan Nature Society, Kuala Lumpur.
- Magsalay, P.M. (1993). Re-discovery of four Cebu endemic birds (Philippines). *Asia Life Sci.* **2**(2): 141–148.
- Magsalay, P.M. (1995). Schutz und Management eines Waldstücks in Tabunan, Zentral-Cebu-Nationalpark. *Mitt. Zool. Ges. Arten-u. Populationsschutz* **11**: 12–14.
- Magsalay, P.M., Brooks, T.M., Dutton, G.C.L. & Timmins, R.J. (1995). Extinction and conservation on Cebu. *Nature (London)* **373**: 294.
- Magsalay, P.M., Rigor, R.P., Gonzales, H.I. & Mapalo, A.M. (1989). *Survey of Olango Island, Philippines with Recommendations for Nature Conservation*. Asian Wetland Bureau Philippines Foundation, Cebu City, Philippines.
- Maher, W.J. (1986). Growth and development of the Brown-backed Honeyeater *Ramsayornis modestus* in North Queensland. *Emu* **86**(4): 245–248.
- Maher, W.J. (1988). Breeding biology of the Brown-backed Honeyeater *Ramsayornis modestus* (Meliphagidae) in Northern Queensland. *Emu* **88**(3): 190–194.
- Maher, W.J. (1991). Growth and development of the Yellow-bellied Sunbird *Nectarinia jugularis* in North Queensland. *Emu* **91**: 58–61.
- Maher, W.J. (1992). Breeding biology of the Yellow-bellied Sunbird *Nectarinia jugularis* in Northern Queensland. *Emu* **92**(1): 57–60.
- Maher, W.J. (1996). Nestling food and feeding frequencies of the Brown-backed Honeyeater *Ramsayornis modestus* and the Yellow-bellied Sunbird *Nectarinia jugularis* in Northern Queensland. *Emu* **96**(1): 17–22.
- Maire, M. (1987). Nidification du Tichodrome au Saleve (Haute-Savoie). *Nos Oiseaux* **39**(2): 49–52. In French.
- Majne, T.S. & Bulmer, R. (1977). *Birds of My Kalam Country*. Auckland University Press & Oxford University Press, Auckland, New Zealand.
- Major, R.E. (2003). Urban currawongs. *Nature Australia* **27**(9): 52–59.
- Major, R.E. & Gowing, G. (1994). An inexpensive photographic technique for identifying nest predators at active nests of birds. *Wildl. Res.* **21**(6): 657–666.
- Major, R.E., Christie, F.J. & Gowing G. (2001). Influence of remnant and landscape attributes on Australian woodland bird communities. *Biol. Conserv.* **102**: 47–66.
- Major, R.E., Christie, F.J., Gowing, G. & Ivson, T.J. (1999). Elevated rates of predation on artificial nests in linear strips of habitat. *J. Field Orn.* **70**: 351–364.
- Major, R.E., Gowing, G. & Kendal, C.E. (1996). Nest predation in Australian urban environments and the role of the Pied Currawong *Srepera graculina*. *Austr. J. Ecol.* **21**(4): 399–409.
- Major, R.E., Pyke, G.H., Christy, M.T., Gowing, G. & Hill, R.S. (1994). Can nest predation explain the timing of the breeding season and the pattern of nest dispersion of New Holland Honeyeaters? *Oikos* **69**: 364–372.
- Majumdar, N. (1980). On the taxonomic validity of the South Indian Blackheaded Oriole, *Oriolus xanthornus maderaspatanus* Franklin (Aves: Oriolidae). *J. Bombay Nat. Hist. Soc.* **77**(1): 139–142.
- Majumdar, N. (1981a). On the first record of occurrence of three passerine birds from Andhra Pradesh. *J. Bombay Nat. Hist. Soc.* **78**(2): 382–383.
- Majumdar, N. (1981b). Extension of range of the Indian Maroonbreasted Sunbird, *Nectarinia lotenia hindustanica* (Whistler) (Aves, Nectariniidae), and the Northern Jungle Myna, *Acridotheres fuscus fuscus* (Wagler) (Aves, Sturnidae). *J. Bombay Nat. Hist. Soc.* **78**(2): 383–384.
- Makatsch, W. (1950). *Die Vogelwelt Macedoniens*. Akademie Verlag, Leipzig, Germany. In German.
- Makatsch, W. (1976). *Die Eier der Vögel Europas*. Vol. 2. Neumann Verlag, Leipzig & Radebeul. In German.
- Malle, G. (2006). Mauerläufer *Tichodroma muraria* (Linné 1766). Pp. 310–311 in: Feldner, J., Rass, P., Pettschnig, W., Wagner, S., Malle, G., Buschenreiter, R.K., Wiedner, P. & Probst, R. (2006). *Avifauna Kärntens: Die Brutvögel*. Naturwissenschaftlicher Verein für Kärnten, Klagenfurt, Austria. In German.
- Mallon, D.P. (1987). The winter birds of Ladakh. *Forktail* **3**: 27–41.
- Manegold, A. (2008). Earliest fossil record of the Certhioidea (treecreepers and allies) from the early Miocene of Germany. *J. Orn.* **149**(2): 223–228.
- Mann, C.F. (1971). Migration in the Dahlak Archipelago and the neighbouring mainland of Ethiopia, autumn 1962. *Bull. Brit. Orn. Club* **91**: 41–46.
- Mann, C.F. (1985). An avifaunal study in Kakamega Forest, Kenya, with particular reference to species diversity, weight and moult. *Ostrich* **56**: 236–262.
- Mann, C.F. (1987). A checklist of the birds of Brunei Darussalam. *Brunei Mus. J.* **6**(3): 170–212.

- Mann, C.F. (1991). Bird report for Negara Brunei Darussalam July 1988–June 1990. *Brunei Mus. J.* 7(3): 86–111.
- Mann, C.F. (1996). The avifauna of Belalong forest, Brunei Darussalam. Pp. 101–116 in: Edwards, D.S., Booth, W.E. & Choy, S.C. eds. (1996). *Tropical Rainforest – Current Issues*. Kluwer, Dordrecht, The Netherlands.
- Mann, C.F. (2002). Systematic notes on Asian birds. 28. Taxonomic comments on some south and south-east Asian members of the Nectariniidae. *Zool. Verhand. Leiden* 340: 179–189.
- Mann, C.F. (2008). *A Checklist of the Birds of Borneo*. British Ornithologists' Union Checklist 23. British Ornithologists' Union, London.
- Mann, C.F. & Cheke, R.A. (2006). The validity of the sunbird genus *Hedylipna*. *Bull. Brit. Orn. Club* 126(3): 199–200.
- Mann, J.G. (1919). The Singing Honey-eater (*Ptilotis sonora*). *Emu* 18: 297–298.
- Manning, J. (2000). Seeing red. Birds and the flowers they pollinate. *Africa Birds & Birding* 5: 40–49.
- Manson, A.J. (1985). Gurney's Sugarbird in the Vumba. *Honeyguide* 31: 220–221.
- Manson, A.J. (1986). Results of a ringing program at Muruwati Farm, Mazowe. *Honeyguide* 32: 34–41.
- Mansoori, J. (2001). *A Field Guide to the Birds of Iran*. Nashr Zehn Aviz, Tehran.
- Manuel, C.G. (1937). The avifauna of Cantanduanes. *Philippine J. Sci.* 63: 185–189.
- Manuel, C.G. & Gilliard, E.T. (1952). Undescribed and newly recorded Philippine birds. *Amer. Mus. Novit.* 1545: 1–9.
- Manuel, F. (1949). Chasse du Tichodrome sur le glacier. *Nos Oiseaux* 20: 126. In French.
- Marchant, S. (1951). Calls of some forest birds. Part 2. *Nigerian Field* 16: 107–112.
- Marchant, S. (1979). The birds of forest and woodland near Moruya N.S.W. *Austr. Birds* 13(4): 59–68.
- Marchant, S. (1980). Incubation and nestling periods of some Australian birds. *Corella* 4(2): 30–32.
- Marchant, S. (1982). The sedentary nature of passerine birds in woodland at Moruya, New South Wales. *Corella* 6(4): 87–88.
- Marchant, S. (1983). Suggested nesting association between Leaden Flycatchers and Noisy Friarbirds. *Emu* 83(2): 119–122.
- Marchant, S. (1986). Nesting notes on the White-naped Honeyeater. *Austr. Birds* 20(2): 52–55.
- Marchant, S. (1992). *A Bird Observatory at Moruya, NSW 1975–84*. Occasional Publication 1. Eurobiodalla Natural History Society, Moruya, New South Wales.
- Mariaux, J. & Vaucher, C. (1991). A new species of *Staphylepis* Spassky & Oshmarin, 1954 (Cestoda: Hymenolepididae) found in West African nectariniid birds. *Rev. Suisse Zool.* 98(2): 261–268.
- Markman, S., Pinshow, B. & Wright, J. (1999). Orange-tufted Sunbirds do not feed nectar to their chicks. *Auk* 116: 257–259.
- Markman, S., Tadmor-Melamed, H., Arieli, A. & Izhaki, I. (2006). Sex differences in food intake and digestive constraints in a nectarivorous bird. *J. Exper. Biol.* 209(6): 1058–1063.
- Markman, S., Yom-Tov, Y. & Wright, J. (1995). Male parental care in the Orange-tufted Sunbird: behavioural adjustments in provisioning and nest guarding effort. *Anim. Behav.* 50: 655–669.
- Markman, S., Yom-Tov, Y. & Wright, J. (1996). The effect of male removal on female parental care in the Orange-tufted Sunbird. *Anim. Behav.* 52: 437–444.
- Marks, M.B. (1972). Notes on the natal plumage of South African passeriform birds. *Ostrich* 40: 17–22.
- van Marle, J.G. & Voous, K.H. (1988). *The Birds of Sumatra. An Annotated Check-list*. British Ornithologists' Union Check-list 10. British Ornithologists' Union, Tring, UK.
- Maron, M. (2007). Threshold effect of eucalypt density on an aggressive avian competitor. *Biol. Conserv.* 136: 100–107.
- Maron, M., Lill, A., Watson, D.M. & Mac Nally, R. (2005). Temporal variation in bird assemblages: how representative is a one-year snapshot? *Austr. Ecol.* 30(4): 383–394.
- Marples, B.J. (1944a). Report on trapping and ringing work on the White-eye *Zosterops lateralis* throughout the dominion. *New Zealand Bird Notes* 1(5): 41–48.
- Marples, B.J. (1944b). Notes on the songs of certain birds in Dunedin. *New Zealand Bird Notes* 1(6): 62–64.
- Marples, B.J. (1945). *Zosterops lateralis* at Dunedin, New Zealand. *Emu* 44: 277–287.
- Marsden, S.J. (1998). Changes in bird abundance following selective logging on Seram, Indonesia. *Conserv. Biol.* 12: 605–611.
- Marsden, S.J., Jones, M.J., Linsley, M.D., Mead, C. & Hounscome, M.V. (1997). The conservation status of the restricted-range lowland birds of Buru, Indonesia. *Bird Conserv. Int.* 7: 213–233.
- Marsh, C.W. ed. (1989). *Expedition to Maliau Basin, Sabah, April–May 1988*. Final report. Yayasan Sabah Forestry Division, Kota Kinabalu, Sabah, Malaysia.
- Marshall, A.J. (1932a). The Fuscous Honeyeater. *Emu* 31: 196.
- Marshall, A.J. (1932b). Notes on the Satin Bower-bird. *Emu* 32: 33–38.
- Marshall, A.J. (1933). The Yellow-spotted Honeyeater. *Emu* 33: 3–5.
- Marshall, A.J. (1934a). Bird notes from Rockingham Bay, Queensland. *Emu* 33: 242–248.
- Marshall, A.J. (1934b). A survey of the bird-fauna of certain islands of the Whitsunday Passage North Queensland. *Emu* 34: 36–44.
- Marshall, A.J. (1950). The function of vocal imitation in birds. *Emu* 50(1): 5–16.
- Marshall, A.J. & Harrison, T.H. (1941). The comparative economy of closely related birds on an island and a continent. *Emu* 40: 310–318.
- Marshall, B.E. & Cooper, J. (1969). Observations on the breeding biology of the Fiscal Shrike. *Ostrich* 40: 148–149.
- Marshall, H. (1959). The orioles of West Africa. *Nigerian Field* 24: 6–13.
- Marshall, J.T. (1949). The endemic avifauna of Saipan, Tinian, Guam and Palau. *Condor* 51: 200–221.
- Marshall, J.T. (1957). *Birds of Pine-oak Woodland in Southern Arizona and Adjacent Mexico*. Pacific Coast Avifauna No. 32. Cooper Ornithological Society, Berkeley, California. 125 pp.
- Marshall, M. (1975). The natural history of Namoluk Atoll, eastern Caroline Islands. *Atoll Res. Bull.* 189: 1–53.
- Martens, J. (1981). Lautäußerungen der Baumläufer des Himalaya und zur akustischen Evolution in der Gattung *Certhia*. *Behaviour* 77: 287–318. In German.
- Martens, J. & Eck, S. (1995). *Towards an Ornithology of the Himalayas: Systematics, Ecology and Vocalizations of Nepal Birds*. Bonner Zoologische Monographien 38. Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn. 445 pp.
- Martens, J. & Geduldig, G. (1988). Akustische Barrieren beim Waldbaumläufer (*Certhia familiaris*)? *J. Orn.* 129(4): 417–432. In German with English summary.
- Martens, J. & Geduldig, G. (1990). Acoustic adaptations of birds living close to Himalayan torrents. Pp. 123–131 in: van den Elzen, R., Schuchmann, K.L. & Schmidt-Koenig, K. eds. (1990). *Proceedings of the International Centennial Meeting of the Deutsche Ornithologen-Gesellschaft. Current Topics in Avian Biology*. Bonn 1988. Deutsche Ornithologen-Gesellschaft, Bonn, Germany.
- Martens, J. & Tietze, D.T. (2006). Systematic notes on Asian birds. 65. A preliminary review of the Certhiidae. *Zool. Meded. Leiden* 80(5): 273–286.
- Martens, J., Eck, S. & Sun Yuehua (2002). *Certhia tianquanensis* Li, a treecreeper with relict distribution in Sichuan, China. *J. Orn.* 143: 440–456.
- Martens, J., Eck, S. & Sun Yuehua (2003). On the discovery of a new treecreeper in China – *Certhia tianquanensis* Li. *Bull. Oriental Bird Club* 37: 65–70.
- Martin, G. & Kremer, S. (2006). Saving Saipan's White-eye. *Endangered Species Bull.* 31(3): 8–11.
- Martin, R. (1983). Possible eclipse plumage in the Lesser Doublecollared Sunbird. *Bokmakierie* 35: 67.
- Martin, R. & Tyler, D. (1996). European Golden Orioles feeding on cicadas. *Promeropis* 22: 12.
- Martin, R., Martin, J. & Martin, E. (1988). A comment on the breeding season of Gurney's Sugarbird in Natal. *Bokmakierie* 40(1): 20.
- Martin, R., Martin, J. & Martin, E. (1991). Lesser Double-collared Sunbirds: new breeding areas. *Promeropis* 198: 14.
- Martin, T.G., Joseph, L.N. & Possingham, H.P. (2003). Black-chinned Honeyeaters (*Melithreptus gularis*) stealing koala (*Phascolarctos cinereus*) fur to build a nest. *Sunbird* 33(1): 29–32.
- Martin, T.G., McIntyre, S., Catterall, C.P. & Possingham, H.P. (2006). Is landscape context important for riparian conservation? Birds in grassy woodland. *Biol. Conserv.* 127: 201–214.
- Martin, W.K., Eyars-Chaddock, M., Wilson, B.R. & Lemon, J. (2004). The value of habitat reconstruction to birds at Gunnedah, New South Wales. *Emu* 104: 177–189.
- Martindale, J. (1980). Warden's report: 1977–1979. Pp. 4–40 in: Anon (1980). *Eyre Bird Observatory Report 1977–1979*. RAOU Report 1. Royal Australasian Ornithologists Union, Melbourne, Victoria.
- Martins, R.P., Porter, R.F. & Stone, F. (1993). Preliminary report of the OSME survey of southern Yemen and Socotra spring 1993. Ornithological Society of the Middle East, Sandy, Bedfordshire, UK. Unpubl.
- Masibala, V.T. & Dutton, G.C.L. eds. (2006). *Important Bird Areas in Fiji*. Birdlife International, Cambridge, UK.
- Mason, C.W. & Maxwell-Lefroy, H. (1912). The food of birds in India. *Mem. Dept. Agric. India (Entomol. Ser.)* 3: 143–144.
- Mason, P. (1985). The impact of urban development on bird communities of three Victorian towns – Lilydale, Coldstream and Mt Evelyn. *Corella* 9(1): 14–21.
- Mason, P. (2004). Golden Orioles in Britain. *British Birds* 97: 146–147.
- Mason, V. (1989). *Birds of Bali*. Periplus Editions, Singapore.
- Mason, V. (1991). A journey to the Spice Islands. *Bull. Bali Bird Club* 1(1): 4–8.
- Mason, V. (1993). Wallacea revisited. *Bull. Bali Bird Club* 2(1): 6–7.
- Mason, V. (1997). Birds of Indonesia. *Bird Obs. Nunawading* 780: 8.
- Massa, R., Bottoni, L. & Fornasari, L. (1993). Site fidelity and population structure of the Red-backed Shrike in Northern Italy. *Ringing & Migration* 14: 129–132.
- Masters, J.R. & Milhinch, A.L. (1974). Birds of the Shire of Northam, about 100 km east of Perth, WA. *Emu* 74(4): 228–244.
- Masteron, A. (1970). Notes on the Spotted Creeper. *Honeyguide* no. 61 [vol. 15(2)]: 35–37.
- Matheson, W.E. (1981). The Brown Honeyeater in South Australia. *South Austr. Orn.* 28(7): 180–184.
- Mathews, A.G. (1966). Range extensions in some Western Australian birds. *West. Austr. Nat.* 10(2): 45.
- Mathews, G.M. (1914). A list of the birds of Melville Island, Northern Territory, Australia. *Ibis Ser.* 10, no. 2: 91–132.
- Mathews, G.M. (1921). *The Birds of Australia*. Vol. 9(4). H.F. & G. Witherby, London.
- Mathews, G.M. (1923). *The Birds of Australia*. Vol. 11(3). H.F. & G. Witherby, London.
- Mathews, G.M. (1924a). *The Birds of Australia*. Vol. 11(5). H.F. & G. Witherby, London.
- Mathews, G.M. (1924b). *The Birds of Australia*. Vol. 11(6). H.F. & G. Witherby, London.
- Mathews, G.M. (1925). *The Birds of Australia*. Vol. 12(2). H.F. & G. Witherby, London.
- Mathews, G.M. (1926). *The Birds of Australia*. Vol. 12(7). H.F. & G. Witherby, London.
- Mathews, G.M. (1928). *The Birds of Norfolk and Lord Howe Islands and the Australasian South Polar Quadrant, with Additions to the Birds of Australia*. H.F. & G. Witherby, London.
- Matsui, S., Hisaka, M. & Takagi, M. (2006). Direct impact of typhoons on the breeding activity of Bull-headed Shrike *Lanius bucephalus* on Minami-daito island. *Orn. Sci.* 5: 227–229.
- Matsuoka, S. (2007). Winter roosting sites and roosting behavior of Tree Creepers (*Certhia familiaris*) in Hokkaido. *Shinrin Sogo Kenkyujo Kenkyu Hokoku* 6(1): 65–69. In English with Japanese summary.
- Matthew, J.S. (1999). A new method for ageing some species of Meliphagidae. *Corella* 23(3): 69–71.
- Matthew, J.S. & Carpenter, G.C. (1990). A survey of birds and their habitats in the unnamed conservation park and adjacent eastern Great Victoria Desert. Report for South Australian Ornithologist Association, Adelaide. Unpubl.
- Matthew, J.S. & Carpenter, G.C. (1993). Recent bird records from east of Lake Gairdner, Gawler Ranges, S.A. *South Austr. Orn.* 31: 127–131.
- Matthews, A., Dickman, C.R. & Major, R.E. (1999). The influence of fragment size and edge on nest predation in urban bushland. *Ecography* 22: 349–357.
- Matthiessen, J.N. (1973). Observations on the food of some birds of south-western Western Australia. *Emu* 73(4): 191–193.
- Matthiessen, J.N. & Springett, B.P. (1973). The food of the Silvereye, *Zosterops gouldi* (Aves: Zosteropidae), in relation to its role as a vector of a granulosis virus of the potato moth, *Phthorimaea operculella* (Lepidoptera: Gelechiidae). *Austr. J. Zool.* 21: 533–540.
- Matthysen, E. (1989). Seasonal variation in bill morphology of Nuthatches *Sitta europaea*: dietary adaptations or consequences? *Ardea* 77(1): 117–125.
- Matthysen, E. (1997). Geographic variation in the occurrence of song types in Nuthatch *Sitta europaea* populations. *Ibis* 139(1): 102–106.
- Matthysen, E. (1998). *The Nuthatches*. T&AD Poyser, London.
- Matthysen, E. (1999a). Foraging behaviour of Nuthatches (*Sitta europaea*) in relation to the presence of mates and mixed flocks. *J. Orn.* 140(4): 443–451.
- Matthysen, E. (1999b). Nuthatches (*Sitta europaea*: Aves) in forest fragments: demography of a patchy population. *Oecologia (Berlin)* 119(4): 501–509.
- Matthysen, E. & Adriaensen, F. (1989). Notes on winter territoriality and social behaviour in the Corsican Nuthatch *Sitta whiteheadi* Sharpe. *Alauda* 57(2): 155–168.
- Matthysen, E. & Adriaensen, F. (1998). Forest size and isolation have no effect on reproductive success of Eurasian Nuthatches (*Sitta europaea*). *Auk* 115(4): 955–963.
- Matthysen, E., Cimplich, D. & Grubb, T.C. (1992). Is social organization in winter determined by short- or long-term benefits? A case study on migrant Red-breasted Nuthatches *Sitta canadensis*. *Ornis Scand.* 23(1): 43–48.
- Matthysen, E., Gaunt, S.L. & McCallum, D.A. (1991). A note on the vocalisations of the Chinese Nuthatch. *Wilson Bull.* 103: 706–710.
- Matvejev, S.D. (1976). *Pregled Faune Pticia Balkanskog Polyostrava*. [Survey of the Balkan Peninsula Bird Fauna]. *Conspectus Avifaunae Balcanicae*. Part 1. Piciformes and Passeriformes. Serbian Academy Monograph 46. Srpska Akademija Nauka i Umetnosti, Beograd. 365 pp. In Serbian with English summary.
- Mauersberger, G. (1960). *Certhia brachydactyla* Brehm. 1st installment in: Stresemann, E. & Portenko, L.A. eds. (1960). *Atlas der Verbreitung palaarktischer Vögel*. Akademie-Verlag, Berlin. In German.
- Mauersberger, G. (1989). Zur Ernährungsweise des Chinesenkleibers, *Sitta villosa* Verreaux. *Acta Ornithocol. (Jena)* 2: 79–86. In German.
- Mauersberger, G., Wagner, S., Wallschläger, D. & Warthold, R. (1982). Neue Daten zur Avifauna Mongolien. Ergebnisse der mongolischen Gemeinschaftsreise von Ornithologen aus der DDR 1979. Part 2. *Mitt. Zool. Mus. Berlin* 58(1): 11–74. In German with English summary.
- Maumary, L., Vallotton, L. & Knaus, P. (2007). *Die Vögel der Schweiz – Das große Nachschlagewerk: Alles über Vorkommen, Bestand, Wanderungen, Lebensraum, Verhalten, Nahrung, Fortpflanzung, Gefährdung, Schutz*. Schweizerische Vogelwarte, Sempach & Nos Oiseaux, Montmolin, Switzerland. In German.
- Mawson, P.R. & Massam, M.C. (1995). The birds of a remnant of native vegetation on the eastern Swan Coastal Plain. *West. Austr. Nat.* 20(1): 37–47.
- Mayr, E. (1931a). Birds collected during the Whitney South Sea Expedition. 13. A systematic list of the birds of Rennell Island with descriptions of new species and subspecies. *Amer. Mus. Novit.* 486: 1–29.
- Mayr, E. (1931b). Birds collected during the Whitney South Sea Expedition. 17. The birds of Malaita island (British Solomon Islands). *Amer. Mus. Novit.* 504: 1–26.
- Mayr, E. (1931c). Die Vögel des Saruwaged- und Herzoggebirges (NO-Neuguinea). *Mitt. Zool. Mus. Berlin* 17: 639–723. In German.
- Mayr, E. (1932). Birds collected during the Whitney South Sea Expedition. 18. Notes on Meliphagidae from Polynesia and the Solomon Islands. *Amer. Mus. Novit.* 516: 1–30.
- Mayr, E. (1933a). Der Formenkreis *Zosterops minor*. *Orn. Monatsber.* 41: 53–54. In German.
- Mayr, E. (1933b). Zur systematischen Stellung von *Paramythia* De Vis. *Orn. Monatsber.* 41: 112–113. In German.

- Mayr, E. (1936). New subspecies of birds from the New Guinea region. *Amer. Mus. Novit.* **869**: 1–7.
- Mayr, E. (1937). Birds collected during the Whitney South Sea Expedition. 32. On a collection from Tanna, New Hebrides. *Amer. Mus. Novit.* **912**: 1–4.
- Mayr, E. (1938). Birds collected during the Whitney South Sea Expedition. 38. On a collection from Erromanga, New Hebrides. *Amer. Mus. Novit.* **986**: 1–3.
- Mayr, E. (1940). Birds collected during the Whitney South Sea Expedition. 42. On the birds of the Loyalty Islands. *Amer. Mus. Novit.* **1057**: 1–3.
- Mayr, E. (1941). *List of New Guinea Birds*. American Museum of Natural History, New York.
- Mayr, E. (1944a). The birds of Timor and Sumba. *Bull. Amer. Mus. Nat. Hist.* **83(2)**: 123–194.
- Mayr, E. (1944b). Birds collected during the Whitney South Sea Expedition. 54. Notes on some genera from the Southwest Pacific. *Amer. Mus. Novit.* **1269**: 1–8.
- Mayr, E. (1945a). Birds collected during the Whitney South Sea Expedition. 50. Notes on the birds of Northern Melanesia. *Amer. Mus. Novit.* **1294**: 125–191.
- Mayr, E. (1945b). *Birds of the Southwest Pacific – a Field Guide to the Birds of the Area between Samoa, New Caledonia, and Micronesia*. The MacMillan Company, New York.
- Mayr, E. (1955). Notes on the birds of northern Melanesia. 3. Passeres. *Amer. Mus. Novit.* **1707**: 1–46.
- Mayr, E. (1957). New species of birds described from 1941 to 1955. *J. Orn.* **98(1)**: 22–35.
- Mayr, E. (1961). The classification of the Red-tipped Pardalotes. *Emu* **61(3)**: 201–202.
- Mayr, E. (1962). Family Paradisaeidae, birds of paradise. Pp. 181–204 in: Mayr, E. & Greenway, J.C. eds. (1962). *Check-list of Birds of the World. A Continuation of the Work of James L. Peters*. Vol. 15. Museum of Comparative Zoology, Cambridge, Massachusetts.
- Mayr, E. (1965). Relationships among Indo-Australian Zosteropidae (Aves). *Breviora* **228**: 1–16.
- Mayr, E. (1967). Family Zosteropidae. Indo-Australian taxa. Pp. 289–326 in: Paynter (1967).
- Mayr, E. (1971). New species of birds described from 1956 to 1965. *J. Orn.* **112(3)**: 302–316.
- Mayr, E. & Amadon, D. (1947). A review of the Dicaeidae. *Amer. Mus. Novit.* **1360**: 1–32.
- Mayr, E. & Amadon, D. (1951). A classification of recent birds. *Amer. Mus. Novit.* **1496**: 1–42.
- Mayr, E. & van Deusen, H.M. (1956). Results of the Archbold Expeditions. No. 74. The birds of Goodenough Island, Papua. *Amer. Mus. Novit.* **1792**: 1–8.
- Mayr, E. & Diamond, J.M. (1976). Birds on islands in the sky: origin of the montane avifauna of Northern Melanesia. *Proc. Natl. Acad. Sci. USA* **73**: 1765–1769.
- Mayr, E. & Diamond, J.M. (2001). *The Birds of Northern Melanesia: Speciation, Ecology & Biogeography*. Oxford University Press, New York.
- Mayr, E. & Gilliard, E.T. (1951). New species and subspecies of birds from the highlands of New Guinea. *Amer. Mus. Novit.* **1524**: 1–15.
- Mayr, E. & Gilliard, E.T. (1952a). Altitudinal hybridization in New Guinea honeyeaters. *Condor* **54(6)**: 325–337.
- Mayr, E. & Gilliard, E.T. (1952b). Six new subspecies of birds from the highlands of New Guinea. *Amer. Mus. Novit.* **1577**: 1–8.
- Mayr, E. & Gilliard, E.T. (1954). Birds of central New Guinea. Results of the American Museum of Natural History Expeditions to New Guinea in 1950 and 1952. *Bull. Amer. Mus. Nat. Hist.* **103(4)**: 311–374, pls. 14–34.
- Mayr, E. & Greenway, J.C. (1956). Sequence of Passerine families. *Breviora* **1956**: 1–11.
- Mayr, E. & Hamlin, H. (1931). Birds collected during the Whitney South Sea Expedition. 14. With notes on the geography of Rennell Island and the ecology of its bird life. *Amer. Mus. Novit.* **488**: 1–11.
- Mayr, E. & Meyer de Schauensee, R. (1939a). Zoological results of the Denison-Crockett Expedition to the South Pacific for the Academy of Natural Sciences of Philadelphia, 1937–1938. Part I. The birds of the island of Biak. *Proc. Acad. Nat. Sci. Philadelphia* **91**: 1–37, pls. 1–2.
- Mayr, E. & Meyer de Schauensee, R. (1939b). Zoological results of the Denison-Crockett Expedition to the South Pacific for the Academy of Natural Sciences of Philadelphia, 1937–1938. Part IV. Birds from northwest New Guinea. *Proc. Acad. Nat. Sci. Philadelphia* **91**: 97–144.
- Mayr, E. & Rand, A.L. (1935). Results of the Archbold Expeditions. No. 6. Twenty-four apparently undescribed birds from New Guinea and the D'Entrecasteaux Archipelago. *Amer. Mus. Novit.* **814**: 1–17.
- Mayr, E. & Rand, A.L. (1936). Vorläufiges über die Ergebnisse der Archbold-Rand Neu-Guinea-Expedition von 1933. *Orn. Monatsber.* **44(2)**: 41–44. In German.
- Mayr, E. & Rand, A.L. (1937). Results of the Archbold Expeditions. No. 14. Birds of the 1933–1934 Papuan Expedition. *Bull. Amer. Mus. Nat. Hist.* **73(1)**: 1–248.
- Mbathu, K., Downs, C.T. & Penning, M. (2002). Nectar passage and gut morphology in the Malachite Sunbird and the Black-capped Lory: implications for feeding in nectarivores. *Ostrich* **73(3/4)**: 138–142.
- McAllan, I.A.W. (1990). Observations on the Green-backed Honeyeater *Glycichaera fallax*. *Austr. Bird Watcher* **13(6)**: 201–202.
- McAllan, I.A.W. & Filewood, L.W.C. (1994). The Yellow-faced Honeyeater on Cape York Peninsula. *Austr. Bird Watcher* **15(6)**: 279–280.
- McAllan, I.A.W., Curtis, B.R., Hutton, I. & Cooper, R.M. (2004). The birds of Lord Howe Island group: a review of records. *Austr. Field Orn.* **21** (Suppl.): 1–82.
- McCann, C. (1952). The Tui and its food plants. *Notornis* **5(1)**: 6–14.
- McCann, C. (1964). Observations on the tongues of some New Zealand birds. *Notornis* **11(1)**: 36–45.
- McCardle, J.E. (1989). Lesser Doublecollared Sunbird *Nectarinia chalybea*. *Mafraja* **6**: 119.
- McCarthy, E.M. (2006). *Handbook of Avian Hybrids of the World*. Oxford University Press, Oxford.
- McCarthy, M.A. (1995). Population viability analysis of the Helmeted Honeyeater: risk assessment of captive management and reintroduction. Pp. 21–25 in: Serena, M. ed. (1995). *Reintroduction Biology of Australian and New Zealand Fauna*. Surrey Beatty & Sons, Chipping Norton, New South Wales.
- McCarthy, M.A., Franklin, D.C. & Burgman, M.A. (1994). The importance of demographic uncertainty: an example from the Helmeted Honeyeater *Lichenostomus melanops cassidix*. *Biol. Conserv.* **67**: 135–142.
- McClure, H.E. (1984). Survival among the birds of Eastern and Southeastern Asia. *J. Yamashina Inst. Orn.* **28**: 51–128.
- McClure, H.E. (1998). *Migration and Survival of the Birds of Asia*. White Lotus, Bangkok.
- McCulloch, E.M. (1966). Birds eating soldier caterpillars. *Emu* **66(1)**: 45–46.
- McCulloch, E.M. (1977). Adaptation by birds to feed at flowers, the nectar of which is not readily available. *Austr. Bird Watcher* **7(4)**: 113–123.
- McCulloch, E.M. (1990). Parental feeding behaviour of the Noisy Friarbird *Philemon corniculatus*. *Austr. Bird Watcher* **13(7)**: 226–230.
- McDonald, P.G., Heathcote, C.F., Clarke, M.F., Wright, J. & Kazem, A.J.N. (2007). Provisioning calls of the cooperatively breeding Bell Miner *Manorina melanophrys* encode sufficient information for individual discrimination. *J. Avian Biol.* **38**: 113–121.
- McEvey, A. (1965). The birds of the Rutherglen district. *Emu* **65(1)**: 1–56.
- McEvey, A.R. & Middleton, W.G. (1968). Birds and vegetation between Perth and Adelaide. *Emu* **68(3)**: 161–212.
- McEwan, W.M. (1977). Seeds from a Tui. *Notornis* **24(4)**: 280.
- McFarland, D.C. (1983a). Calling and resource defence by Little Wattlebirds *Anthochaera chrysoptera*. *Austr. Birds* **18(1)**: 10–12.
- McFarland, D.C. (1983b). Ritualized aggression in the Eastern Spinebill *Acanthorhynchus tenuirostris*. *Sunbird* **13(4)**: 78–81.
- McFarland, D.C. (1983c). Appeasement display of the Red Wattlebird. *Austr. Birds* **17(4)**: 76–78.
- McFarland, D.C. (1984a). Protection behaviours of breeding White-plumed Honeyeaters *Lichenostomus penicillatus*. *Emu* **84(1)**: 42–43.
- McFarland, D.C. (1984b). Seasonal changes in the avifauna of New England National Park. *Austr. Bird Watcher* **10(8)**: 255–263.
- McFarland, D.C. (1984c). Behaviour of White-cheeked Honeyeaters and Little Wattlebirds in *Banksia integrifolia*. *Austr. Birds* **19(1)**: 1–6.
- McFarland, D.C. (1985). Diurnal and seasonal changes in aggression in a honeyeater community. *Corella* **9(1)**: 22–25.
- McFarland, D.C. (1986a). Breeding behaviour of the New Holland Honeyeater *Phylidonyris novaehollandiae*. *Emu* **86(3)**: 161–167.
- McFarland, D.C. (1986b). The organization of a honeyeater community in an unpredictable environment. *Austr. J. Ecol.* **11(2)**: 107–120.
- McFarland, D.C. (1986c). Seasonal changes in the abundance and body condition of honeyeaters (Meliphagidae) in response to inflorescence and nectar availability in the New England National Park, New South Wales. *Austr. J. Ecol.* **11(4)**: 331–340.
- McFarland, D.C. (1986d). Determinants of feeding territory size in the New Holland Honeyeater *Phylidonyris novaehollandiae*. *Emu* **86(3)**: 180–185.
- McFarland, D.C. (1988). The composition, microhabitat use and response to fire of the avifauna of sub-tropical heathlands in Cooloola National Park, Queensland. *Emu* **88(4)**: 249–257.
- McFarland, D.C. (1994a). Responses of territorial New Holland Honeyeaters *Phylidonyris novaehollandiae* to short-term fluctuations in nectar productivity. *Emu* **94(3)**: 193–200.
- McFarland, D.C. (1994b). Flower use and aggression among nectarivorous birds in a suburban garden. *Sunbird* **24(4)**: 80–90.
- McFarland, D.C. (1995). Notes on the corroboree behaviour of the New Holland Honeyeater. *Corella* **19(2)**: 51–54.
- McFarland, D.C. (1996). Aggression and nectar use in territorial non-breeding New Holland Honeyeaters *Phylidonyris novaehollandiae* in eastern Australia. *Emu* **96(3)**: 181–188.
- McFarland, D.C. (2002). Non-breeding territoriality in the New Holland Honeyeater, *Phylidonyris novaehollandiae*, in an unpredictable environment – short-term energy costs for possible long-term reproductive benefits. *Emu* **102(4)**: 315–321.
- McFarland, D.C. & Ford, H.A. (1987). Aspects of population biology of the Eastern Spinebill *Acanthorhynchus tenuirostris* (Meliphagidae) in New England National Park, NSW. *Corella* **11(2)**: 52–58.
- McFarland, D.C. & Ford, H.A. (1991). The relationship between foraging ecology and social behaviour in Australian honeyeaters. Pp. 1141–1155 in: Bell, B.D. ed. (1992). *Acta XX Congressus Internationalis Ornithologici*. New Zealand Ornithological Trust Board, Wellington, New Zealand.
- McFarland, D.C. & Sale, P.F. (1986). Behaviour and ecology of two species of honeyeater. *Corella* **10(2)**: 37–45.
- McGarvie, A.M. & Templeton, M.T. (1974). Additions to the birds of King Island, Bass Strait. *Emu* **74(2)**: 91–96.
- McGill, A. (1975). The Painted Honeyeater on the north coast of New South Wales. *Austr. Birds* **10(2)**: 36–38.
- McGill, A.R. (1944). An ornithological trip to north-western New South Wales. *Emu* **44(1)**: 50–63.
- McGill, A.R. (1947). Migrating honeyeaters. *Emu* **47(1)**: 56–57.
- McGill, A.R. & Lane, S.G. (1955). The Mt. Keira camp-out. *Emu* **55(1)**: 49–71.
- McGill, J.N. (1922). Notes by the late Dr. Angove, Tea-Tree Gully, S.A. *South Austr. Orn.* **6(5)**: 114–118.
- McGill, J.N. (1923). Birds of Lake Frome district, South Australia. Part II. *Emu* **22**: 274–287.
- McGill, J.N. (1932). Some birds of the interior. *South Austr. Orn.* **11(8)**: 222–225.
- McGill, J.N. (1945). *Meliphaga plumula* – Yellow-fronted Honeyeater. *South Austr. Orn.* **17**: 46–51.
- McGill, J.N. (1949). Birds on the fringe of Cattle Country, N.E. South Australia. *South Austr. Orn.* **19(5)**: 42–50.
- McGill, J.N. (1956). Notes on cuckoos in South Australia. *South Austr. Orn.* **22(1)**: 9–12.
- McGill, J.N. & Parsons, F.E. (1937). Mallee Whipbird, *Psophodes nigrogularis* (leucogaster ?) and other mallee birds. *South Austr. Orn.* **14(1)**: 3–13.
- McGoldrick, J.M. & Mac Nally, R. (1998). Impact of flowering on bird community dynamics in some central Victorian eucalypt forests. *Ecol. Res.* **13**: 125–139.
- McGowan, A., Hatchwell, B.J. & Woodburn, R.J.W. (2003). The effect of helping behaviour on the survival of juvenile and adult Long-tailed Tits *Aegintha caudatus*. *J. Anim. Ecol.* **72(3)**: 491–499.
- McGowan, A., Sharp, S.P. & Hatchwell, B.J. (2004). The structure and function of nests of Long-tailed Tits *Aegintha caudatus*. *Functional Ecol.* **18(4)**: 578–583.
- McGregor, R., Whittingham, M.J. & Cresswell, W. (2007). Survival rates of tropical birds in Nigeria, West Africa. *Ibis* **149**: 615–618.
- McGregor, R.C. (1905a). Birds from the islands of Romblon, Sibuyan, and Cresta de Gallo. *Publ. Bureau Govt. Labs. Manila* **25(1)**: 1–23.
- McGregor, R.C. (1905b). Further notes on birds from Ticao, Cuyo, Culion, Calayan, Lubang, and Luzon. *Publ. Bureau Govt. Labs. Manila* **25(2)**: 25–34.
- McGregor, R.C. (1907). The birds of Bohol. *Philippine J. Sci.* **2** (Sect. A): 315–333.
- McGregor, R.C. (1909). *A Manual of Philippine Birds*. Part 2. Passeriformes. Bureau of Printing, Manila.
- McGregor, R.C. (1911). Notes on a collection of birds from northern Negros. *Philippine J. Sci.* **6**: 39–46.
- McGregor, R.C. (1927). New or noteworthy Philippine birds. [Part] 5. *Philippine J. Sci.* **32(4)**: 513–527, pls. 1–2.
- McGregor, R.C. & Gardner, L.L. (1930). Philippine bird traps. *Condor* **32**: 89–100.
- McKean, J.L. (1965). Weights of the Silvereye at Canberra. *Austr. Bird Bander* **3**: 43–44.
- McKean, J.L. (1982). Some notes on the birds of Sulawesi (Celebes). *Papua New Guinea Bird Soc. Newslett.* **191/192**: 12–17.
- McKean, J.L. (1985). Birds of the Keep River National Park (Northern Territory), including the Night Parrot *Geopsittacus occidentalis*. *Austr. Bird Watcher* **11(4)**: 114–130.
- McKean, J.L. & Hindwood, K.A. (1965). Additional notes on the birds of Lord Howe Island. *Emu* **64**: 79–97.
- McKenzie, H.R. (1979). A history and account of the birds of the Hunua Ranges. *Notornis* **26(2)**: 105–119.
- McKenzie, S. (1996). *How Different are Mainland and Island Singing Honeyeaters* (*Lichenostomus virescens*) in the Perth Metropolitan Area. BSc thesis, Murdoch University, Perth, Western Australia.
- McKeown, K.C. (1936). The food of Australian birds with reference to protective adaptations in insects. *Emu* **36**: 21–30.
- McKilligan, N. (1972). Interesting parental behaviour of a Striped Honeyeater. *Sunbird* **3(1)**: 16.
- McKinlay, B. (2001). Counting terrestrial bird species in mixed habitats: an assessment of relative conspicuousness. *Notornis* **48(1)**: 47–53.
- McLandress, M.R. & Raveling, D.G. (1981). Hyperphagia and social behavior of Canada Geese prior to spring migration. *Wilson Bull.* **93(3)**: 310–324.
- McLaughlin, J. (1990). *Surveys and Observations of the Black-eared Miner* *Manorina melanotis* in Victoria, 1989–1990. RAOU Report **71**. Royal Australasian Ornithologists Union, Melbourne, Victoria.
- McLaughlin, J. (1992). *The Floristic and Structural Features of Black-eared Miner* *Manorina melanotis* Habitat. RAOU Report **84**. Royal Australasian Ornithologists Union, Melbourne, Victoria.
- McLaughlin, J. (1993a). Recovery plan research phase for the Black-eared Miner *Manorina melanotis* (Wilson 1911). Report to Australian Nature Conservation Agency, Canberra. Unpubl.
- McLaughlin, J. (1993b). The identification of the endangered Black-eared Miner *Manorina melanotis*. *Austr. Bird Watcher* **15(3)**: 116–123.
- McLaughlin, J. (1994). *Searches for the Black-eared Miner* *Manorina melanotis* in the Victorian Murray Mallee, 1992/1993. RAOU Report **93**. RAOU, Royal Australasian Ornithologists Union, Melbourne, Victoria.
- McLaughlin, J. (1996a). Update on the field management phase of the Black-eared Miner Recovery Program. Report to the Royal Australasian Ornithologists Union & Victorian Department of Conservation and Natural Resources, Melbourne, Victoria. Unpubl.

McLaughlin / Minder

- McLaughlin, J. (1996b). Cheating extinction: faith, hard work and a well-timed miracle bring hope for the Black-cared Miner. *Wingspan* 6(3): 6–11.
- McLean, I.G., Recher, H.F., Studholme, B.J.S., Given, A. & Duncan, C. (2005). Breeding success and timing of nesting forest birds on the Northern Tablelands of New South Wales, Australia. *Corella* 29(3): 53–62.
- McLean, I.G., Wells, M.S., Brown, R., Creswell, P., McKenzie, J. & Musgrove, R. (1987). Mixed-species flocking of forest birds on Little Barrier Island. *New Zealand J. Zool.* 14(2): 143–147.
- McLean, J.A. (1993). The birds of Three Isles, North Queensland. *Sunbird* 23: 95–106.
- McLean, J.A. (1995). The Family Meliphagidae of the Cooktown area, North Queensland. *Sunbird* 25(3): 63–70.
- McLean, J.A. (1996). The birds of the Hope Islands, North Queensland. *Sunbird* 26: 66–75.
- McLean, J.A. (1997). The birds of Low Wooded Island, North Queensland. *Sunbird* 27(4): 98–104.
- McLean, J.C. (1912). Bush-birds of New Zealand. *Emu* 11(3): 171–187.
- McMahon, A.R.G. & Carr, G.W. (1992). Strategy for restoration of habitat for the Helmeted Honeyeater, Yellingbo State Nature Reserve. Report to Victorian Department of Conservation and Environment, Melbourne, Victoria. Unpubl.
- McMahon, A.R.G. & Franklin, D.C. (1993). The significance of mountain swamp gum for Helmeted Honeyeater populations in the Yarra Valley. *Victorian Naturalist* 110: 230–237.
- McMahon, L. & Fraser, M.W. (1988). *A Fynbos Year*. David Philip, Cape Town & Johannesburg.
- McNair, D.B. (1983). Brown-headed Nuthatches store pine seeds. *Chat* 47: 47–48.
- McNair, D.B. (1984). Clutch-size and nest placement in the Brown-headed Nuthatch (*Sitta pusilla*). *Wilson Bull.* 96(2): 296–301.
- McNeil, R., Diaz, M.T. & Villeneuve, A. (1994). The mystery of shorebird overwintering: a new hypothesis. *Ardea* 82: 143–152.
- McWhorter, T.J., Martinez del Rio, C., Pinshow, B. & Roxburgh, L. (2004). Renal function in Palestine Sunbirds: elimination of excess water does not constrain energy intake. *J. Exper. Biol.* 207: 3391–3398.
- Mead, C.J. (1975). Variation in some characters in three Palaearctic *Certhia* species. *Bull. Brit. Orn. Club* 95(1): 30–39.
- Mead, C.J. (1985). Penduline tit. Page 444 in Campbell & Lack (1985).
- Mead, C.J. & Wallace, D.J.M. (1976). Identification of European treecreepers. *British Birds* 69: 117–131.
- Mearns, E.A. (1905). Descriptions of eight new Philippine birds, with notes on other species new to the islands. *Proc. Biol. Soc. Washington* 18: 83–90.
- Mearns, E.A. (1907). Descriptions of a new genus and nine new species of Philippine birds. *Phil. J. Sci.* 2: 355–360.
- Mearns, E.A. (1909). Additions to the list of Philippine birds, with descriptions of a new and rare species. *Proc. US Natl. Mus.* 36: 435–447.
- Medland, R.D. (1991). Souza's Shrike attacking Violet-backed Sunbird. *Nyala* 15: 49.
- Medland, R.D. (1992). Song-flight of White-bellied Sunbird. *Nyala* 16(1): 29–30.
- Medway, D.G. (1976). Extant types of New Zealand birds from Cook's voyages. [Part 2: The type-specimens]. *Notornis* 23(2): 120–137.
- Medway, Lord (1970). A ringing study of the migratory Brown Shrike in West Malaysia. *Ibis* 112: 184–198.
- Medway, Lord (1972). The Gunong Benom Expedition 1967. 6. The distribution and altitudinal zonation of birds and mammals on Gunong Benom. *Brit. Mus. (Nat. Hist.) Zool.* 23: 103–154.
- Medway, Lord & Marshall, A.G. (1975). Terrestrial vertebrates of the New Hebrides: origin and distribution. A discussion on the results of the 1971 Royal Society-Percy Sladen Expedition to the New Hebrides. *Phil. Trans. Roy. Soc. London (Ser. B)* 272(918): 423–465.
- Medway, Lord & Nisbet, I.C.T. (1968). Bird report: 1966. *Malay. Nat. J.* 21: 34–50.
- Medway, Lord & Wells, D.R. (1976). *The Birds of the Malay Peninsula*. Vol. 5. H.F. & G. Witherby, London.
- Mees, G.F. (1951). Het areaal van *Zosterops palpebrosa buxtoni* Nicholson op Java. *Ardea* 39: 196–218. In Dutch.
- Mees, G.F. (1953a). The white-eyes of the Aroe Islands (Aves, Zosteropidae). *Zool. Meded. Leiden* 32: 25–30.
- Mees, G.F. (1953b). An attempt at a natural classification of certain Zosteropidae of the Indo-Australian Archipelago. *Zool. Meded. Leiden* 32: 57–68.
- Mees, G.F. (1954). The Genus *Zosterops* in Borneo. *Sarawak Mus. J.* 6(4): 133–153.
- Mees, G.F. (1955). Description of a new race of *Zosterops novaeguineae* Salvadori (Aves, Zosteropidae). *Zool. Meded. Leiden* 34: 153–154.
- Mees, G.F. (1957). A systematic review of the Indo-Australian Zosteropidae (Part I). *Zool. Verhand. Leiden* 35: 1–204.
- Mees, G.F. (1961). A systematic review of the Indo-Australian Zosteropidae (Part II). *Zool. Verhand. Leiden* 50: 1–168.
- Mees, G.F. (1964a). Four new subspecies of birds from the Moluccas and New Guinea. *Zool. Meded. Leiden* 40(15): 125–130.
- Mees, G.F. (1964b). Notes on two small collections of birds from New Guinea. *Zool. Verhand. Leiden* 66: 1–62.
- Mees, G.F. (1964c). Geographical variation and distribution of some birds from Western Australia. *J. Proc. Roy. Soc. West. Austr.* 47: 91–96.
- Mees, G.F. (1965a). The avifauna of Misool. *Nova Guinea (Zool.)* 31: 139–203.
- Mees, G.F. (1965b). The status of *Pardalotus ornatus* Temminck. *Emu* 65(2): 97–102.
- Mees, G.F. (1965c). Revision of *Nectarinia sericea* (Lesson). *Ardea* 53: 38–56.
- Mees, G.F. (1966). A new subspecies of *Antheptes malacensis* (Scopoli) from the Soela Islands (Aves, Nectariniidae). *Zool. Meded. Leiden* 41(18): 255–257.
- Mees, G.F. (1969). A systematic review of the Indo-Australian Zosteropidae (Part III). *Zool. Verhand. Leiden* 102: 1–390.
- Mees, G.F. (1970a). Amendment of Grant's paper on species-pairs of birds. *Syst. Zool.* 19: 196–197.
- Mees, G.F. (1970b). Birds of the Inyanga National Park, Rhodesia. *Zool. Verhand. Leiden* 109: 1–74, pls. 1–5.
- Mees, G.F. (1975). A list of the birds known from Roti and adjacent islets (Lesser Sunda Islands). *Zool. Meded. Leiden* 49(12): 115–140.
- Mees, G.F. (1982). Birds from the lowlands of southern New Guinea (Merauke and Koembe). *Zool. Verhand. Leiden* 191: 1–188.
- Mees, G.F. (1984). White-eyes. Pp. 339–344 in: Grzimek *et al.* (1984).
- Mees, G.F. (1986). A list of the birds recorded from Bangka island, Indonesia. *Zool. Verhand. Leiden* 232: 1–176.
- Mees, G.F. (1996). *Geographical Variation in Birds of Java*. Publications of the Nuttall Ornithological Club 26. Cambridge, Massachusetts. Viii, 119 pp.
- Mees, G.F. (2006). The avifauna of Flores (Lesser Sunda Islands). *Zool. Meded. Leiden* 80(3): 1–261.
- Meinertzhagen, R. (1923). A review of the genus *Oriolus*. *Ibis Ser.* 11, no. 5: 52–96.
- Meinertzhagen, R. (1927). Systematic results of birds collected at high altitudes in Ladak and Sikkim. Part I. *Ibis Ser.* 12, no. 3(3): 363–422, pls. 11–12.
- Meinertzhagen, R. (1954). *Birds of Arabia*. Oliver and Boyd, Edinburgh & London.
- Meininger, P.L. & Mullié, W.C. (1981). Some interesting ornithological records from Egypt. *Bull. Orn. Soc. Middle East* 6: 2–5.
- Meise, W. (1929). Die Vögel von Djampoa und benachbarten Inseln nach einer Sammlung Baron Plessens. *J. Orn.* 77(2): 431–480. In German.
- Meise, W. (1958). Über neue Hühner-, Specht- und Singvogelrassen von Angola. *Abh. Verh. Naturw. Ver. Hamburg (Neue Folge)* 2: 63–83. In German.
- Mellor, J.W. (1907). The Australasian Ornithologists' Union in Tasmania. *Emu* 6: 159–171.
- Mellor, J.W. (1914). Current observations: Fantailed Cuckoo breeding near Adelaide. *South Austr. Orn.* 1: 22–23.
- Mellor, J.W. (1918). Notes upon the Brush Wattle Bird (*Anthochaera chrysoptera intermedia*). *South Austr. Orn.* 3(8): 231.
- Mellor, J.W. & White, S.A. (1913). Flinders Island camp-out. *Emu* 12(3): 158–164.
- Melnikov, Y.I. (1998). [The Golden *Oriolus oriolus* and Black-naped *O. chinensis* Orioles in Eastern Siberia]. *Russ. Orn. Zhurnal Ekspress Vypusk* 45: 17–20. In Russian.
- Melville, D. (1979). Ornithological notes on a visit to Irian Jaya. *Papua New Guinea Bird Soc. Newsl.* 161: 3–26.
- Melville, D. (1980). Some observations on birds in Irian Jaya, New Guinea. *Emu* 80: 89–91.
- Melville, D.S. & Galsworthy, A.C. (1991). The 1989/90 Penduline Tit 'invasion' of Hong Kong. *Hong Kong Bird Rep.* 1990: 149–154.
- Melville, D.S. & Round, P.D. (1984). Weights and gonad conditions of some Thai birds. *Bull. Brit. Orn. Club* 104: 127–138.
- Mendoza, M.M. (1987). Updated list of Mt. Makiling avifauna. *Philippine J. Sci.* 116(1): 31–58.
- Menkhurst, P.W. (1994). *Regent Honeyeater Xanthomyia phrygia* Action Statement 41. Department of Conservation and Natural Resources (Victoria), Melbourne, Victoria.
- Menkhurst, P.W. (1997). *Regent Honeyeater Recovery Plan*. Flora & Fauna Branch, Department of Natural Resources and Environment (Victoria), Melbourne, Victoria.
- Menkhurst, P.W. & Davies, J.N. (1983). The status and distribution in Victoria of the Grey-fronted Honeyeater *Lichenostomus plumulus*. *Austr. Bird Watcher* 10(4): 107–112.
- Menkhurst, P.W. & Middleton, D. (1991). *The Helmeted Honeyeater Recovery Plan: 1989–1993*. Department of Conservation and Environment (Victoria), Melbourne, Victoria.
- Menkhurst, P.W., Smales, I. & Quin, B. (1999). The Helmeted Honeyeater recovery plan 1999–2003. Department of the Environment, Water, Heritage and the Arts (Commonwealth) & The Helmeted Honeyeater Recovery Team, Canberra. URL: <http://www.environment.gov.au/biodiversity/threatened/publications/recovery/helmeted-h-eater/index.html#ref> (download 17 October 2007).
- Mentis, M.T., Meiklejohn, M.J. & Scotcher, J.S.B. (1974). Veld burning in the Giant's Castle Game Reserve, Natal Drakensberg. *Proc. Grassld. Soc. South Afr.* 9: 26–31.
- Mercer, R. (1966). *A Field Guide to Fiji Birds*. Fiji Museum, Suva, Fiji.
- Merrall, D. (1987). A tiny tragedy. *Bird Obs. Nunawading* 665: 70.
- Merton, D.V. (1966). Foods and feeding behaviour of some forest birds on Hen Island in May. *Notornis* 13(4): 179–184.
- Merton, D.V. (1970). Kermadec Islands expedition reports: a general account of birdlife. *Notornis* 17(3): 147–199.
- Merton, D.V. & Bell, B.D. (1975). Endemic birds of the Chatham Islands. Report to New Zealand Wildlife Service, Department of Internal Affairs, Wellington, New Zealand. Unpubl.
- Metcalfe, N.B. & Furness, R.W. (1984). Changing priorities: the effect of pre-migratory fattening on the trade-off between foraging and vigilance. *Behav. Ecol. Sociobiol.* 15: 203–206.
- Mey, E. (2000). Eco-faunistic and morphological data on some bird species of the Cuc Phuong National Park in northern Vietnam. *Rudolstädter Naturhist. Schr.* 10: 133–176.
- Meyer, A.B. (1879). Field-notes on the birds of Celebes. Part 2. *Ibis Ser.* 4, no. 3: 125–147.
- Meyer, A.B. & Wiglesworth, L.W. (1895). Bericht über die von den Herren P. und F. Sarasin in Nord-Celebes gesammelten Vögel. *Abh. Ber. Königl. Mus. Dresden* 8: 1–20. In German.
- Meyer, A.B. & Wiglesworth, L.W. (1898a). Introduction. Pp. 1–130 in: Meyer, A.B. & Wiglesworth, L.W. (1898). *The Birds of Celebes and the Neighbouring Islands*. Vol. 1. Introduction, Systematic Part. R. Friedländer & Sohn, Berlin.
- Meyer, A.B. & Wiglesworth, L.W. (1898b). *The Birds of Celebes and the Neighbouring Islands*. Vol. 2. Systematic Part. Orders Passeres (continued). R. Friedländer & Sohn, Berlin.
- Meyer, P.O. (1930). Übersicht über die Brutzeiten der Vögel auf der Insel Vuatom (New Britain). *J. Orn.* 78: 19–38. In German.
- Meyer, P.O. (1933). Vögeleier und Nester aus Neubritannien, Südsee. *Beitr. Fortpflanzungsbiol. Vögel* 9(4/5): 122–139. In German.
- Meyer de Schauensee, R. (1940). The birds of the Batu Islands. *Proc. Acad. Nat. Sci. Philadelphia* 92: 23–42.
- Meyer de Schauensee, R. (1984). *The Birds of China*. Oxford University Press, Oxford, UK.
- Meyer de Schauensee, R. & duPont, J.E. (1962). Birds from the Philippine islands. *Proc. Acad. Nat. Sci. Philadelphia* 114(4): 149–173.
- Meyer de Schauensee, R. & Ripley, S.D. (1940). Zoological results of the George Vanderbilt Sumatran Expedition, 1936–1939. Part 1. Birds from Atjeh. *Proc. Acad. Nat. Sci. Philadelphia* 91: 311–368.
- Michaels, H.L. & Cully, J.F. (1998). Landscape and fine scale habitat associations of the Loggerhead Shrike. *Wilson Bull.* 110: 474–482.
- Michalcuk, J. (2004). Flocks of the Great Grey Shrike (*Lanius excubitor*) on migration. *Biol. Letters (Poznan)* 41: 189–190.
- Micheneau, C., Fournel, J. & Pailler, T. (2006). Bird pollination in an angraecoid orchid on Réunion island (Mascarene Archipelago, Indian Ocean). *Ann. Bot. London* 97(6): 965–974.
- Mikhailov, K.E., Shibnev, Y.B. & Koblik, D.Y. (1998). Breeding birds of the Bikin River basin (annotated list of species). *Russ. Orn. Zhurnal Ekspress Vypusk* 46: 3–19. In Russian with English summary.
- Miksik, I. (1993). Porovnání hnízdní variability Tuhyká obecného (*Lanius collurio*) v jednotlivých letech a ve dvou nadmořských výškách. Comparison of the breeding variability of Red-backed Shrike (*Lanius collurio*) in individual years and at two altitudes. *Sylvia* 29: 12–20. In Czech with English summary.
- Milledge, D.R. (1972). The birds of Maatsuyker Island, Tasmania. *Emu* 72(4): 167–170.
- Milledge, D.R. & Recher, H.F. (1985). A comparison of forest bird communities on the New South Wales south and mid-north coasts. Pp. 47–52 in: Keast *et al.* (1985).
- Miller, A.H. (1928). The molts of the Loggerhead Shrike *Lanius ludovicianus* Linnaeus. *Univ. Calif. Publ. Zool.* 30: 393–417.
- Miller, A.H. (1931). Systematic revision and natural history of the American shrikes (*Lanius*). *Univ. Calif. Publ. Zool.* 38(2): 11–242.
- Miller, J.V. (1992). Golden Orioles drinking in flight. *British Birds* 85: 245.
- Miller, K.E. & Jones, G.A. (1999). Nesting phenology and cooperative breeding of the Brown-headed Nuthatch in north Florida pinelands. *Florida Field Nat.* 27(3): 89–94.
- Miller, R.S. (1932). Some remarks on the nesting of the Brown-backed Honeyeater. *Emu* 32: 110–112.
- Miller, R.S. (1937). The Helmeted Friar-bird. *Emu* 36(4): 249–253.
- Miller, R.S. (1939). The Little Friar-bird – *Philemon citreogularis*. *Emu* 38: 341–343.
- Milligan, A.W. (1902). Field observations on Western Australian birds. *Emu* 2: 68–77.
- Milligan, A.W. (1903). Notes on a trip to the Stirling Range. *Emu* 3(1): 9–19.
- Milligan, A.W. (1904). Notes on a trip to the Wongan Hills, Western Australia, with a description of a new *Ptilotis*. Part 1. *Emu* 3: 217–226.
- Milne, H.V. (1937). Some birds of the "Whipstick" scrub. *Emu* 36: 287–291.
- Milne, H.V. (1938). The Black Honeyeater. *Emu* 37(4): 247–250.
- Milne-Edwards, A. & Oustalet, E. (1888). Études sur les mammifères et les oiseaux des Îles Comores. *Nouv. Arch. Mus. Hist. Nat. Paris Ser.* 2, no. 10: 219–297, pls. 4–9. In French.
- Milon, P. (1949). Notes d'observation sur les Soui-mangas malgaches. *Terre et Vie* 4: 1–10. In French.
- Milstein, P. & le S. (1963). Nesting behaviour of Marico Sunbird and Greater Double-collared Sunbird. *Ostrich* 34: 46.
- Milton, G.R. & Marhadi, A. (1985). The bird life of the Nature Reserve Pulau Dua. *Kukila* 2(2): 32–41.
- Milwright, R.D.P. (1998). Breeding biology of the Golden Oriole *Oriolus oriolus* in the Fenland basin of eastern Britain. *Bird Study* 45(3): 320–330.
- Minder, H. (2006). Successful winter breeding record of the European Nuthatch *Sitta europaea* in Schaffhausen (Switzerland). *Orn. Beob.* 103(3): 207–208. In German with English summary.

- Miranda, H.C., Kennedy, R.S., Sison, R.V., Gonzales, P.C. & Ebreo, M.F. (2000). New records of birds from the island of Panay, Philippines. *Bull. Brit. Orn. Club* **120**: 266–280.
- Mironov, S.V. & Kopij, G. (2000a). New feather mite species of the family Pteronyssidae (Astigmata: Analgoidea) from South African passerines (Aves: Passeriformes). *Folia Parasitol.* **47**(4): 319–329.
- Mironov, S.V. & Kopij, G. (2000b). New feather mite species of the genus *Trouessartia* (Acari: Analgoidea: Trouessartiidae) from South African passerines (Aves: Passeriformes). *Mitt. Hamb. Zool. Mus. Inst.* **97**: 99–115.
- Miskelly, C., Empson, R. & Wright, K. (2005). Forest birds recolonising Wellington. *Notornis* **52**(1): 21–26.
- Mitchell, A., Peter, J. & McCarthy, G. (1996). Birds of the Ironbark Basin. *Geelong Bird Rep.* **1995**: 29–40.
- Mitchell, P. (1996). Bird reports series 118 (part 1). *Bird Obs. Nunawading* **768**: 16–17.
- Mitchell, R.J. & Paton, D.C. (1990). Effects of nectar volume and concentration on sugar intake rates of Australian honeyeaters (Meliphagidae). *Oecologia* **83**: 238–246.
- Mitra, S.S. & Sheldon, F.H. (1993). Use of an exotic tree plantation by Bornean lowland forest birds. *Auk* **110**: 529–540.
- Mitsch, H. (1974). Schwierige Kostgänger: die Fleckenbaumläufer oder Stammsteiger. *Gefiederte Welt* **98**(1): 11–13. In German.
- Mizzel, K.L. (1993). *The Impaling Behavior of the Loggerhead Shrike in Eastern Texas*. MSc thesis, Stephen F. Austin University, Nacogdoches, Texas.
- Mlikovsky, J. (2007). Type specimens and type localities of rock nuthatches of the *Sitta neumayer* species complex. *J. Natl. Mus. Prague Nat. Hist. Ser.* **176**(6): 91–115.
- Moffatt, J.D., Whitmore, M.J. & Date, E.M. (1983). Communal breeding by Striped Honeyeaters. *Emu* **83**(3): 202–203.
- Moffatt, M. & Minot, E.O. (1994). Distribution and abundance of forest birds in the Ruamahanga Ecological Area, North Island, New Zealand. *New Zealand J. Zool.* **21**: 135–150.
- Moffet, J. (1990). The Malachite Sunbird. *Mirafa* **7**: 7–8.
- Molisch, H. (1926). *Pflanzenbiologie in Japan auf Grund eigener Beobachtungen*. G. Fischer, Jena, Germany. In German.
- Mollison, B.C. (1960). Notes on Tasmanian birds. 2. Observations on the nesting of the Spotted Pardalote. *Emu* **60**(2): 119–123.
- Mollison, B.C. (1974). Birds of the Australian Newsprint Mills concession – Florentine and Styx Valleys (continued). *Tasmanian Nat.* **39**: 6–7.
- Molokwu, M., Otossou, U. & Azi, J. (2006). Observations at a Scarlet-chested Sunbird *Chalcomitra senegalensis* nest. *Malimbus* **28**(1): 45–46.
- Molyneux, T.G. (1976). Notes on birds of the northeastern Namib Desert Park, south-west Africa, and adjoining farms. *Madoqua* **9**: 45–52.
- Momiyama, T.T. (1931). On a [i.e. the] family of nutha[t]ches in Japan. *Kaidori* **2**(8): 1–25. In Japanese and English.
- Moncrieff, P. (1928). A visit to Taranga, Hen and Chickens Group (N.Z.). *Emu* **28**: 100–110.
- Moncrieff, P. (1938). Birds of Nelson Province, New Zealand. *Emu* **37**: 207–234.
- Moon, G.J.H. (1967). *Refocus on New Zealand Birds*. AH&AW Reed, Wellington, New Zealand.
- Moore, A. (1995). More anecdotal evidence for the type-locality of *Chalcomitra rubescens stangerii*. *Bull. Brit. Orn. Club* **115**(2): 134–135.
- Moore, F., Mabey, S. & Woodrey, M. (2003). Priority access to food in migratory birds: age, sex and motivational asymmetries. Pp. 281–292 in: Berthold *et al.* (2003).
- Moore, F.R. & Phillips, J.B. (1988). Sunset, skylight polarization and the migratory orientation of Yellow-rumped Warblers, *Dendroica coronata*. *Anim. Behav.* **36**: 1770–1778.
- Moores, L., Healey, C. & van Balen, S. [= B.J.] (1996). Additions to the avifauna of the Banda Islands, Maluku. *Kukila* **8**: 127–131.
- Mordue, T.A. (1981). Presence of the Dusky Myzomela (*Myzomela obscura*) on the north side of mainland New Guinea. *Papua New Guinea Bird Soc. Newsl.* **181/182**: 30–32.
- Moreau, R.E. (1942). The nesting of African birds in association with other living things. *Ibis Ser.* **14**, no. 6: 240–243.
- Moreau, R.E. (1944). Some weights of African and of wintering Palaearctic birds. *Ibis* **86**: 16–29.
- Moreau, R.E. (1957a). The names of the Mascarene Olive White-eyes. *Bull. Brit. Orn. Club* **77**: 7–8.
- Moreau, R.E. (1957b). Variation in the western Zosteropidae (Aves). *Bull. Brit. Mus. (Nat. Hist.)* **4**(7): 318–433.
- Moreau, R.E. (1960). Climatic correlations of size in *Zosterops*. *Ibis* **102**: 137–138.
- Moreau, R.E. (1961). Problems of Mediterranean-Sahara migration. *Ibis* **103**: 373–421, 580–623.
- Moreau, R.E. (1966). *The Bird Faunas of Africa and its Islands*. Academic Press, London & New York.
- Moreau, R.E. (1967). Family Zosteropidae. African and Indian Ocean taxa. Pp. 326–337 in: Paynter (1967).
- Moreau, R.E. (1969). The Sooty Falcon *Falco concolor* Temminck. *Bull. Brit. Orn. Club* **89**: 62–67.
- Moreau, R.E. (1972). *The Palearctic-African Bird Migration Systems*. Academic Press, London.
- Moreau, R.E. & Dolp, R.M. (1970). Fat, water, weights and wing-lengths of autumn migrants in transit on the northwest coast of Egypt. *Ibis* **112**: 209–228.
- Moreau, R.E. & Kikkawa, J. (1985). White-eye. Pp. 651–652 in: Campbell & Lack (1985).
- Moreau, R.E. & Moreau, W. (1937). Biological and other notes on some East African birds. *Ibis Ser.* **14**, no. 1: 321–345.
- Moreau, R.E. & Moreau, W. (1939). Observations on some East African birds. *Ibis Ser.* **14**, no. 3: 296–323.
- Moreau, R.E. & Moreau, W. (1940). Incubation and fledging periods of African birds. *Auk* **57**: 313–325.
- Moreau, R.E., Perrins, M. & Hughes, J.T. (1969). Tongues of the Zosteropidae (white-eyes). *Ardea* **57**: 29–47.
- Morel, G.J. & Morel, M.Y. (1990). *Les Oiseaux de Sénégalie*. Éditions de l'Orstom, Paris. In French.
- Morgan, A.M. (1919). The birds of the south-eastern part of South Australia. *South Austr. Orn.* **4**: 7–20.
- Morgan, A.M. (1922). Order Passeriformes, family Meliphagidae, genus *Melithreptus*. *Melithreptus gularis* – the Black-chinned Honey-eater. *South Austr. Orn.* **6**(7): 152–153.
- Morgan, A.M., McGilp, J.N., Parsons, F.E. & Sutton, J. (1926). North-east Eyre Peninsula. *South Austr. Orn.* **8**: 171–219.
- Morgan, B. & Morgan, J. (1965). Some notes on birds of the Fiji Islands. *Notornis* **12**: 158–168.
- Morgan, J.H. & Shirihai, H. (1997). *Passerines and Passerine Migration in Eilat 1984–1993*. International Birdwatching Center Technical Publication **6**(1). International Birdwatching Center, Eilat, Israel. 50 pp.
- Moriarty, T.K. (1972). Birds of Wanjarri, WA (27°25'S, 120°40'E). *Emu* **72**(1): 1–7.
- Morioka, H. (1992). Tongue of two species of *Prianochilus* from the Philippines, with notes on feeding habits of flowerpeckers (Dicaeidae). *Jap. J. Orn.* **40**(3): 85–91. In English with Japanese summary.
- Morioka, H. (1994). Subspecific status of certain birds breeding in Hokkaido. *Mem. Natl. Sci. Mus. Tokyo* **27**: 165–173. In English with Japanese summary.
- Morioka, H. & Sakane, T. (1978). Observations on the ecology and behaviour of *Apalopteron familiare* (Aves, Meliphagidae). *Mem. Natl. Sci. Mus. Tokyo* **11**: 169–188, 2 plates.
- Morishita, E. & Higuchi, H. (1999). [Population decline of tropical migratory birds based on birdwatching record]. Pp. 19–43 in: Higuchi, H. ed. (1999). [Research Report on the Population Decline of Tropical Migratory Birds]. University of Tokyo Research Group of Migratory Birds, Tokyo. In Japanese.
- Morony, J.J., Bock, W.J. & Farrand, J. (1975). *Reference List of the Birds of the World*. American Museum of Natural History, New York.
- Morris, A.K. (1967). Yellow Tufted Honeyeaters in the Mudgee district. *Austr. Bird Bander* **5**: 53–54.
- Morris, A.K. (1974). Fuscous Honeyeaters in the Mudgee district. *Austr. Bird Bander* **12**(3): 58.
- Morris, A.K. (1975a). The birds of Gosford, Wyong and Newcastle (County of Northumberland). *Austr. Birds* **9**(3): 37–76.
- Morris, A.K. (1975b). Results from banding Yellow-tufted Honeyeaters. *Austr. Bird Bander* **13**(1): 3–8.
- Morris, A.K. (1986). The birds of Sydney Harbour National Park, New South Wales. *Austr. Birds* **20**(3): 65–81.
- Morris, A.K. (1989). The birds of Botany Bay National Park, New South Wales. *Austr. Birds* **23**(1): 7–21.
- Morris, A.K. & Kurtz, N. (1982). The status of the Regent Honeyeater in the upper Macquarie and Castlereagh valleys. *Austr. Birds* **16**(3): 48–52.
- Morris, A.K., McGill, A.R. & Holmes, G. (1981). *Handlist of Birds in New South Wales*. New South Wales Field Ornithologists Club, Sydney.
- Morris, W.J. & Wooller, R.D. (2001). The structure and dynamics of an assemblage of small birds in a semi-arid eucalypt woodland in south-western Australia. *Emu* **101**(1): 7–12.
- Morrison, M.L. (1979). Loggerhead Shrike eggshell thickness in California and Florida. *Wilson Bull.* **91**: 468–469.
- Morrison, M.L. (1981). Population trends of the Loggerhead Shrike in the United States. *Amer. Birds* **35**: 754–757.
- Morrison, M.L. & Winchell, C. (1993). Artificial incubation and hand-rearing of Loggerhead Shrikes. *Wildl. Soc. Bull.* **21**: 165–171.
- Morse, D.H. (1967). Foraging relationships of Brown-headed Nuthatches and Pine Warblers. *Ecology* **48**: 94–103.
- Morse, D.H. (1968). The use of tools by Brown-headed Nuthatches. *Wilson Bull.* **80**: 220–224.
- Mortimer, J. & Martin, E. (1991). Lesser Double-collared Sunbirds: new breeding areas. *Promerops* **198**: 14.
- Mosey, H. (1956). Birds observed on a visit to New Guinea during June to August, 1950. *Emu* **56**(5): 357–366.
- Moskát, C. (2001). Changes in the frequency of hunting techniques in the Red-backed Shrike during the breeding season. *Ornis Hungarica* **11**: 33–36.
- Moskát, C. & Fuiz, T.I. (1999). Reactions of Red-backed Shrikes *Lanius collurio* to artificial Cuckoo *Cuculus canorus* eggs. *J. Avian Biol.* **30**: 175–181.
- Moskát, C. & Fuiz, T.I. (2002). Habitat segregation among the Woodchat Shrike, *Lanius senator*, the Red-backed Shrike, *Lanius collurio*, and the Masked Shrike, *Lanius nubicus*, in NE Greece. *Folia Zool. (Brno)* **51**: 103–111.
- Moskait, C., Fujimaki, Y. & Yamagishi, S. (2000). Perch site preference of the Bull-headed Shrike (*Lanius bucephalus*) during the breeding season in Japan. *Ring* **22**(1): 51–57.
- Moss, S. (2007). *Remarkable Birds – 100 of the World's Most Unmissable Birds*. Collins, London.
- Mostert, D.P., Siegfried, W.R. & Louw, G.N. (1980). *Protea* nectar and satellite fauna in relation to the food requirements and pollinating role of the Cape Sugarbird. *South Afr. J. Sci.* **76**(9): 409–412.
- Moulton, J.C. (1914). Handlist of the birds of Borneo. *J. Straits Branch Roy. Asiat. Soc.* **67**: 125–191.
- Mountainspring, S. & Scott, J.M. (1981). Interspecific competition among Hawaiian forest birds. *Ecol. Monogr.* **55**: 219–239.
- Mountfort, G. (1962). *Portrait of a River – The Wildlife of the Danube, from the Black Sea to Budapest*. Hutchinson, London.
- Mountfort, G. (1969). *The Vanishing Jungle – The Story of the World Wildlife Fund Expeditions to Pakistan*. Collins, London.
- Mountfort, G. (1971). Do some Wallcreepers migrate? *British Birds* **64**: 378.
- Moyer, D.C. (1983). A record of the Angola White-bellied Sunbird *Nectarinia oustaleti* from Ksesya in southwestern Tanzania. *Scopus* **7**: 52.
- Moyer, J.T. (1957). The birds of Miyake Jima, Japan. *Auk* **74**: 215–228.
- Moysey, E.D. (1997). A study of resource partitioning within the Helmeted Honeyeater *Lichenostomus melanops cassidix* during the non-breeding season. *Emu* **97**(3): 207–219.
- Muheim, R., Phillips, J.B. & Åkesson, S. (2006). Polarized light cues underlie compass calibration in migratory songbirds. *Science (Washington, D.C.)* **313**: 837–839.
- Muir, A.M., Quin, D. & Dominelli, S. (1999). Habitat requirements of Black-eared Miners in South Australia. Report to the Black-eared Miner Recovery Team. Unpubl.
- Mukherjee, P. (1981). A curious accident to the nest of a sunbird. *J. Bombay Nat. Hist. Soc.* **78**(1): 170–171.
- Mules, M.W. (1932). Notes on some birds in the vicinity of Coniston Station, central Australia. *South Austr. Orn.* **11**: 212–221.
- Müller, A.K. (1962). Zur Biologie des Mauerläufers (*Tichodroma muraria*). *Anz. Orn. Ges. Bayern* **6**: 359–361. In German.
- Müller, A.K. (1965). Weitere Beiträge zur Biologie des Mauerläufers (*Tichodroma muraria*). *Anz. Orn. Ges. Bayern* **7**: 333–335. In German.
- Müller, H.E.J. (2001). Nest building of Eurasian Treecreeper *Certhia familiaris*. *Limicola* **15**(3): 166–170. In German with English summary.
- Mulwa, R.K., Bennun, L.A., Ogol, C.K.P.O. & Lens, L. (2007). Population status and distribution of Taita White-eye *Zosterops silvanus* in the fragmented forests of Taita Hills and Mount Kasigau, Kenya. *Bird Conserv. Int.* **17**: 141–150.
- Mundy, N.L., Winchell, C.S., Burr, T. & Woodruff, D.S. (1997). Microsatellite variation and microevolution in the critically endangered San Clemente Island Loggerhead Shrike (*Lanius ludovicianus mearnsi*). *Proc. Royal Soc. London (Ser. B Biol. Sci.)* **264**: 869–875.
- Mundy, N.L., Winchell, C.S. & Woodruff, D.S. (1996). Tandem repeats and heteroplasmy in the mitochondrial DNA control region of the Loggerhead Shrike (*Lanius ludovicianus*). *J. Heredity* **87**: 21–26.
- Mundy, N.L., Winchell, C.S. & Woodruff, D.S. (1997). Genetic differences between the endangered San Clemente Island Loggerhead Shrike *Lanius ludovicianus mearnsi* and two neighbouring subspecies demonstrated by mtDNA control region and cytochrome b sequence variation. *Mol. Ecol.* **6**: 29–37.
- Mundy, P.J. & Cook, A.W. (1972). Birds of Sokoto. Part 2. *Bull. Nigerian Orn. Soc.* **9**: 61–76.
- Munro, U. & McFadden, M. (2005). Molt in captive Regent Honeyeaters *Xanthomyza phrygia*. *Corella* **29**(1): 17–18.
- Munro, U. & Munro, J.A. (1998). Migratory restlessness in the Yellow-faced Honeyeater *Lichenostomus chrysops* (Meliphagidae), an Australian diurnal migrant. *Ibis* **140**: 599–604.
- Munro, U. & Wiltshcko, R. (1993). Clock-shift experiments with migratory Yellow-faced Honeyeaters, *Lichenostomus chrysops* (Meliphagidae), an Australian day-migrating bird. *J. Exper. Biol.* **181**(1): 233–244.
- Munro, U. & Wiltshcko, W. (1992). Orientation studies on Yellow-faced Honeyeaters *Lichenostomus chrysops* (Meliphagidae) during autumn migration. *Emu* **92**(3): 181–184.
- Munro, U., Funnell, J.R. & Thomson, A.S. (2006). Molt in captive partially migratory and sedentary Australian Silvereyes (*Zosterops lateralis*) (Zosteropidae). *J. Orn.* **147**: 287–297.
- Munro, U., McCloskey, K. & Cooke, B. (2003). Seasonal trends in food consumption and body mass of captive Regent Honeyeaters *Xanthomyza phrygia* (Meliphagidae). *Corella* **27**(2): 47–51.
- Munro, U., Munro, J.A., Phillips, J.B., Wiltshcko, R. & Wiltshcko, W. (1997). Evidence for a magnetite-based navigational map in birds. *Naturwissenschaften* **84**: 26–28.
- Munro, U., Munro, J.A., Phillips, J.B. & Wiltshcko, W. (1997). Effect of wavelength of light and pulse magnetisation on different magnetoreception systems in a migratory bird. *Austr. J. Zool.* **45**: 189–198.
- Munro, U., Wiltshcko, W. & Ford, H.A. (1993). Changes in the migratory direction of Yellow-faced Honeyeaters *Lichenostomus chrysops* (Meliphagidae) during autumn migration. *Emu* **93**(1): 59–62.
- Münster, W. (1984). True shrikes. Pp. 209–213 in: Grzimek *et al.* (1984).
- Murdoch, D. (2005). Observation from Syria with notes on 11 new breeding species. *Sandgrouse* **27**(1): 37–45.
- Murphy, D.J. & Kelly, D. (2001). Scarce or distracted? Bellbird (*Anthornis melanura*) foraging and diet in an area of inadequate mistletoe pollination. *New Zealand J. Ecol.* **25**(1): 69–81.
- Murphy, R.C. (1929). Birds collected during the Whitney South Sea Expedition. 9. Zosteropidae from the Solomon Islands. *Amer. Mus. Novit.* **263**: 1–11.
- Murphy, R.C. & Mathews, G.M. (1929). Birds collected during the Whitney South Sea Expedition. 7. Zosteropidae. *Amer. Mus. Novit.* **356**: 1–14.

- Murphy, S.R., Reid, N., Yan, Z. & Venables, W.N. (1993). Differential passage time of mistletoe fruits through the gut of honeyeaters and flowerpeckers: effects on seedling establishment. *Oecologia* **93**: 171–176.
- Murr, F. (1938). Der Mauerläufer. *Jb. Ver. Schutze Alpenpfl. & Tiere* **10**: 109–118. In German.
- Murr, F. (1950). Das Flügel-Lüpfen des Mauerläufers. *Orn. Beob.* **47**: 188–189. In German.
- Murray, A. (1988a). A study of the birds of the Tabubil region, Western Province, Papua New Guinea. *Muruk* **3**(3): 89–117.
- Murray, A. (1988b). Annotated list of species present in the Tabubil and Ok Tedi valley region. *Muruk* **3**(3): 94–117.
- Murray, F. (1947). Tui nesting at Clevedon, 1946–47. *New Zealand Bird Notes* **2**(6): 131.
- Murray, R.M. (1968). St Lucia Park, South Africa, October: Scarlet-chested Sunbird *Nectarinia senegalensis*. *Lammergeyer* **9**: 51.
- Muse, C. & Muse, S. (1982). *The Birds and Birdlore of Samoa. O Manu Ma Tala'aga o Manu o Samoa*. Pioneer, Walla Walla, Washington, D.C.
- Myers, S.D. (2004). The birds and mammals recorded on the Victor Emanuel Nature Tours South West Pacific 2004 Tour. Unpubl.
- Myers, S.D. & Bishop, K.D. (2005). A review of historic and recent bird records from Lombok, Indonesia. *Forktail* **21**: 147–160.
- Nadler, T. (1993). Beiträge zur Avifauna der Insel São Tomé (Gulf von Guinea). *Faun. Abh. Staatl. Mus. Tierk. Dresden* **19**(1): 37–58. In German with English summary.
- Nakamura, T. (1969). Structure of flock range in the Long-tailed Tit. Part 1: Winter flock, its home range and territory. *Misc. Rep. Yamashina Inst. Orn.* **5**(5): 433–461.
- Nakamura, T. (1972). Home range structure of a population of *Aegithalos caudatus*. Part 2: Home range and territoriality in breeding season. *J. Yamashina Inst. Orn.* **6**(5/6): 424–488.
- Nankinow, D.N. (2001). [About the first and following observations of the Masked Shrike (*Lanius nubicus* Liechtenstein) in Bulgaria]. Pp. 177–181 in: Anon. (2001). *Geoeological and Bioecological Problems of the North Black Sea Coast*. Proceedings of an International Conference in Tiraspol, March 28–30, 2001. EPD Dniester State University & Eco-Dniester, Tiraspol, Moldova. In Russian.
- Napier, J.R. (1967). Birds of Mt. Elephant. *Tasmanian Nat.* **10**: 2–4.
- Napier, J.R. (1969). Birds of the Break O'Day valley, Tasmania. *Austr. Bird Watcher* **3**(6): 179–192.
- Nash, A.D. & Nash, S.V. (1985). Breeding notes on some Padang-Sugihan birds. *Kukila* **2**: 59–63.
- Nash, S.V. (1993). *Sold for a Song – the Trade in Southeast Asian Non-CITES Birds*. TRAFFIC International, Cambridge, UK.
- Nash, S.V. & Nash, A.D. (1988). An annotated checklist of the birds of Tanjung Puting National Park, Central Kalimantan. *Kukila* **3**(3/4): 93–116.
- de Naurais, R. (1979). The Emerald Cuckoo of São Tomé and Príncipe islands (Gulf of Guinea). *Ostrich* **50**: 88–93.
- de Naurais, R. (1983). Les oiseaux reproducteurs des Îles de São Tomé et Príncipe: liste systématique commentée et indications zoogéographiques. *Bonn. Zool. Beitr.* **34**: 129–148. In French.
- de Naurais, R. (1984). Le loriot endémique de l'île de São Tomé (Golfe de Guinée) *Oriolus crassirostris* (Hartlaub). *Cyanopicea* **3**(2): 121–134. In French.
- de Naurais, R. (1994). *Les Oiseaux des Îles du Golfe de Guinée (São Tomé, Príncipe et Annobón)*. Instituto de Investigação Científica Tropical, Lisbon. In French and Portuguese.
- Nazarenko, A.A. (1988). The Chinese Nuthatch *Sitta villosa corea* Ogilvie-Grant in southern Ussuriland: status, biology, present day state of population. Pp. 48–55 in: Litvinenko, N.M. ed. (1988). *Rare Birds of the Far East and their Protection*. Akademiya Nauk SSSR, Vladivostok, Russia. In Russian with English summary.
- Nazarenko, A.A. (2005). [The Chinese Nuthatch *Sitta villosa* in “mountain” pine forest in south-west Ussuriland: rapid opening up of a new environment]. *Russ. J. Orn.* **14**(288): 435–439. In Russian.
- Nazarenko, A.A. (2006). Systematic notes on Asian birds. 64. The range of the Chinese Nuthatch *Sitta villosa* and an evaluation of subspecies validity. *Zool. Meded. Leiden* **80**(5): 265–271.
- Nazarov, Y.N. (2004). [The Birds of Vladivostok and its Surroundings]. Publishing House of Far-Eastern University, Vladivostok, Russia. In Russian.
- Nechaev, V.A. (1976). [Towards the biology of the Chinese Grey Shrike in Primorye region]. *Ornitologiya* **12**: 118–124. In Russian.
- Nechaev, V.A. (1991). *Pititsy ostrova Sakhalin. [The Birds of Sakhalin]*. Akademiya nauk SSSR, Dal'nevostochnoe otdelenie, Vladivostok, Russia. In Russian with English summary.
- Neelakantan, K.K. (1975). Curious behaviour of a Loten's Sunbird (*Nectarinia lotenia*). *J. Bombay Nat. Hist. Soc.* **72**(3): 858–859.
- Nehrkorn, A. (1879). Mitteilungen über Nester und Eier des Museums Godeffroy zu Hamburg. *J. Orn.* **27**: 393–410. In German.
- Nehrkorn, A. (1910). *Katalog der Eiersammlung nebst Beschreibungen der außereuropäischen Eier*. 2nd edition. R. Friedländer and Sohn, Berlin. In German.
- Neufeldt, I.A. (1970). Das Buschhähnchen. Eine ornithologische Kostbarkeit aus dem Tien-Schan. *Der Falke* **17**: 148–157, 194–198. In German.
- Neufeldt, I.A. (1978). On the postnuptial moult in the Brown Shrike (*Lanius cristatus*). *Trudy Zool. Inst. Akad. Nauk SSSR* **68**: 176–227. In Russian with English summary.
- Neufeldt, I.A. & Wunderlich, K. (1984). *Sitta krueperi* Pelzeln. 12th instalment in: Dathe, H. & Neufeldt, I.A. eds. (1984). *Atlas der Verbreitung paläarktischer Vögel*. Akademie-Verlag, Berlin. In German.
- Neumann, O. (1902). Diagnosen neuer Vogelarten aus Süd-Äthiopien. *Orn. Monatsber.* **10**: 8–10. In German.
- Neumann, O. (1904). Fünf neue Vögel von Nordost-Afrika. *Orn. Monatsber.* **12**: 162–164. In German.
- Neumann, O. (1905). Vögel von Schoa und Süd-Äthiopien. [Part 2]. *J. Orn.* **53**(1): 184–243. In German.
- Neunhoffer, N. (1980). Ungewöhnlicher Brutort des Mauerläufers *Tichodroma muraria*. *Orn. Beob.* **77**: 198. In German.
- Neuschulz, F. (1988). *Zur Synäkie von Sperbergrasmücke Sylvia nisoria (Bechst., 1795) und Neuntöter Lanius collurio (L., 1758): Ergebnisse einer populationsbiologischen Studie*. Lüchow-Dannenberg Ornithologische Jahresberichte **11**. Avifaunistische Arbeitsgemeinschaft für Lüchow und Dannenberg, Bergen an der Dumme, Germany. 234 pp. In German with English summary.
- Nevill, H. (1987). Gurney's Sugarbird breeding in winter. *Bokmakierie* **39**(3): 71–74.
- Newbey, K.R. & Newbey, B.J. (1989). Notes on the vegetation, flora and birds of Edithana Pool, Gascoyne district, Western Australia. *West. Austr. Nat.* **18**(1): 13–20.
- Newby, J.E. (1980). The birds of the Ouadi Rime-Ouadi Achim Faunal Reserve. A contribution to the study of the Chadian avifauna. *Malimbus* **2**: 29–55.
- Newby-Varty, B.V. (1945). Observations made on Umvukwe Ranch, 27 miles north of Banket, S. Rhodesia. *Ostrich* **16**(3): 218–220.
- Newby-Varty, B.V. (1948). Some nests and eggs. *Ostrich* **19**: 158–160.
- Newland, C.E. & Wooller, R.D. (1985). Seasonal changes in a honeyeater assemblage in *Banksia* woodland near Perth, Western Australia. *New Zealand J. Zool.* **12**(4): 631–636.
- Newsome, D. (1986). A brief report on the habitat status of some of the rarer birds of Cameroon. *Univ. Hull Dept. Geogr. Misc. Ser.* **30**: 73–86.
- Newton, E. (1867). On the land birds of the Seychelles archipelago. *Ibis Ser. 2, no. 3*: 334–360.
- Newton, I. (1977). Timing and success of breeding in tundra-nesting geese. Pp. 113–126 in: Stonehouse, B. & Perrins, C.M. eds. (1977). *Evolutionary Ecology*. Macmillan, London.
- Newton, I. (1995). The contribution of some recent research on birds to ecological understanding. *J. Anim. Ecol.* **64**: 675–696.
- Newton, I. (2006). Advances in the study of irruptive migration. *Ardea* **94**(3): 433–460.
- Newton, I. (2008). *The Migration Ecology of Birds*. Academic Press, London.
- Newton, I. & Dale, L.C. (1996a). Relationship between migration and latitude among West European birds. *J. Anim. Ecol.* **65**: 137–146.
- Newton, I. & Dale, L.C. (1996b). Bird migration at different latitudes in eastern North America. *Auk* **113**: 626–635.
- Ng'weno, F. (1990). Sunbird flying backwards. *Bull. East Afr. Nat. Hist. Soc.* **20**: 27–28.
- Nichols, O.G. & Nichols, F.M. (1984). The reptilian, avian and mammalian fauna on the Mount Saddleback State Forest, Western Australia. *West. Austr. Nat.* **15**(8): 179–189.
- Nichols, R.K. & Woolaver, L.G. (2003). First observations of a successful nest for the endangered Mauritius Olive White-eye. *Bull. Afr. Bird Club* **10**(2): 101–106.
- Nichols, R.K., Woolaver, L.G. & Jones, C.G. (2004). Continued decline and conservation needs of the endangered Mauritius Olive White-eye *Zosterops chloronothos*. *Oryx* **38**(3): 291–296.
- Nichols, R.K., Woolaver, L.G. & Jones, C.G. (2005a). Breeding biology of the endangered Mauritius Olive White-eye *Zosterops chloronothos*. *Ostrich* **76**(1/2): 1–7.
- Nichols, R.K., Woolaver, L.G. & Jones, C.G. (2005b). Low productivity in the critically endangered Mauritius Olive White-eye *Zosterops chloronothos*. *Bird Conserv. Int.* **15**(3): 297–302.
- Nicholson, F. (1883). On a second collection of birds made in the island of Sumatra by Mr. H.O. Forbes. *Ibis Ser. 5, no. 1*: 235–257.
- Nicolson, F.W. & Fleming, P.A. (2003). Energy balance in the White-bellied Sunbird *Nectarinia talatala*: constraints on compensatory feeding, and consumption of supplementary water. *Functional Ecol.* **17**: 3–9.
- Niehuis, M. (1968). Die Bestandsentwicklung des Schwarzstirnwürgers *Lanius minor* in Deutschland unter besonderer Berücksichtigung des Nahetals und Rheinheessen. *Mainzer Naturwiss. Archiv* **7**: 185–224. In German.
- Nielsen, L. (1961). Nesting of the Blue-faced Honeyeater. *Emu* **61**(3): 198–200.
- Nielsen, L. (1991). *Birds of Lamington National Park and Environs: a Guide's Guide*. Published privately, Canungra, Queensland.
- Nielsen, L. (1996). *Birds of Queensland's Wet Tropics and Great Barrier Reef: Cooktown to Townsville, North-Eastern Queensland, Australia*. Gerard Industries, Bowden, South Australia.
- van Nieuwenhuyse, D. (1992a). Caractéristiques et typologie des territoires de la Pie-grièche écorcheur (*Lanius collurio*) en Lorraine belge. *Aves (Liège)* **29**: 137–154. In French.
- van Nieuwenhuyse, D. (1992b). Evolution du statut de la Pie-grièche écorcheur (*Lanius collurio*) dans la région de Virton (Lorraine belge). *Aves (Liège)* **29**: 216–220. In French.
- van Nieuwenhuyse, D. (1996). Propositions pour la conservation de la Pie-grièche écorcheur *Lanius collurio*. *Aulauda* **64**(1): 45–55. In French with English summary.
- van Nieuwenhuyse, D. (1998). Conservation opportunities for the Red-backed Shrike (*Lanius collurio*). Pp. 79–82 in: Yosef & Lohrer (1998).
- van Nieuwenhuyse, D. (1999a). Decline and extinction of shrikes (Laniidae) as breeding birds in Flanders (northern Belgium). An analysis of all published observations since 1985. *Aves (Liège)* **36**: 101–111.
- van Nieuwenhuyse, D. (1999b). Global shrike conservation: problems, methods and opportunities. *Aves (Liège)* **36**: 193–204.
- van Nieuwenhuyse, D. (2000). Dispersal patterns of the Red-backed Shrike (*Lanius collurio*) in Gaume, Belgium. *Ring* **22**(1): 65–78.
- van Nieuwenhuyse, D. & Iweins, B. (1995). À propos de la seconde ponte chez la Pie-grièche écorcheur (*Lanius collurio*). *Aves (Liège)* **32**: 133–143. In French.
- van Nieuwenhuyse, D. & Vandekerckhove, K. (1992). Caractéristiques et typologie des territoires de la Pie-grièche écorcheur *Lanius collurio* en Lorraine belge. *Aves (Liège)* **29**: 137–154. In French.
- van Nieuwenhuyse, D., Nollet, F. & Coussens, P. (1995). Digital method for recording and analyzing territory use and activity budget of the Red-backed Shrike (*Lanius collurio*). *Proc. West. Found. Vert. Zool.* **6**: 268–275.
- van Nieuwenhuyse, D., Nollet, F. & Evans, A. (1999). The ecology and conservation of the Red-backed Shrike *Lanius collurio* breeding in Europe. *Aves (Liège)* **36**: 179–192.
- van Nieuwenhuyse, D., Vandekerckhove, K., Nollet, F. & Verhaeghe, K. (1992). Definitie van een protocolleringmethode voor territoriumgebruik en specifieke gedragingen bij de Grauwe Klauwier *Lanius collurio*. *Oriolus* **58**: 38–43. In Flemish.
- Nikiforov, M.E. (1993). Impact of habitat succession in avian populations in the area abandoned after Chernobyls accident. *Ring* **15**: 281–292.
- Nikolaus, G. (1987). *Distribution Atlas of Sudan's Birds with Notes on Habitat and Status*. Bonner Zoologische Monographien **25**. Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn. 322 pp.
- Nikolaus, G. (2001). Bird exploitation for traditional medicine in Nigeria. *Malimbus* **23**: 45–55.
- Nikolov, B.P. (2003). Presumed hybrid between Red-backed Shrike and Lesser Grey Shrike in Bulgaria. *British Bird* **96**(9): 455–456.
- Nikolov, B.P. (2004). Reproductive rates of the Red-backed Shrike in Sofia region, Bulgaria. *Acta Zool. Bulg.* **56**: 75–82.
- Nikolov, B.P. (2005). Reproductive success of the Woodchat Shrike in western Bulgaria. *Ornis Fenn.* **82**: 73–80.
- Nikolov, B.P. (2006). [Shrikes (Family Laniidae) (Aves: Passeriformes) in Bulgaria – Distribution, Breeding Biology and Migration]. PhD thesis, Institute of Zoology, Bulgarian Academy of Sciences, Sofia. In Bulgarian.
- Nikolov, B.P., Kodzhabashev, N.D. & Popov, V.V. (2004). Diet composition and spatial patterns of food caching in wintering Great Grey Shrikes (*Lanius excubitor*) in Bulgaria. *Biol. Letters (Poznan)* **41**: 119–133.
- Nilsson, R.J., Kennedy, E.S. & West, J.A. (1994). The birdlife of South East Island (Rangitira), Chatham Islands, New Zealand. *Notornis* **41** (Suppl.): 109–125.
- Nisbet, I.C.T. (1968). The utilization of mangroves by Malayan birds. *Ibis* **110**: 348–352.
- Nix, H.A. (1976). Environmental control of breeding, post-breeding dispersal and migration of birds in the Australian region. Pp. 272–305 in: Frith, H.J. & Calaby, J.H. eds. (1976). *Proceedings of the 16th International Ornithological Congress, Canberra, 12–17 August 1974*. Australian Academy of Sciences, Canberra.
- Nixon, A. (1992). Blackheaded Oriole mimics Olive Woodpecker. *Bee-eater & BirdLife E Cape News* **43**: 26–27.
- Nogales, M., Delgado, J.D. & Medina, F.M. (1998). Shrikes, lizards and *Lycium intricatum* (Solanaceae) fruits: a case of indirect seed dispersal on an oceanic island (Aleganza, Canary Islands). *J. Ecol. (London)* **86**: 866–871.
- Noll, G. (1992). *Zosterops pallidus* Swains., 1838 – Verhaltensbeobachtungen während der Fortpflanzungszeit. *Trop. Vögel* **13**(2): 35–40. In German.
- Noll, H. (1956). Aus Leben und Forschung von E. H. Zollikofer, nach seinen Tagebüchern berichtet. *Jb. St. Gall. Naturwiss. Ges.* **75**: 1–96. In German.
- Noll, H. (1957). Notizen von E. H. Zollikofer über das Freileben des Mauerläufers, *Tichodroma muraria*. *Orn. Beob.* **54**: 45–50. In German.
- Noma, N. & Yumoto, T. (1997). Fruiting phenology of animal-dispersed plants in response to winter migration of frugivores in a warm temperate forest on Yakushima island, Japan. *Ecol. Res.* **12**: 119–129.
- Norberg, U.M. (1979). Morphology of the wings, legs and tail of three coniferous forest tits, the Goldcrest and the Treecreeper in relation to locomotor pattern and feeding station selection. *Phil. Trans. Roy. Soc. London (Ser. B)* **287**: 131–165.
- Norman, J.A., Rheindt, F.E., Rowe, D.L. & Christidis, L. (2007). Speciation dynamics in the Australo-Papuan Meliphaga honeyeaters. *Mol. Phylog. Evol.* **42**: 80–91.
- Norris, R.A. (1958). Comparative biosystematics and life history of the nuthatches *Sitta pygmaea* and *Sitta pusilla*. *Univ. Calif. Publ. Zool.* **56**(2): 119–300.
- North, A.J. (1902). *Nests and Eggs of Birds Found Breeding in Australia and Tasmania*. 2nd edition. Vol. 1(2). Australian Museum Special Catalogue 1. Trustees of the Australian Museum, Sydney.

- North, A.J. (1905). Description of the nest and eggs of the Varied Honey-eater, *Ptilotis versicolor*, Gould. *Victorian Naturalist* **21**(11): 167.
- North, A.J. (1906). *Nests and Eggs of Birds Found Breeding in Australia and Tasmania*. 2nd edition. Vol. 2(1). Australian Museum Special Catalogue **1**. Trustees of the Australian Museum, Sydney.
- North, A.J. (1907). *Nests and Eggs of Birds Found Breeding in Australia and Tasmania*. 2nd edition. Vol. 2(2). Australian Museum Special Catalogue **1**. Trustees of the Australian Museum, Sydney.
- Norton, S.A. (1980). Honeyeaters feeding on *Pseudowintera* – a new record. *Notornis* **27**(1): 99–100.
- Norton, S.A. (1982). Bird dispersal of *Pseudowintera* seed. *Notornis* **29**(2): 91–92.
- Noske, R.A. (1978). Range extensions of the Grey-headed Honeyeater and Fan-tailed Cuckoo. *Sunbird* **9**(1/2): 12.
- Noske, R.A. (1983). Communal behaviour of Brown-headed Honeyeaters. *Emu* **83**(1): 38–41.
- Noske, R.A. (1990). Seed dispersal of black wattles *Acacia auriculiformis* by birds. *North. Territ. Naturalist* **12**: 24–25.
- Noske, R.A. (1993). *Bruguiera hainesii*: another bird-pollinated mangrove? *Biotropica* **25**(4): 481–483.
- Noske, R.A. (1995a). At the crossroads of two avifaunas – Timor. *Bull. Oriental Bird Club* **21**: 34–38.
- Noske, R.A. (1995b). The ecology of mangrove forest birds in peninsular Malaysia. *Ibis* **137**: 250–263.
- Noske, R.A. (1996). Abundance, zonation and foraging ecology of birds in mangroves of Darwin Harbour, Northern Territory. *Wildl. Res.* **23**(4): 443–474.
- Noske, R.A. (1997). Short breeding season of Figbirds *Sphecotheres viridis* in Darwin, Northern Territory. *Corella* **21**(2): 44–47.
- Noske, R.A. (1998). Breeding biology, demography and success of the Rufous-banded Honeyeater, *Conopophila albogularis*, in Darwin, a monsoonal tropical city. *Wildl. Res.* **25**(4): 339–356.
- Noske, R.A. (1999). Notes on the breeding biology of the tropical mangrove-dwelling Yellow White-eye *Zosterops luteus*. *Austr. Bird Watcher* **18**: 3–7.
- Noske, R.A. (2003). The breeding seasons of birds on Timor. *Kukila* **12**: 27–38.
- Noske, R.A. & Franklin, D.C. (1999). Breeding seasons of land birds in the Australian monsoonal tropics: diverse responses to a highly seasonal environment. *Austr. Biol.* **12**: 72–90.
- Noske, R.A. & Saleh, N. (1994). The status of lowland forest birds in West Timor. Report to Lembaga Ilmu Pengetahuan Indonesia (LIPI). Unpubl.
- Noske, R.A. & Saleh, N. (1996). The conservation status of forest birds in West Timor. Pp. 65–74 in: Kitchener, D.J. & Suyanto, A. eds. (1996). *Proceedings of the First International Conference on Eastern Indonesian-Australian Vertebrate Fauna, Manado, Indonesia, November 22–26, 1994*. Western Australian Museum & Lembaga Ilmu Pengetahuan Indonesia, Perth, Western Australia.
- Noske, R.A. & Saleh, N. (1997). The ecology of Timor birds. Pp. 353–362 in: Monk, K.A., de Freitas, Y. & Reksodiharjo-Lilley, G. eds. (1997). *The Ecology of Nusa Tenggara and Maluku*. University of New South Wales Press, Sydney.
- Novak, P.G. (1989). *Breeding Ecology and Status of Loggerhead Shrike in New York*. MSc thesis, Cornell University, Ithaca, New York.
- Novak, P.G. (1995). Habitat selection by breeding Loggerhead Shrikes in northern New York. *Proc. West. Found. Vert. Zool.* **6**: 176–181.
- Nowak, D. & Sachanowicz, K.A. (2002). Further significant bird records from south-east Iran. *Sandgrouse* **24**(2): 147–148.
- Oates, E.W. (1890a). *The Fauna of British India, Including Ceylon and Burma*. Vol. 2. Birds. Taylor and Francis, London.
- Oates, E.W. ed. (1890b). *The Nests and Eggs of Indian Birds by Allan O. Hume*. Vol. 2. 2nd edition. R.H. Porter, London.
- Oatley, T.B. (1969). Bird ecology in the evergreen forests of north western Zambia. *Puku* **5**: 141–180.
- Oatley, T.B. (1995). Selected recoveries reported to SAFRING: January 1995–June 1995. *Safring News* **24**: 68–75.
- Oatley, T.B. (1996). SASOL report on selected recoveries received at SAFRING: January 1996–June 1996. *Safring News* **25**: 60–67.
- Oatley, T.B. (1997). Selected recoveries reported to SAFRING: July 1996–December 1996. *Safring News* **26**: 25–33.
- Oatley, T.B. & Best, C.C. (1997). Selected recoveries reported to SAFRING: January 1997–June 1997. *Safring News* **26**: 72–80.
- Oatley, T.B. & Skead, D.M. (1972). Nectar feeding by South African birds. *Lammergeyer* **15**: 65–74.
- Oberholser, H.C. (1897). Critical notes on the genus *Auriparus*. *Auk* **14**: 390–394.
- Oberholser, H.C. (1912). Descriptions of one hundred and four new species and subspecies of birds from the Burassan Islands and Sumatra. *Smithsonian Misc. Coll.* **60**(7): 1–22.
- Oberholser, H.C. (1923). A review of the genus *Prionochilus* Strickland and its closest allies. *Ohio J. Sci.* **23**: 287–294.
- Oberholser, H.C. (1974). *The Bird Life of Texas*. Vol. 2. University of Texas Press, Austin & London.
- O'Brien, P.H. & Dow, D.D. (1979). Vocalizations of nestling Noisy Miners *Manorina melanoccephala*. *Emu* **79**(2): 63–70.
- O'Connor, R.J. (1985). Behavioural regulation of bird populations: a review of habitat use in relation to migration and residence. Pp. 105–142 in: Sibley, R.M. & Smith, R.H. eds. (1985). *Behavioural Ecology. Ecological Consequences and Adaptive Behaviour*. Blackwell Scientific, Oxford, UK.
- O'Donnell, C.F.J. & Dilks, P.J. (1993). Habitat use in autumn by forest birds on South East Island, Chatham Islands. *Notornis* **40**(4): 247–252.
- O'Donnell, C.F.J. & Dilks, P.J. (1994). Foods and foraging of forest birds in temperate rainforest, south Westland, New Zealand. *New Zealand J. Ecol.* **18**(2): 87–107.
- Officer, H.R. (1967). 'In the footsteps of McLennan and Barnard at Cape York'. *Emu* **66**(3): 279–287.
- Officer, H.R. (1971). *Australian Honeyeaters*. 3rd impression. The Bird Observers Club, Melbourne, Victoria.
- Officer, H.R. (1976). Ten days observations of the birds of Gove Peninsula [sic]. *Austr. Bird Watcher* **6**(7): 223–228.
- Ogawa, I. (1977a). Pellet analysis of the Bull-headed Shrike *Lanius bucephalus* and the seasonal change of food habits. *Tori* **26**(2/3): 63–75. In Japanese with English summary.
- Ogawa, I. (1977b). Distribution of Shrikes (Laniidae) in Hokkaido. 1. The outline of horizontal distribution. *Misc. Rep. Yamashina Inst. Orn.* **9**: 44–55.
- Ogilvie-Grant, W.R. (1888). Second list of the birds collected by Mr. C. M. Woodford in the Solomon Archipelago. *Proc. Zool. Soc. London* **1888**(2): 185–204.
- Ogilvie-Grant, W.R. (1894). On the birds of the Philippine islands. Part 2. The highlands of north Luzon, 5000 ft. *Ibis Ser.* **6**, no. 6: 501–522.
- Ogilvie-Grant, W.R. (1896a). On the birds of the Philippine islands. Part 8. The highlands of Negros. *Ibis Ser.* **7**, no. 2: 525–565.
- Ogilvie-Grant, W.R. (1896b). [Four new species described from Samar]. *Bull. Brit. Orn. Club* **6**: 16–18.
- Ogilvie-Grant, W.R. (1897a). On the birds of the Philippine islands. Part 9. The islands of Samar and Leite. *Ibis Ser.* **7**, no. 3: 209–250, pls. pls. 5–6.
- Ogilvie-Grant, W.R. (1897b). [Specimens of several interesting birds from the island of Samar]. *Ibis Ser.* **7**, no. 3: 253–255.
- Ogilvie-Grant, W.R. (1904). On the birds collected during a recent expedition through Somali-Land and Abyssinia to Lake Tsana. *Ibis Ser.* **8**, no. 4: 250–280.
- Ogilvie-Grant, W.R. (1910). [Description of a new species of white-eye from Ceram]. *Bull. Brit. Orn. Club* **25**: 90–91.
- Ogilvie-Grant, W.R. (1912). *Catalogue of the Collection of Birds' Eggs in the British Museum*. Vol. 5. Trustees of the British Museum (Natural History), London.
- Ogilvie-Grant, W.R. (1915). Report on the birds collected by the British Ornithologists' Union Expedition and the Wollaston Expedition in Dutch New Guinea. *Ibis Ser.* **10** (Suppl. 2): 1–329.
- Ogilvie-Grant, W.R. & Forbes, H.O. (1903). Aves. Pp. 19–72, 7 plates in: Forbes, H.O. ed. (1903). *The Natural History of Sokotra and Abd-el-Kuri: Being the Report upon the Results of the Conjoint Expedition to these Islands in 1898–9*. Henry Young and Sons & H.R. Porter, Liverpool & London.
- Ogilvie-Grant, W.R. & Whitehead, J. (1898). On the nests and eggs of some rare Philippine birds. *Ibis Ser.* **7**, no. 4: 231–247.
- O'Hara, P.D., Lank, D.B. & Delgado, F.S. (2002). Is the timing of moult altered by migration? Evidence from a comparison of age and residency classes of Western Sandpipers *Calidris mauri* in Panama. *Ardea* **90**: 61–70.
- Ohata, K. (1991). Nesting and courtship feeding by Brown and Thick-billed Shrikes, *Lanius cristatus* and *L. tigrinus*. *Strix* **10**: 280–281. In Japanese with English summary.
- Olborska, P. & Kosicki, J.Z. (2004). Breeding biology of the Great Grey Shrike (*Lanius excubitor*): an analysis of nest record cards. *Biol. Letters (Poznan)* **41**: 147–154.
- Oliver, D.L. (1998a). *Ecology and Conservation of the Endangered Regent Honeyeater*. *Xanthomyza phrygia*, in Northern New South Wales. PhD thesis, University of New England, Armidale, New South Wales.
- Oliver, D.L. (1998b). Roosting of non-breeding Regent Honeyeaters *Xanthomyza phrygia*. *Emu* **98**: 65–69.
- Oliver, D.L. (1998c). The importance of insects and leop in the diet of juvenile Regent Honeyeaters, *Xanthomyza phrygia*: implications for the conservation of an endangered woodland bird. *Wildl. Res.* **25**(4): 409–417.
- Oliver, D.L. (1998d). The breeding behaviour of the endangered Regent Honeyeater, *Xanthomyza phrygia*, near Armidale, New South Wales. *Austr. J. Zool.* **46**(2): 153–170.
- Oliver, D.L. (2000). Foraging behaviour and resource selection of the Regent Honeyeater *Xanthomyza phrygia* in northern New South Wales. *Emu* **100**(1): 12–30.
- Oliver, D.L., Chambers, M.A. & Parker, D.G. (2003). Habitat and resource selection of the Painted Honeyeater (*Grantiella picta*) on the northern floodplains region of New South Wales. *Emu* **103**(2): 171–176.
- Oliver, D.L., Ley, A.J., Ford, H.A. & Williams, B. (1999). Habitat of the Regent Honeyeater *Xanthomyza phrygia* and the value of the Bundarra-Barraba region for the conservation of avifauna. *Pacific Conserv. Biol.* **5**(3): 224–239.
- Oliver, D.L., Ley, A.J. & Williams, B. (1998). Breeding success and nest site selection of the Regent Honeyeater *Xanthomyza phrygia* near Armidale, New South Wales. *Emu* **98**(2): 97–103.
- Oliver, D.L., Quin, B.R., Quin, D.G., Walpole, R.M. & Walpole, S.C. (1998). Observations of nectar- and insect-feeding by Painted Honeyeaters *Grantiella picta*. *Austr. Bird Watcher* **17**(7): 353–355.
- Oliver, J. & Hopkins, H.F. (1989). Brown-backed Honeyeater *Ramsayornis modestus* near Madang. *Muruk* **4**(1): 24.
- Oliver, P.J. (1991). Seychelles Sunbird *Nectarinia dussumieri* piercing flowers. *Bull. Brit. Orn. Club* **111**(3): 174–175.
- Oliver, W.R.B. (1955). *New Zealand Birds*. Reed, Wellington, New Zealand.
- Olivier, G. (1944). *Monographie des Pies-grièches du Genre Lanius*. Edition Lecercf, Rouen, France. In French.
- Olson, P., Weston, M., Tzaros, C. & Silcocks, A. (2005). The state of Australia's birds 2005. Woodlands and birds. *Wingspan* **15**(4) (Suppl.): 1–31.
- Olson, S.L. & Ames, P.L. (1984). *Promerops* as a thrush, and its implications for the evolution of nectarivory in birds. *Ostrich* **55**: 213–218.
- Olsson, V. (1980). Recent changes in the distribution of the Great Grey Shrike, *Lanius excubitor*, in Sweden. *Fauna och Flora* **75**: 247–255. In Swedish with English summary.
- Olsson, V. (1981). Varfågeln *Lanius excubitor* flyttning och övervintringsområde. *Vår Fågelvärld* **40**(6): 447–454. In Swedish with English summary.
- Olsson, V. (1984a). Varfågeln *Lanius excubitor* vintervanor. 1. Biotop. *Vår Fågelvärld* **43**(2): 113–124. In Swedish with English summary.
- Olsson, V. (1984b). Varfågeln *Lanius excubitor* vintervanor. 2. Revir. *Vår Fågelvärld* **43**(3): 199–210. In Swedish with English summary.
- Olsson, V. (1984c). Varfågeln *Lanius excubitor* vintervanor. 3. Jaktmetoder. *Vår Fågelvärld* **43**(6): 405–414. In Swedish with English summary.
- Olsson, V. (1985). Varfågeln *Lanius excubitor* vintervanor. 4. Behandling av bytet. *Vår Fågelvärld* **44**(5): 269–283. In Swedish with English summary.
- Olsson, V. (1986). Varfågeln *Lanius excubitor* vintervanor. 5. Bytesval. *Vår Fågelvärld* **45**(1): 19–31. In Swedish with English summary.
- Olsson, V. (1988). [Great Grey Shrike *Lanius e. excubitor* L.]. *Fåglar i Jordbrukslandskapet* **1988**: 315–320. In Swedish.
- Olsson, V. (1995a). The effects of habitat changes on the distribution and population trends of the Great Grey Shrike and Red-backed Shrike in Sweden. *Proc. West. Found. Vert. Zool.* **6**: 108–111.
- Olsson, V. (1995b). The Red-backed Shrike *Lanius collurio* in southeastern Sweden: habitat and territory. *Ornis Svecica* **5**: 31–41.
- Olsson, V. (1995c). The Red-backed Shrike *Lanius collurio* in southeastern Sweden: breeding biology. *Ornis Svecica* **5**: 101–110.
- Olsson, V. (2001). Polygyny in the Red-backed Shrike *Lanius collurio*. *Ornis Svecica* **11**: 97–99.
- Onley, D.J. (1980). Bird counts in lowland forests in the western Paparoas. *Notornis* **27**(4): 335–362.
- Onley, D.J. (1983). The effects of logging on winter bird populations near Karama. *Notornis* **30**(3): 187–197.
- Opit, G. (1975). Observations (along Kokoda Trail). *Papua New Guinea Bird Soc. Newsl.* **115**: 4–5.
- Orenstein, R.I. (1976). Birds of Plesymia area, central New Britain. *Condor* **78**: 370–374.
- Orenstein, R.I. (1977). *Morphological Adaptations for Bark Foraging in Australian Treecreepers (Aves: Climacteridae)*. PhD thesis, University of Michigan, Ann Arbor, Michigan.
- Orenstein, R.I. (1979). Notes on the Ma'o (*Gymnomys samoensis*), a rare Samoan honeyeater. *Notornis* **26**: 181–184.
- Orenstein, R.I. & Kennedy, R.S. (1985). Creeper, Philippine. Page 118 in: Campbell & Lack (1985).
- Orton, C.L.E. (1918). A trip in search of the Spotted Scrub-Wren (*Sericornis maculata*) and the Little Wattle-Bird (*Anellobia lunulata*). *Emu* **18**: 101–103.
- Orton, C.L.E. & Sandland, P.T. (1913). Birds of Moora (W.A.) and district. *Emu* **13**(2): 75–80.
- Osborne, W.S. & Green, K. (1992). Seasonal changes in composition, abundance and foraging behaviour of birds in the Snowy Mountains. *Emu* **92**(2): 93–105.
- Oschadlous, D. & Fraser, M. (1988). Observations of colour-ringed Cape Sugarbirds at Kirstenbosch. *Safring News* **17**: 59–64.
- Osiejuk, T.S. (1998). Correlates of creeping speed variability in two species of treecreepers. *Condor* **100**(1): 174–177.
- Osiejuk, T.S. & Kuczyński, L. (2000). Mixed and atypical singers among treecreepers *Certhia brachydactyla* and *C. familiaris*: a review and preliminary data from western Poland. *Biol. Bull. Poznan* **37**(1): 83–94.
- Ottow, J. & Duve, G. (1965). Zur Kenntnis der Fortpflanzung von *Chrysococcyx caprius* und *Cuculus canorus gularis* in Süd-Africa. *J. Orn.* **106**(4): 431–439. In German.
- Oustalet, E. (1889). Note sur la faune ornithologique des Îles Mariannes. *Le Naturaliste* **11**: 260–261. In French.
- Owen, H. & Bresson, R. (1987). A 3-year study of the Seychelles Sunbird *Nectarinia dussumieri* on Cousin Island, Seychelles. Report to the International Council for Bird Preservation, Cambridge, UK. Unpubl.
- Owen, K.P. & Sell, M.G. (1985). The birds of Waimea Inlet. *Notornis* **32**(4): 271–309.
- Owen, R.P. (1977). A checklist of the birds of Micronesia. *Micronesia* **13**: 65–81.
- Oxlee, D. (1988). "Crimson-throated" Black Sunbird. *WBC News* **42**: 14.

- Oyugi, J.O. & Kombe, W. (2004). Nesting behaviour of Amani Sunbird in Arabuko-Sokoke Forest. *Kenya Birds* 11(1): 18–19.
- Pa-alan, R.B. (1993). *Habitat-correlated Patterns of Bird Abundance and Diversity in Southern Negros Oriental, Philippines*. MSc thesis, Silliman University, Dumaguete, Negros.
- Page, W.T. (1912). Breeding of the Indian White-eye, *Zosterops palpebrosa*. *Avicult. Mag.* 3: 114–117.
- Painter, J.N. (1997). *Colony Structure and Relatedness in the Cooperatively Breeding Bell Miner* Manorina melanophrys. PhD thesis. Department of Genetics and Human Variation, La Trobe University, Melbourne, Victoria.
- Painter, J.N., Crozier, R., Poiani, A., Robertson, R.J. & Clarke, M.F. (2006). Complex social organization reflects genetic structure and relatedness in the cooperatively breeding Bell Miner, *Manorina melanophrys*. *Mol. Ecol.* 9: 1339–1347.
- Pakenham, R.H.W. (1979). *The Birds of Zanzibar and Pemba*. British Ornithologists' Union Checklist 2. British Ornithologists' Union, London.
- Palliser, T. (1989). Lowland birds of the Vanimo region, West Sepik Province. *Muruk* 4(1): 11–17.
- Paludan, K. (1959). On the birds of Afghanistan. *Vidensk. Medd. Dansk Naturhist. Foren.* 122: 1–332.
- Pande, S. (2004). The shrike in Sanskrit literature since 400 BC. *Biol. Letters (Poznan)* 41: 191–193.
- Pande, S., Pawashe, A., Sant, N. & Mahabal, A. (2004). Status, habitat preferences and population estimates of non-breeding shrikes *Lanius* spp. in Maharashtra and Karnataka states, India. *Biol. Letters (Poznan)* 41: 65–69.
- Panov, E.N. (1973). *Ptitsy yuzhnogo Primor'ya (fauna, biologiya i povedenie)*. [The Birds of South Ussuriland (Fauna, Biology, Behaviour)]. Nauka, Novosibirsk. In Russian with English summary.
- Panov, E.N. (1983). *Die Vögel der Paläarktis*. [1st edition]. Neue Brehm-Bücherei 557. A. Ziemsen, Wittenburg Lutherstadt, Germany. In German.
- Panov, E.N. (1989). *Gibridizatsiya i etologicheskaya izolyatsiya u Ptitsy*. [Natural Hybridization and Ethological Isolation in Birds]. Akademiya nauk SSSR, Institut evolyutsionnoi morfologii i ekologii zhivotnykh, Moscow. In Russian with English summary.
- Panov, E.N. (1995). Superspecies of shrikes in the former USSR. *Proc. West. Found. Vert. Zool.* 6: 26–33.
- Panov, E.N. (1996). *Die Vögel der Paläarktis: Gattung Lanius*. 2nd edition. Die Neue Brehm-Bücherei 557. Westarp Wissenschaften & Spektrum Akademischer Verlag, Magdeburg & Heidelberg. In German.
- Parasharya, B.M. & Vyas, R. (2002). Status of the Purple-rumped Sunbird *Nectarinia zeylonica* in Gujarat state. *J. Bombay Nat. Hist. Soc.* 99(1): 119–120.
- Park, G., Hay, J., Whistler, W.A., Lovegrove, T. & Ryan, P. (1992). *The National Ecological Survey of Western Samoa: the Conservation of Biological Diversity in the Coastal Lowlands of Western Samoa*. New Zealand Department of Conservation Report, Wellington, New Zealand.
- Parker, S.A. (1963). Nidification of the genus *Melanocharis* Slater (Dicaeidae). *Bull. Brit. Orn. Club* 83: 109–112.
- Parker, S.A. (1967). Some eggs from the New Hebrides, south-west Pacific. *Bull. Brit. Orn. Club* 87(5): 90–91.
- Parker, S.A. (1969). New and interesting distribution records of central Australian birds. *South Austr. Orn.* 25: 59–71.
- Parker, S.A. (1970). Critical notes on the status of some Northern Territory birds. *South Austr. Orn.* 25: 115–125.
- Parker, S.A. (1971a). Taxonomy of the Northern Territory friarbirds known as *Philemon buceroides gordoni*. *Emu* 71(2): 54–56.
- Parker, S.A. (1971b). Distribution of *Meliphaga flavescens* and *M. fusca* in Northern Queensland. *Sunbird* 2(3): 41–47.
- Parker, S.A. (1973). The tongues of *Ephthiamura* and *Ashbyia*. *Emu* 73: 19–20.
- Parker, S.A. (1977). Birds as pollinators. *Austr. Bird Watcher* 7(4): 124–133.
- Parker, V. (1997a). Fiscal Shrike *Lanius collaris*. Pp. 408–409 in: Harrison *et al.* (1997).
- Parker, V. (1997b). White-crowned Shrike *Eurocephalus anguitimens*. Pp. 450–451 in: Harrison *et al.* (1997).
- Parker, V. (2005). *The Atlas of the Birds of Central Mozambique*. Endangered Wildlife Trust & Avian Demography Unit, Johannesburg & Cape Town.
- Parkes, C.P. (1980). A new subspecies of the Spiny-cheeked Honeyeater *Acanthagenys rufogularis*, with notes on generic relationships. *Bull. Brit. Orn. Club* 100(2): 143–147.
- Parkes, K.C. (1958). The Palearctic element in the New World fauna. Pp. 421–432 in: Hubbs, C.L. ed. (1958). *Zoogeography*. Publication of the American Association for the Advancement of Science 51. American Institute of Biological Sciences & American Association for the Advancement of Science (Pacific Division), Washington, D.C.
- Parkes, K.C. (1962). New subspecies of birds from Luzon, Philippines. *Postilla Yale Peabody Mus.* 67: 1–8.
- Parkes, K.C. (1963). The races of the Flaming Sunbird (*Aethopyga flagrans*). *Bull. Brit. Orn. Club* 83: 7–8.
- Parkes, K.C. (1965). A small collection of birds from the island of Buad, Philippines. *Ann. Carnegie Mus.* 38(2): 49–67.
- Parkes, K.C. (1971). Taxonomic and distributional notes on Philippine birds. *Nemouria* 4: 1–67.
- Parkes, K.C. (1973). Annotated list of the birds of Leyte island, Philippines. *Nemouria* 11: 1–73.
- Parkes, K.C. (1989). Notes on the Menage collection of Philippine birds. 1. Revision of *Pachycephala cinerea* (Pachycephalidae) and an overlooked subspecies of *Dicaeum trigonostigma* (Dicaeidae). *Nemouria* 33: 1–9.
- Parrott, J. (1980). Frugivory by Great Grey Shrikes *Lanius excubitor*. *Ibis* 122: 532–533.
- Parrott, S. & Andrew, A. (1996). An annotated checklist of the birds of Way Kambas National Park, Sumatra. *Kukila* 8: 57–85.
- Parsons, H. & Major, R.E. (2004). Bird interactions in Sydney gardens: some initial findings of the birds in backyards program. Pp. 211–215 in: Lunney, D. & Burgin, S. eds. (2004). *Urban Wildlife: More than Meets the Eye*. Royal Zoological Society of New South Wales, Sydney.
- Parsons, H., French, K. & Major, R.E. (2003). The influence of remnant bushland on the composition of suburban bird assemblages in Australia. *Landscape Urban Planning* 66: 43–56.
- Parsons, H., Major, R.E. & French, K. (2006). Species interactions and habitat associations of birds inhabiting urban areas of Sydney, Australia. *Austr. Ecol.* 31(2): 217–227.
- Pascoe, C. & Saxon, M. (1992). The taking of human hair by the Brown-headed Honeyeater *Melithreptus brevirostris*. *Austr. Bird Watcher* 14(8): 318–319.
- Pasinelli, G., Müller, M., Schaub, M. & Jenni, L. (2007). Possible causes and consequences of philopatry and breeding dispersal in Red-backed Shrikes *Lanius collurio*. *Behav. Ecol. Sociobiol.* 61: 1061–1074.
- Pasquet, E. (1998). Phylogeny of the nuthatches of the *Sitta canadensis* group and its evolutionary and biogeographic implications. *Ibis* 140(1): 150–156.
- Pasquet, E., Bourdon, E., Kalyakin, M.V. & Cibois, A. (2006). The fulvetas (*Alcippe*, Timaliidae, Aves): a polyphyletic group. *Zool. Scr.* 35: 559–566.
- Passmore, M.D. (1982). Birds of Stanthorpe, Queensland, and its northern environs, 1972/1981. *Austr. Bird Watcher* 9(7): 227–237.
- Paton, D.C. (1979). *The Breeding Behaviour and Feeding Ecology of the New Holland Honeyeater* Phylidonyris novaehollandiae in Victoria. PhD thesis, Monash University, Melbourne, Victoria.
- Paton, D.C. (1980). The importance of manna, honeydew and lerp in the diets of honeyeaters. *Emu* 80(4): 213–226.
- Paton, D.C. (1981). The significance of pollen in the diet of the New Holland Honeyeater, *Phylidonyris novaehollandiae* (Aves: Meliphagidae). *Austr. J. Zool.* 29(2): 217–224.
- Paton, D.C. (1982a). The diet of the New Holland Honeyeater, *Phylidonyris novaehollandiae*. *Austr. J. Ecol.* 7: 279–298.
- Paton, D.C. (1982b). Moults of New Holland Honeyeaters, *Phylidonyris novaehollandiae* (Aves: Meliphagidae), in Victoria. 1. Moults of adults. *Austr. Wildl. Res.* 9(2): 331–344.
- Paton, D.C. (1982c). Moults of New Holland Honeyeaters, *Phylidonyris novaehollandiae* (Aves: Meliphagidae), in Victoria. 2. Moults of juveniles. *Austr. Wildl. Res.* 9(2): 345–356.
- Paton, D.C. (1982d). The influence of honeyeaters on flowering strategies of Australian plants. Pp. 95–75 in: Armstrong, J.A., Powell, J.M. & Richards, A.J. eds. (1982). *Pollination and Evolution*. Royal Botanic Gardens, Sydney.
- Paton, D.C. (1985a). Do New Holland Honeyeaters *Phylidonyris novaehollandiae* breed regularly in spring and autumn? *Emu* 85(2): 130–133.
- Paton, D.C. (1985b). Food supply, population structure, and behaviour of New Holland Honeyeaters *Phylidonyris novaehollandiae* in woodland near Horsham, Victoria. Pp. 219–230 in: Keast *et al.* (1985).
- Paton, D.C. (1986). Honeyeaters and their plants in southeastern Australia. Pp. 9–19 in: Ford & Paton (1986).
- Paton, D.C. (1988). Migratory flocks of honeyeaters at Cape Jervis, South Australia. *South Austr. Orn.* 30(5): 133–134.
- Paton, D.C. (1991). Variation in meliphagid morphology and its influence on pollen dispersal in Australian plants. Pp. 1611–1616 in: Bell, B.D. ed. (1992). *Acta XX Congressus Internationalis Ornithologici*. New Zealand Ornithological Trust Board, Wellington, New Zealand.
- Paton, D.C. & Collins, B.G. (1989). Bills and tongues of nectar-feeding birds: a review of morphology, function and performance, with intercontinental comparisons. *Austr. J. Ecol.* 14(4): 473–506.
- Paton, D.C. & Ford, H.A. (1977). Pollination by birds of native plants in South Australia. *Emu* 77(2): 73–85.
- Paton, D.C. & Ford, H.A. (1983). The influence of plant characteristics and honeyeater size on levels of pollination in Australian plants. Pp. 235–248 in: Jones, C.E. & Little, R.J. eds. (1983). *Handbook of Experimental Pollination Biology*. Van Nostrand Reinhold Co., New York.
- Paton, D.C. & Paton, J.B. (1980). The birds of Scott Conservation Park. *South Austr. Orn.* 28(5): 120–126.
- Paton, D.C. & Turner, V. (1985). Pollination of *Banksia ericifolia* Smith: birds, mammals and insects as pollen vectors. *Austr. J. Bot.* 33(3): 271–286.
- Paton, D.C., Carpenter, G. & Sinclair, R.G. (1994). A second bird atlas of the Adelaide region. Part 1: changes in the distribution of birds: 1974–75 vs 1984–85. *South Austr. Orn.* 31(7): 151–193.
- Paton, D.C., Dorward, D.F. & Fell, P. (1983). Thiamine deficiency and winter mortality in Red Wattlebirds, *Anthochaera carunculata* (Aves: Meliphagidae) in suburban Melbourne. *Austr. J. Zool.* 31(2): 147–154.
- Paton, D.C., Tucker, J.R., Paton, J.B. & Paton, P.A. (1988). Avian vectors of the seeds of the european olive *Olea europaea*. *South Austr. Orn.* 30(6): 158–159.
- Paton, J.B. (1975). Birds of the Gawler Ranges, South Australia. *South Austr. Orn.* 26(8): 180–193.
- Paton, J.B. (1981). The Grey Honeyeater: a review of distribution and variation. *South Austr. Orn.* 28(7): 185–190.
- Patrichev, M. (2004). *The Birds of Azerbaijan*. Pensoft, Sofia & Moscow.
- Pattemore, V. (1980). *Effects of the Pulpwood Industry on Wildlife in Tasmania. 3. Succession in Bird Communities and their Habitats*. National Parks and Wildlife Service (Tasmania) Wildlife Division Technical Report 80/I. National Parks and Wildlife Service, Hobart, Tasmania.
- Patten, G. (2002). Short feeding and other notes. *Bokmakierie* 199: 13–14.
- Patten, M.A. & Campbell, K.F. (2000). Typological thinking and the conservation of subspecies: the case of the San Clemente Island Loggerhead Shrike. *Divers. Distr.* 6: 177–188.
- Patterson, I.J. (1982). *The Shelduck. A Study in Behavioural Ecology*. Cambridge University Press, Cambridge, UK.
- Pauw, A. (1998). Pollen transfer on birds' tongues. *Nature (London)* 394: 731–732.
- Pavey, C.R. (1991). Comments on the range, seasonality and behaviour of some North Queensland birds. *Sunbird* 21(1): 13–18.
- Pavey, C.R. (1994). Observations on the ecology of the Green-backed Honeyeater *Glycichaera fallax* at Iron Range, Cape York Peninsula. *Sunbird* 24(3): 66–69.
- Payne, R.B. (1978). Microgeographic variation in songs of Splendid Sunbirds *Nectarinia coccinigaster* – population phenetics, habitats and song dialects. *Behaviour* 65(3/4): 282–308.
- Payne, R.B. & Payne, K. (1967). Cuckoo hosts in Southern Africa. *Ostrich* 38: 135–143.
- Payer, R.A. ed. (1967). *Check-list of Birds of the World. A Continuation of the Work of James L. Peters*. Vol. 12. Museum of Comparative Zoology, Cambridge, Massachusetts.
- Paz, U. (1983). Portrait of the Palestine Sunbird. *Israel Land and Nature* 9: 7–10.
- Paz, U. (1987). *The Birds of Israel*. Ministry of Defence Publication & Christopher Helm, Tel Aviv & London.
- Peach, W.J., Hanmer, D.B. & Oatley, T.B. (2001). Do Southern African songbirds live longer than their European counterparts? *Oikos* 93: 235–249.
- Peacey, A.M.J. (1985). Brief notes on the nesting habits of the Rufous-banded Honeyeater (*Conopophila albobularis*). *Papua New Guinea Bird Soc. Newsl.* 218: 8–9.
- Pearce, J.L. (1996a). Habitat selection by the White-eared Honeyeater. 1. Review of habitat studies. *Emu* 96(1): 42–49.
- Pearce, J.L. (1996b). Habitat selection by the White-eared Honeyeater. 2. A case study at Yellingbo State Nature Reserve, south-east Victoria. *Emu* 96(1): 50–54.
- Pearce, J.L., Burgman, M.A. & Franklin, D.C. (1994). Habitat selection by Helmeted Honeyeaters. *Wildl. Res.* 21(1): 53–63.
- Pearce, J.L., Menkhurst, P.W. & Burgman, M.A. (1995). Niche overlap and competition for habitat between the Helmeted Honeyeater and the Bell Miner. *Wildl. Res.* 22(6): 633–646.
- Pearson, D.C. (1975). A preliminary survey of the birds of Kutai Reserve, Kalimantan Timur, Indonesia. *Treubia* 28(4): 157–162.
- Pearson, D.J. (1983). East African bird report 1979. *Scopus* 5: 129–153.
- Pearson, D.J. (2000). The races of the Isabelline Shrike *Lanius isabellinus* and their nomenclature. *Bull. Brit. Orn. Club* 120(1): 22–27.
- Pearson, D.L. (1975). Survey of the birds of a lowland forest in the East Sepik district, Papua New Guinea. *Emu* 75: 175–177.
- Peck, B. & Peck, A. (1984). Spiderhunters. *Avicult. Mag.* 90(1): 1–10.
- Peckover, W.S. & Filewood, L.W.C. (1976). *Birds of New Guinea and Tropical Australia*. A.H. & A.W. Reed, Sydney.
- Pedersen, T. (2006). Birds of the United Arab Emirates – annotated checklist. URL: <http://www.tommypedersen.com/UAE%20checklist%20-%20annotated.htm> (download 11 March 2008).
- Pet, N.B. & Atkinson, P.W. (1994). The biodiversity and conservation of the birds of São Tomé and Príncipe. *Biodiversity & Conservation* 3(9): 851–867.
- Peiponen, V.A. (1967). Südliche Fortpflanzung und Zug von *Carduelis flammea* (L.) im Jahre 1965. *Ann. Zool. Fennici* 4: 547–559. In German with Finnish summary.
- Pek, L.V. & Fedyanina, T.F. (1961). [Food of birds in Kyrgyzia]. Pp. 59–118 in: Yanushevich, A.I., Tyurin, K.S., Yakovleva, I.D., Kydryaliev, A. & Semenova, N.I. eds. (1961). *Ptitsy Kirgizii*. [Birds of Kyrgyzia]. Vol. 3. Academy of Sciences of the Kyrgyz SSR Press, Frunze [Bishkek], Kyrgyzstan. In Russian.
- Pellinger, A. (1992). On the occurrence [sic] of *Tichodroma muraria* in Hungary. *Erdészeti és Faipari Tudományos Közlemények* 1991(1): 221–227. In Hungarian with English and German summaries.
- Pellow, K. (1971). Analysis of pellet from Dorset Wallcreeper. *British Birds* 64: 80–81.
- Penny, M. (1974). *The Birds of the Seychelles and the Outlying Islands*. Collins, London.
- Pennycuik, C.J. (1969). The mechanics of bird migration. *Ibis* 111: 525–556.
- Pennycuik, C.J. (2002). Gust soaring as a basis for the flight of petrels and albatrosses. *Avian Science* 2: 1–12.
- Pepper, J. & Pepper, A.Y. (1973). Singing Honeyeater feeding like bee-eater. *West. Austr. Nat.* 12(5): 114.
- Perdeck, A.C. (1958). Two types of orientation in migrating Starlings, *Sturnus vulgaris* L., and Chaffinches, *Fringilla coelebs* L., as revealed by displacement experiments. *Ardea* 46: 1–37.
- Perdeck, A.C. (1964). An experiment on the ending of autumn migration in Starlings. *Ardea* 52: 133–139.
- Perdeck, A.C. (1967). Orientation of Starlings after displacement to Spain. *Ardea* 55: 93–104.

- Pérez, G.E. & Hobson, K.A. (2006). Isotopic evaluation of interrupted molt in northern breeding populations of the Loggerhead Shrike. *Condor* **108**: 877–886.
- Pérez, G.E. & Hobson, K.A. (2007). Feather deuterium measurements reveal origins of migratory western Loggerhead Shrikes (*Lanius ludovicianus excubitorides*) wintering in Mexico. *Divers. Distr.* **12**: 1–6.
- Pérez del Val, J. (1996). *Las Aves de Bioko, Guinea Ecuatorial. Guía de Campo*. Edilesa, León, Spain. In Spanish.
- Pérez del Val, J., Castroviejo, J. & Purroy, F.J. (1994). Species richness and endemism of birds in Bioko. *Biodiversity & Conservation* **3**: 868–892.
- Pernetta, J.C. & Watling, D. (1978). The native and introduced terrestrial vertebrates of the Fiji Islands. *Pacific Sci.* **32**(3): 223–244.
- Persson, O. & Öhrström, P. (1989). A new avian mating system: ambisexual polygamy in the Penduline Tit *Remiz pendulinus*. *Ornis Scand.* **20**(2): 105–111.
- Pescott, T. (1985). Black Honeyeaters and charcoal. *Geelong Nat.* **22**(2): 37–39.
- Peterjohn, B.G. & Sauer, J.R. (1995). Population trends of the Loggerhead Shrike from the North American Breeding Bird Survey. *Proc. West. Found. Vert. Zool.* **6**: 117–121.
- Peters, D.E. (1979). Some evidence for a decline in population status of the Regent Honeyeater. *Austr. Bird Watcher* **8**(4): 117–123.
- Peterson, A.P. ed. (1999). Zoological nomenclature resource (Zoonomen). URL: <http://www.zoonomen.net> (download 19 June 2007).
- Peterson, A.T. (1996). Geographic variation in sexual dichromatism in birds. *Bull. Brit. Orn. Club* **116**(3): 156–163.
- Peterson, A.T. (2006). Taxonomy is important in conservation: a preliminary reassessment of Philippine species-level bird taxonomy. *Bird Conserv. Int.* **16**: 155–173.
- Petrov, V.S. & Gusev, V.M. (1967). [On the food of Woodchat Shrike (*Lanius senator*)]. *Ornitologiya* **8**: 381–382. In Russian.
- Pettet, A. (1977). Seasonal changes in nectar-feeding by birds at Zaria, Nigeria. *Ibis* **119**(3): 291–308.
- Pfeffer, P. (1961). Étude d'une collection d'oiseaux de Bornéo. [Last part]. *Oiseau et RFO RFO (Nouv. Sér.)* **31**(1): 9–29. In French.
- Pfeifer, R. (1992). Beobachtungen bei der Handaufzucht und Jugendentwicklung von Schwanzmeisen *Aegithalos caudatus*. *Gefiederte Welt* **116**(7): 228–231. In German.
- Phillips, A.R. (1959). Las peculiaridades del Sastrecito (*Psaltiriparus*, familia Paridae) y su incubación. *An. Inst. Biol. Univ. Nac. Aut. Mex. (Ser. Zool.)* **29**: 355–360. In Spanish.
- Phillips, A.R. (1986). *The Known Birds of North and Middle America*. Part 1. Hirundinidae to Mimidae; Certhiidae. Denver Museum of Natural History, Denver, Colorado.
- Phillips, A.R., Marshall, J. & Monson, G. (1964). *The Birds of Arizona*. University of Arizona Press, Tucson, Arizona.
- Phillips, J.B. & Moore, F.R. (1992). Calibration of the sun compass by sunset polarized light patterns in a migratory bird. *Behav. Ecol. Sociobiol.* **31**: 189–193.
- Phillips, W.W.A. (1951). Nests and eggs of Ceylon birds (Zosteropidae, Nectarinidae and Pittidae). *Ceylon J. Sci. (Biol. Sci.)* **24**: 143–163.
- Pianka, H.D. & Pianka, E.R. (1970). Bird censuses from desert localities in Western Australia. *Emu* **70**(1): 17–22.
- Piechocki, R. & Bolod, A. (1972). Beiträge zur Avifauna der Mongolei. Teil 2. Passeriformes. *Mitt. Zool. Mus. Berlin* **48**(1): 41–175. In German with Russian summary.
- Pierce, A.J. & Round, P.D. (2006). Everett's White-eye *Zosterops everetti* in Khao Yai, north-east Thailand. *Forktail* **22**: 116–117.
- Pierce, R.J. (1980). Seasonal and long-term changes in bird numbers at Lake Wainono. *Notornis* **27**(1): 21–44.
- Piersma, T. (1998). Phenotypic flexibility during migration: optimisation of organ size contingent on the risks and rewards of fuelling and flight? *J. Avian Biol.* **29**: 511–520.
- Piersma, T. & Jukema, J. (2002). Contrast in adaptive mass gains: Eurasian Golden Plovers store fat before midwinter and protein before prebreeding flight. *Proc. Royal Soc. London (Ser. B Biol. Sci.)* **269**: 1101–1105.
- Piersma, T., Klaassen, M., Bruggemann, J.H., Blomert, A.M., Gueye, A., Ntiama-Baidou, Y. & van Brederode, N.E. (1990). Seasonal timing of the spring departure of waders from the Banc-D'Arguin, Mauritania: a census in June 1988. *Ardea* **78**: 123–134.
- van der Pijl, L. (1936). Brilvogels en Ganitri. *Tropische Natuur* **25**: 119–121. In Dutch.
- van der Pijl, L. (1937). Disharmony between Asiatic flower-birds and American bird-flowers. *Ann. Jardin Bot. Buitenzorg* **48**: 17–26.
- Pilgrim, J.D. & Pierce, A.J. (2006). Some significant bird records from the Cardamom Mountains, Cambodia, including the first recent record of Silver Oriole *Oriolus melianus*. *Forktail* **22**: 125–127.
- Pilgrim, J.D., Leadley, J.D. & Saifuddin (1997). *Preliminary Report of the Flores '97 Expedition*. University of East Anglia Project in Indonesia, University of East Anglia, Norwich, UK.
- Pilgrim, J.D., Leadley, J.D. & Saifuddin (2000). *Bird Surveys and Conservation Status of Four Forests on Flores, Indonesia*. CSB Conservation Publications, Cambridge, UK.
- Piper, S.D. & Catterall, C.P. (2003). A particular case and a general pattern: hyperaggressive behaviour by one species may mediate avifaunal decreases in fragmented Australian forests. *Oikos* **101**: 602–614.
- Piper, S.D. & Catterall, C.P. (2006). Is the conservation value of small urban remnants of eucalypt forest limited by increased levels of nest predation? *Emu* **106**(2): 119–125.
- Pizzey, G. (1980). *A Field Guide to the Birds of Australia*. Collins, Sydney.
- Pizzey, G. & Knight, F. (1997). *Field Guide to the Birds of Australia*. Angus & Robertson & HarperCollins, Sydney, New South Wales.
- Pleske, T.D. (1990). Die Vogelfauna des russischen Reichs – Sylviinae. Instalments 1–4 of vol. 2 in: Przewalski, N.M. ed. (1889–1905). *Wissenschaftliche Resultate der von N.M. Przewalski nach Central-Asien unternommenen Reisen*. Zoological Part 2: Vögel. Commissionaires de l'Académie Impériale des Sciences, St. Petersburg. In German and Russian.
- du Plessis, M.A., Siegfried, W.R. & Armstrong, A.J. (1995). Ecological and life-history correlates of cooperative breeding in South African birds. *Oecologia* **102**(2): 180–188.
- Plucinski, A. (1982). Eidechsen als Vogelhaltung. *Orn. Mitt.* **34**: 63–64. In German.
- Poiani, A. (1990). Communal roosting of the Bell Miner *Manorina melanophrys*, Meliphagidae. *Victorian Naturalist* **107**: 105–106.
- Poiani, A. (1991a). Laughing Kookaburra robs Bell Miner nest. *Corella* **15**(3): 87.
- Poiani, A. (1991b). Anti-predator behaviour in the Bell Miner *Manorina melanophrys*. *Emu* **91**(3): 164–171.
- Poiani, A. (1992a). *Hormonal, Behavioural and Ecological Aspects of Cooperative Breeding in the Bell Miner* (*Manorina melanophrys*, Meliphagidae). PhD thesis, La Trobe University, Melbourne, Victoria.
- Poiani, A. (1992b). Feeding of the female breeder by male helpers in the Bell Miner *Manorina melanophrys*. *Emu* **92**(4): 233–237.
- Poiani, A. (1992c). Ectoparasitism as a possible cost of social life: a comparative analysis using Australian passerines (Passeriformes). *Oecologia (Berlin)* **92**(3): 429–441.
- Poiani, A. (1993a). Bell Miners: what kind of 'farmers' are they? *Emu* **93**(3): 188–194.
- Poiani, A. (1993b). Reproductive biology of the Bell Miner (*Manorina melanophrys*, Meliphagidae) at Healesville, south-eastern Victoria. *Wildl. Res.* **20**(5): 579–598.
- Poiani, A. (1993c). A possible case of intra-specific brood parasitism in the Bell Miner. *Corella* **17**(2): 61–62.
- Poiani, A. (1993d). Effects of clutch size manipulations on reproductive behaviour and nesting success in the cooperatively breeding Bell Miner (*Manorina melanophrys*). *Evol. Ecol.* **7**(4): 329–356.
- Poiani, A. (1993e). Social structure and the development of helping behaviour in the Bell Miner (*Manorina melanophrys*, Meliphagidae). *Ethology* **93**(1): 62–80.
- Poiani, A. (1994). Host-ectoparasite interactions in the Bell Miner *Manorina melanophrys* (Meliphagidae) and other sympatric passerines. *Victorian Naturalist* **111**(3): 102–109.
- Poiani, A. (1995). On Bell Miners, farmers and the role of metaphors in science: a reply to Loyn. *Emu* **95**(2): 147–148.
- Poiani, A. (1997). Prey delivered to Bell Miner nestlings: is there a division of labour among nest attendants. *Emu* **97**(1): 87–90.
- Poiani, A. & Fletcher, T. (1994). Plasma levels of androgens and gonadal development of breeders and helpers in the Bell Miner (*Manorina melanophrys*). *Behav. Ecol. Sociobiol.* **34**: 31–41.
- Poiani, A. & Jermin, L.S. (1994). A comparative analysis of some life-history traits between cooperatively and non-cooperatively breeding Australian passerines. *Evol. Ecol.* **8**(5): 471–488.
- Poiani, A. & Yorke, M. (1989). Predator harassment: more evidence on the deadly risk. *Ethology* **83**(2): 167–169.
- Poiani, A., Rogers, A., Rogers, K. & Rogers, D. (1990). Asymmetrical competition between the Bell Miner (*Manorina melanophrys*, Meliphagidae) and other honeyeaters: evidence from southeastern Victoria, Australia. *Oecologia (Berlin)* **85**(2): 250–256.
- Polanen Petel, T. von & Lill, A. (2004). Bird communities of some urban bushland fragments: implications for conservation. *Austr. Field Orn.* **21**(1): 21–32.
- Pöldmaa, T. & Holder, K. (1997). Behavioural correlates of monogamy in the Noisy Miner, *Manorina melanoccephala*. *Anim. Behav.* **54**(3): 571–578.
- Pöldmaa, T., Montgomerie, R. & Boag, P.T. (1995). Mating system of the cooperatively breeding Noisy Miner *Manorina melanoccephala* as revealed by DNA profiling. *Behav. Ecol. Sociobiol.* **37**: 137–143.
- Pollard, C.J.W. (2001). Shelley's Sunbird in north-western Zimbabwe. *Honeyguide* **47**: 193–194.
- duPont, J.E. (1971a). Notes on Philippine birds (No. 1). *Nemouria* **3**: 1–6.
- duPont, J.E. (1971b). *Philippine Birds*. Monograph Series 2. Delaware Museum of Natural History, Greenville, Delaware.
- duPont, J.E. (1976). *South Pacific Birds*. Monograph Series 3. Delaware Museum of Natural History, Greenville, Delaware.
- duPont, J.E. & Rabor, D.S. (1973a). South Sulu Archipelago birds – an expedition report. *Nemouria* **9**: 1–63.
- duPont, J.E. & Rabor, D.S. (1973b). Birds of Dinagat and Siargao, Philippines: an expedition report. *Nemouria* **10**: 1–111.
- Poole, L.D. (1992). *Reproductive Success and Nesting Habitat of Loggerhead Shrikes in Shrub Steppe Communities*. MSc thesis, Oregon State University, Corvallis, Oregon.
- Portenko, L.A. (1954). *Pititsy SSSR. [The Birds of the USSR]*. Part 3. Akademiya nauk SSSR, Moscow & Leningrad [St. Petersburg]. In Russian.
- Portenko, L.A. (1955). Obzor form palearkticheskikh remezov (*Remiz pendulinus* (L.)) i ikh taksonomicheskaya otsenka. [An overview of the Palearctic forms of Penduline-tits *Remiz pendulinus* (L.) and their taxonomic evaluation]. *Trudy Zool. Inst. Akad. Nauk SSSR* **18**: 459–492. In Russian.
- Portenko, L.A. & Stübs, J. (1977). *Certhia familiaris* L. 6th instalment in: Dathe, H. & Neufeldt, I.A. eds. (1977). *Atlas der Verbreitung paläarktischer Vögel*. Akademie-Verlag, Berlin. In German.
- Portenko, L.A. & Vietinghoff-Scheel, E. von (1974). *Tichodroma muraria* (L.). 4th instalment in: Stresemann, E., Portenko, L.A., Dathe, H. & Mauersberger, G. eds. (1974). *Atlas der Verbreitung paläarktischer Vögel*. Akademie-Verlag, Berlin. In German.
- Portenko, L.A. & Wunderlich, K. (1980). *Certhia himalayana* Vigors. 9th instalment in: Dathe, H. & Neufeldt, I.A. eds. (1980). *Atlas der Verbreitung paläarktischer Vögel*. Akademie-Verlag, Berlin. In German.
- Porter, D.K., Strong, M.A., Giezantanner, J.B. & Ryder, R.A. (1975). Nest ecology, productivity, and growth of the Loggerhead Shrike on the shortgrass prairie. *Southwest. Nat.* **19**: 429–436.
- Porter, J.W. (1982). *Terrestrial Birds of the Coastal Lowlands of South-east Queensland*. Technical Paper 30. Queensland Department of Forestry, Brisbane, Queensland.
- Porter, J.W. & Henderson, R. (1983). Birds and burning histories of open forest at Gundiah, south eastern Queensland. *Sunbird* **13**(4): 61–68.
- Porter, R.F. & Martins, R.P. (1993). OSME in southern Yemen and Socotra. *Bull. Orn. Soc. Middle East* **31**: 1–4.
- Porter, R.F., Christensen, S. & Schiermacker-Hansen, P. (1996). *Field Guide to the Birds of the Middle East*. T&A Poyser, London.
- Porter, R.N. (1975). Spider feeding on a Cape White-eye. *Limnology* **22**: 49.
- Porter, S. (1956). Nesting of Malachite Sunbird. *Avicult. Mag.* **62**: 46–53.
- Possingham, M.L. & Possingham, H.P. (1997). Habitat use and abundance of dryland birds in heritage areas in the upper south east of South Australia. *South Austr. Orn.* **32**: 145–160.
- Potapov, R.L. (1966). Pititsy Pamira. [The birds of the Pamirs]. Pp. 3–119 in: Ivanov, A.I. ed. (1966). *Biologiya Pitits [Biology of Birds]*. Trudy Zoologicheskogo instituta akademii nauk SSSR **39**. Nauka, Moscow & Leningrad [St. Petersburg]. In Russian.
- Potter, N.S. (1953). The birds of Calicoan, Philippine islands. *Wilson Bull.* **65**: 252–270.
- Poulin, R.G., Wellcome, T.I. & Todd, L.D. (2001). Synchronous and delayed numerical responses of a predatory bird community to a vole outbreak on the Canadian prairies. *J. Raptor Res.* **35**: 288–295.
- Poulsen, H. (1956). A study of anting behaviour in birds. *Dansk Orn. Foren. Tidsskr.* **50**: 267–298.
- Poulsen, M.K. (1995). The threatened and near-threatened birds of Luzon, Philippines, and the role of the Sierra Madre mountains in their conservation. *Bird Conserv. Int.* **5**: 79–115.
- Poulsen, M.K. & Lambert, F.R. (2000). Altitudinal distribution and habitat preferences of forest birds on Halmahera and Buru, Indonesia: implications for conservation of Moluccan avifaunas. *Ibis* **142**(4): 566–586.
- Poulsen, M.K., Lambert, F.R. & Cahyadi, Y. (1999). *Evaluation of the Proposed Lalobata and Ake Tajawe National Park*. Report 6. Perlindungan dan Konservasi Alam (PKA) & BirdLife International – Indonesia Programme, Bogor, Indonesia.
- Powell, B.F. & Steidl, R.J. (2002). Habitat selection by riparian songbirds breeding in southern Arizona. *J. Wildl. Management* **66**(4): 1096–1103.
- Pranty, B. (1995). Tool use by Brown-headed Nuthatches in two Florida slash pine forests. *Florida Field Nat.* **23**(2): 33–34.
- Pratt, E. (1971). Migration movement dates – Murwillumbah district. *Sunbird* **2**(3): 59–60.
- Pratt, E. (1978). Birds bathing behaviour. *Sunbird* **9**: 15.
- Pratt, H.D., Bruner, P.L. & Berrett, D.G. (1977). Ornithological observations on Yap, western Caroline Islands. *Micronesica* **13**: 49–56.
- Pratt, H.D., Bruner, P.L. & Berrett, D.G. (1979). America's unknown avifauna: the birds of the Mariana Islands. *Amer. Birds* **33**: 227–235.
- Pratt, H.D., Bruner, P.L. & Berrett, D.G. (1987). *A Field Guide to the Birds of Hawaii and the Tropical Pacific*. Princeton University Press, Princeton, New Jersey.
- Pratt, H.D., Engbring, J., Bruner, P.L. & Berrett, D.G. (1980). Notes on the taxonomy, natural history, and status of the resident birds of Palau. *Condor* **82**: 117–131.
- Pratt, T.K. (1982). Additions to the avifauna of the Adelbert Range, Papua New Guinea. *Emu* **82**(3): 117–125.
- Pratt, T.K. (1984). Examples of tropical frugivores defending fruit-bearing plants. *Condor* **86**: 123–129.
- Pravosudov, V.V. (1991). Growth and development of the Nuthatch nestlings (*Sitta europaea asiatica*). *Trudy Zool. Inst. (St. Petersburg)* **231**: 159–173.
- Pravosudov, V.V. (1993a). Breeding biology of the Eurasian Nuthatch in northeastern Siberia. *Wilson Bull.* **105**(3): 475–482.
- Pravosudov, V.V. (1993b). Social organisation of the Nuthatch *Sitta europaea asiatica*. *Ornis Scand.* **24**(4): 290–296.
- Pravosudov, V.V. & Grubb, T.C. (1993). White-breasted Nuthatch *Sitta carolinensis*. No. 54 in: Poole, A. & Gill, F. eds. (1993). *The Birds of North America*. Vol. 2. The American Ornithologists' Union & The Academy of Natural Sciences of Philadelphia, Philadelphia, Pennsylvania.

- Prendergast, H.D.V. (1983). Competition for nectar between sunbirds and butterflies. *Malimbus* **5**: 51–53.
- Prendergast, H.D.V. (1984). Feeding times of honeyeaters on *Banksia ericifolia* inflorescences. *Corella* **8**(4): 83–88.
- Prendergast, H.D.V. (1987). Notes on bill-snapping in Australian birds. *Canberra Bird Notes* **12**(3): 86–89.
- Prescott, D.R. & Collier, D.M. (1993). Characteristics of occupied and unoccupied Loggerhead Shrike territories in Southern Alberta. *J. Wildl. Management* **57**: 346–352.
- Price, G. (1977). Birdlist of Cheltenham Park, Victoria. *Bird Watcher* **7**(4): 134–136.
- Price, O.F. (2006). Movements of frugivorous birds among fragmented rainforests in the Northern Territory, Australia. *Wildl. Res.* **33**(6): 521–528.
- Price, O.F., Woinarski, J.C.Z. & Robinson, D. (1999). Very large area requirements for frugivorous birds in monsoon rainforests of the Northern Territory, Australia. *Biol. Conserv.* **91**(2/3): 169–180.
- Price, T.D. (1979). The seasonality and occurrence of birds in the Eastern Ghats of Andhra Pradesh. *J. Bombay Nat. Hist. Soc.* **76**: 379–422.
- Prieme, A. & Heegaard, M. (1988). A visit to Gunung Nyiut in West Kalimantan. *Kukila* **3**(3/4): 138–140.
- Priest, C.D. (1936). *The Birds of Southern Rhodesia*. Vol. 4. William Clowes and Sons, London & Beccles.
- Priest, C.D. (1938). The breeding habits of the Violet-backed Sunbird *A. longuemarei* nyassa, Neumann. *Ostrich* **9**: 99.
- Prigogine, A. (1952). Quatre nouveaux oiseaux du Congo belge. *Rev. Zool. Bot. Afr.* **46**: 407–415. In French.
- Prigogine, A. (1971). Les oiseaux de l'Itombwe et de son hinterland. Part 1. *Mus. Roy. Afr. Centr. Ann.* **185**: 1–298. In French.
- Prigogine, A. (1972). Nids et oeufs récolté au Kivu. Part 2. République du Zaïre. *Rev. Zool. Afr.* **85**(3/4): 203–226. In French.
- Prigogine, A. (1975). Étude taxonomique de *Nectarinia alinae* et description de trois nouvelles formes de la République du Zaïre. *Rev. Zool. Afr.* **89**(2): 455–480. In French.
- Prigogine, A. (1977). Populations of the Scarlet-tufted Malachite Sunbird, *Nectarinia johnstoni* Shelley, in Central Africa and description of a new subspecies from the Republic of Zaïre. *Mitt. Zool. Mus. Berlin* **53**: 117–125.
- Prigogine, A. (1978a). Le statut du Lorient de Percival, *Oriolus percivali*, et son hybridation avec *Oriolus larvatus* dans l'est africain. *Gerfaut* **68**(3): 253–320. In French with English and Flemish summaries.
- Prigogine, A. (1978b). Les oiseaux de l'Itombwe et de son hinterland. Part 2. *Mus. Roy. Afr. Centr. Ann.* **223**: 1–134. In French.
- Prigogine, A. (1979). Subspecific variation of Stuhlmann's Double-collared Sunbird, *Nectarinia stuhlmanni*, around the Albertine Rift. *Gerfaut* **69**: 225–238.
- Prigogine, A. (1984). Les oiseaux de l'Itombwe et de son hinterland. Part 3. *Mus. Roy. Afr. Centr. Ann.* **243**: 1–146. In French.
- Prinzinger, R. & Jackel, S. (1986). Energy metabolism, respiration frequency and oxygen-consumption per breathing act in 11 different sunbird species during day and night. *Experientia* **42**(9): 1002–1003.
- Prinzinger, R., Lübben, I. & Schuchmann, K.L. (1989). Energy metabolism and body temperature in 13 sunbird species (Nectariniidae). *Comp. Biochem. Physiol.* **92A**: 393–402.
- Prinzinger, R., Schäfer, T., Schuchmann, K.L. (1992). Energy metabolism, respiratory quotient and breathing parameters in two convergent small bird species: the Fork-tailed Sunbird *Aethopyga christinae* (Nectariniidae) and the Chilean Hummingbird *Sephanoides sephanoides* (Trochilidae). *J. Therm. Biol.* **17**(2): 71–79.
- Probst, R. (2001). Successful bigamy in the Great Grey Shrike *Lanius e. excubitor*. *Ornis Fenn.* **78**: 93–96.
- Probst, R. (2002). Great Grey Shrike feeding on carrion. *British Birds* **95**(1): 25.
- Probst, R., Pavlicev, M. & Viitala, J. (2002). UV reflecting vole scent marks attract a passerine, the Great Grey Shrike *Lanius excubitor*. *J. Avian Biol.* **33**: 437–440.
- Prokop, P. (1982). Golden Orioles feeding on the ground. *British Birds* **75**: 185.
- Pruitt, L. (2000). *Loggerhead Shrike Status Assessment*. US Fish and Wildlife Service, Fort Snelling, Minnesota.
- Prys-Jones, R.P. (1985). Movements, mortality and the annual cycle of white-eyes in Southern Africa. *Safring News* **14**: 25–35.
- Prys-Jones, R.P. & Diamond, A.W. (1984). Ecology of the land birds of the granitic and coralline islands of the Seychelles, with particular reference to Cousin Island and Aldabra Atoll. Pp. 529–558 in: Stoddart (1984).
- Psenner, H. (1984). Wall creepers. Pp. 323–324 in: Grzimek et al. (1984).
- Psenner, H. & Thaler-Kottke, E. (1969). Über Pflege und Haltung des Mauerläufers, *Tichodroma muraria* L. *Zool. Garten* **36**: 216–224. In German.
- Pucheran, J. (1853). Zoologie 3 (Mammifères et Oiseaux). Pp. 47–158 in: Hombron, J.B. & Jacquinot, C.H. eds. (1853). *Voyage au Pôle Sud et dans l'Océanie sur les Corvettes l'Astrolabe et la Zélée. Exécuté [...] pendant les Années 1837–1840, sous le Commandement de M. J. Dumont d'Urville*. Gide et Baudry, Paris. In French.
- Puckey, H.L., Lill, A. & O'Dowd, D.J. (1996). Fruit color choices of captive Silvereyes (*Zosterops lateralis*). *Condor* **98**: 780–790.
- Pui Lok, C.B., Lee Kwok Shing, Zhang Jianfeng & Su Wenba (2005). Notable bird records from Bangwangling National Nature Reserve, Hainan Island, China. *Forktail* **21**: 33–41.
- Purchase, D. (1985). Bird-banding and the migration of Yellow-faced and White-naped Honeyeaters through the Australian Capital Territory. *Corella* **9**(2): 59–62.
- Purroy Irazoz, F.J. (1997). *Atlas de las Aves de España (1975–1995)*. Sociedad Española de Ornitología & Lynx Ediciones, Barcelona. In Spanish.
- Pyke, G.H. (1979). The economics of territory size and time budget in the Golden-winged Sunbird. *Amer. Naturalist* **114**: 131–145.
- Pyke, G.H. (1980). The foraging behaviour of Australian honeyeaters: a review and some comparisons with hummingbirds. *Austr. J. Ecol.* **5**(4): 343–369.
- Pyke, G.H. (1981a). Why hummingbirds hover and honeyeaters perch. *Anim. Behav.* **29**(3): 861–867.
- Pyke, G.H. (1981b). Honeyeater foraging: a test of optimal foraging theory. *Anim. Behav.* **29**(3): 878–888.
- Pyke, G.H. (1983). Seasonal pattern of abundance of honeyeaters and their resources in heathland areas near Sydney. *Austr. J. Ecol.* **8**(3): 217–233.
- Pyke, G.H. (1985). The relationships between abundances of honeyeaters and their food resources in open forest areas near Sydney. Pp. 65–77 in: Keast et al. (1985).
- Pyke, G.H. (1988). Yearly variation in seasonal patterns of honeyeater abundance, flower density and nectar production in heathland near Sydney. *Austr. J. Ecol.* **13**(1): 1–10.
- Pyke, G.H. (1989). Effects of flower removal on abundance and behaviour of honeyeaters in heathland near Sydney. *Austr. J. Ecol.* **14**(4): 415–421.
- Pyke, G.H. (1995). A choice of methods for estimating sexes of birds using morphometric measurements: a reply to Rogers and Rogers (1995). *Corella* **19**(1): 18–23.
- Pyke, G.H. & Armstrong, D.P. (1993). Estimating sexes of New Holland and White-cheeked Honeyeaters from head-bill measurements. *Corella* **17**(2): 43–46.
- Pyke, G.H. & O'Connor, P.J. (1989). Corroboree behaviour of New Holland and White-cheeked Honeyeaters. *Emu* **89**(1): 55–57.
- Pyke, G.H. & O'Connor, P.J. (1993). Use of heathland and adjoining forest by honeyeaters: results of a radiotracking study. *Austr. J. Ecol.* **18**(3): 269–274.
- Pyke, G.H. & Recher, H.F. (1986). Relationship between nectar production and seasonal patterns of density and nesting of resident honeyeaters in heathland near Sydney. *Austr. J. Ecol.* **11**(2): 195–200.
- Pyke, G.H. & Recher, H.F. (1988). Seasonal patterns of capture rate and resource abundance for honeyeaters and Silvereyes in heathland near Sydney. *Emu* **88**(1): 33–42.
- Pyke, G.H., Christy, M. & Major, R.E. (1996). Territoriality in honeyeaters: reviewing the concept and evaluating available information. *Austr. J. Zool.* **44**(3): 297–317.
- Pyke, G.H., O'Connor, P.J. & Recher, H.F. (1993). Relationship between nectar production and yearly and spatial variation in density and nesting of resident honeyeaters in heathland near Sydney. *Austr. J. Ecol.* **18**(2): 221–229.
- Pyke, G.H., Recher, H.F. & O'Connor, P.J. (1989). Patterns of residency and movement among honeyeaters in heathland near Sydney. *Emu* **89**(1): 30–39.
- Pyle, P. (1997). *Identification Guide to North American Birds: a Compendium of Information on Identifying, Ageing, and Sexing "Near-passerines" and Passerines in the Hand*. Part 1. Slate Creek Press, Bolinas, California.
- Pyle, P. & Engbring, J. (1988). First described nest and nest-site activity of the Truk Greater White-eye (*Rukia rukia*). *Micronesica* **21**: 281–283.
- Quaglierini, A. (2001). Nidificazione di Pendolino *Remiz pendulinus* su canna domestica *Arundo donax*. *Picus* **27**(2): 99–101. In Italian with English summary.
- Quaiser, C. & Dekker, R.W.R.J. (2006). Systematic notes on Asian birds. 67. Taxonomic identity and lectotype designation of *Sitta velata* Temminck, 1821. *Zool. Meded. Leiden* **80**(5): 311–314.
- Quantrill, B. & Quantrill, R. (1998). The birds of the Parours Vita, Yaoundé, Cameroon. *Malimbus* **20**: 1–14.
- Quin, B.R. & Reid, A.J. (1996). The Turquoise Parrot *Neophema pulchella* in the Yea and Yarra River Valleys, central southern Victoria. *Austr. Bird Watcher* **16**(6): 250–254.
- Quin, D.G. (1998). Birds of certain bore drains of Lake Eyre region, South Australia. Report for Kinhill, Melbourne, Victoria. Unpubl.
- Quin, D.G. & Briggs, S.V. (1995). Birds. Pp. 91–111 in: Jenkins, K.M. & Briggs, S.V. eds. (1995). *Ecological Management of Lakebed Cropping on the Lakes of the Great Anabranch of the Darling River*. Final report for Australian Nature Conservation Agency. New South Wales National Parks and Wildlife Service & CSIRO Wildlife and Ecology, Sydney & Canberra.
- Rabbitts, B. & Vinicombe, K.E. (1978). Wallcreeper wintering in Somerset. *Bristol Orn.* **11**: 17–20.
- Rabel, J. (1993). The orientation system of long-distance passerine migrants displaced in autumn from Denmark to Kenya. *Ornis Scand.* **24**: 183–196.
- Rabor, D.S. (1936). Life histories of some common birds in the vicinity of Novaliches, Rizal province, Luzon—the Large-nosed Shrike, *Lanius schach nasutus* (Scopoli). *Philippine J. Sci.* **59**(3): 337–352, plate 1.
- Rabor, D.S. (1938). Birds from Leyte. *Philippine J. Sci.* **66**: 15–34.
- Rabor, D.S. (1977). *Philippine Birds and Mammals*. University of the Philippines Science Education Center, Quezon City, Philippines.
- Radermacher, W. (1967). Nach Schwalbenart badender Pirol (*Oriolus oriolus*). *Orn. Mitt.* **19**: 126. In German.
- Radicke, F.L. (1985). *Der Indische Brillenvogel*. Die Neue Brehm-Bücherei **572**. Ziemsen, Wittenberg Lutherstadt, Germany. In German.
- Ragless, G.B. (1985). Exotic plants used by Yellow-faced Honeyeaters for nest sites. *South Austr. Orn.* **29**(8): 211.
- Rahman, M.M., Baksha, M.W. & Sterringa, J.T. (1993). Ethological observations on the Purple Sunbird (*Nectarinia asiatica* Latham): a mistletoe-frequenting bird. *Indian Forester* **119**: 388–403.
- Rahmani, A.R., Shobrak, M.Y. & Newton, S.F. (1994). Birds of the Tihamah coastal plains of Saudi Arabia. *Bull. Orn. Soc. Middle East* **32**: 1–19.
- Raijmakers, K. (1999). Sexing of the Cape White-eye *Zosterops pallidus*. *Safring News* **28**(1/2): 29–30.
- Raitt, R.J. (1967). Relationships between black-eared and plain-eared forms of Bushitis (*Psaltirparus*). *Auk* **84**(4): 503–528.
- Raja, N.A., Davidson, P., Bean, N., Drijvers, R., Showler, D.A. & Barker, C. (1999). The birds of Palas, North-West Frontier Province, Pakistan. *Forktail* **15**: 77–85.
- Rajathurai, S. (1996). The birds of Batam and Bintan Islands, Riau Archipelago. *Kukila* **8**: 86–113.
- Raju, A.J.S. (1998). Foraging of sunbirds on some plant species of sub-tropical India. Page 375 in: Adams, N.J. & Slotow, R.H. eds. (1998). *Proceedings of the 22nd International Ornithological Congress Held in Durban, South Africa, 1998 "Making Rain for African Ornithology"*. *Ostrich* **69**(1/2). BirdLife South Africa, Durban & Cape Town.
- Raju, A.J.S. (2001). Interaction between *Acanthus* and sunbirds at Coringa in Andhra Pradesh. *J. Bombay Nat. Hist. Soc.* **98**(2): 316–317.
- Raju, A.J.S. & Reddi, C.S. (1989). Pollination biology of *Anisomeles indica* and *A. malabarica* (Lamiaceae). *Plant Species Biol.* **4**: 157–167.
- Ralph, C.J. & Noon, B.R. (1988). Foraging interactions of small Hawaiian forest birds. Pp. 1992–2006 in: Ouellet, H. ed. (1988). *Acta XIX Congressus Internationalis Ornithologici*. Vol. 2. University of Ottawa Press, Ottawa, Canada.
- Ramadan-Jaradi, G. & Ramadan-Jaradi, M. (1999). An updated checklist of the birds of Lebanon. *Sandgrouse* **21**(2): 132–170.
- Ramadan-Jaradi, G., Bara, T. & Ramadan-Jaradi, M. (2008). Revised checklist of the birds of Lebanon 1999–2007. *Sandgrouse* **30**(1): 22–69.
- Ramsay, M.W. (1989). The seasonal abundance and foraging behaviour of honeyeaters and their potential role in the pollination of *Banksia menziesii*. *Austr. J. Ecol.* **14**(1): 33–40.
- Rand, A.L. (1936a). Results of the Archbold Expeditions. No. 11. *Meliphaga analoga* and its allies. *Amer. Mus. Novit.* **872**: 1–23.
- Rand, A.L. (1936b). Results of the Archbold Expeditions. No. 12. Altitudinal variation in New Guinea birds. *Amer. Mus. Novit.* **890**: 1–14.
- Rand, A.L. (1936c). The distribution and habits of Madagascar birds. *Bull. Amer. Mus. Nat. Hist.* **62**: 143–499.
- Rand, A.L. (1938). Results of the Archbold Expeditions. No. 20. On some passerine New Guinea birds. *Amer. Mus. Novit.* **991**: 1–20.
- Rand, A.L. (1940a). Results of the Archbold Expeditions. No. 25. New birds from the 1938–1939 expedition. *Amer. Mus. Novit.* **1072**: 1–14.
- Rand, A.L. (1940b). Result of the Archbold Expeditions. No. 26. Breeding habits of the birds of paradise: *Macgregoria* and *Diphylloides*. *Amer. Mus. Novit.* **1073**: 1–14.
- Rand, A.L. (1941). Results of the Archbold Expeditions. No. 32. New and interesting birds from New Guinea. *Amer. Mus. Novit.* **1102**: 1–15.
- Rand, A.L. (1942a). Results of the Archbold Expeditions. No. 42. Birds of the 1936–1937 New Guinea Expedition. *Bull. Amer. Mus. Nat. Hist.* **79**(4): 289–366.
- Rand, A.L. (1942b). Results of the Archbold Expeditions. No. 43. Birds of the 1938–1939 New Guinea Expedition. *Bull. Amer. Mus. Nat. Hist.* **79**(7): 425–516.
- Rand, A.L. (1948). Five new birds from the Philippines. *Fieldiana Zool.* **31**(25): 201–205.
- Rand, A.L. (1950a). A new race of the Philippine Creeper, *Rhabdornis inornatus* (Class Aves). *Nat. Hist. Misc. (Chicago)* **59**: 1–3.
- Rand, A.L. (1950b). Three rare Philippine birds. *Nat. Hist. Misc. (Chicago)* **60**: 1–5.
- Rand, A.L. (1951a). Birds of Negros island. *Fieldiana Zool.* **31**(48): 571–596.
- Rand, A.L. (1951b). Review of the subspecies of the sunbird *Nectarinia jugularis*. *Fieldiana Zool.* **31**(49): 597–607.
- Rand, A.L. (1959). Birds from Gabon and Moyen Congo. *Fieldiana Zool.* **41**(2): 219–411.
- Rand, A.L. (1960). Family Laniidae, shrikes and allies. Pp. 309–365 in: Mayr, E. & Greenway, J.C. eds. (1960). *Check-list of Birds of the World. A Continuation of the Work of James L. Peters*. Vol. 9. Museum of Comparative Zoology, Cambridge, Massachusetts.
- Rand, A.L. (1961). The tongue and nest of certain flowerpeckers (Aves: Dicaeidae) *Fieldiana Zool.* **39**: 581–587.
- Rand, A.L. (1967a). The flower-adapted tongue of a Timaliinae bird and its implications. *Fieldiana Zool.* **51**(3): 53–63.

- Rand, A.L. (1967b). Nectariniidae, sunbirds. Pp. 208–289 in: Paynter (1967).
- Rand, A.L. (1970). An annotated list of Philippine birds. Unpubl. 511 pp.
- Rand, A.L. & Fleming, R.L. (1957). Birds from Nepal. *Fieldiana Zool.* **41**(1): 1–218.
- Rand, A.L. & Gilliard, E.T. (1967). *Handbook of New Guinea Birds*. Weidenfeld and Nicolson, London.
- Rand, A.L. & Rabor, D.S. (1957). Philippine Zoological Expedition 1946–1947. New birds from the Philippines. *Fieldiana Zool.* **42**(2): 13–18.
- Rand, A.L. & Rabor, D.S. (1958). The races of the shrike *Lanius validirostris*. *Fieldiana Zool.* **39**(11): 85–86.
- Rand, A.L. & Rabor, D.S. (1960). Birds of the Philippine islands: Siquijor, Mount Malindang, Bohol, and Samar. *Fieldiana Zool.* **35**(7): 221–441.
- Rand, A.L. & Rabor, D.S. (1967). New birds from Luzon, Philippine islands. *Fieldiana Zool.* **51**: 85–89.
- Rand, A.L. & Rabor, D.S. (1969). New birds from Camiguin South, Philippines. *Fieldiana Zool.* **51**(13): 157–168.
- Rand, A.L. & Traylor, M.A. (1959). Three new birds from West Africa. *Fieldiana Zool.* **39**(25): 269–273.
- Rand, A.L., Friedmann, H. & Traylor, M.A. (1959). Birds from Gabon and Moyen Congo. *Fieldiana Zool.* **41**(2): 219–411.
- Randall, R.D. (1994). The Spotted Creeper *Salpornis spilonotus* new to Botswana. *Babbler (Botswana)* **28**: 38.
- Rasch, G. (1985). *The Behavioural Ecology and Management of the Stitchbird*. MSc thesis, University of Auckland, Auckland, New Zealand.
- Rashkevich, N.A. (1956). On the ecology of *Lanius minor* in the forest plantations in the Salsk steppe. *Zoologicheskii Zhurnal* **35**: 1379–1383. In Russian with English summary.
- Rasmussen, P.C. & Anderton, J.C. (2005a). *Birds of South Asia. The Ripley Guide*, Vol. 1. Field guide. Smithsonian Institution & Lynx Edicions, Washington, D.C. & Barcelona.
- Rasmussen, P.C. & Anderton, J.C. (2005b). *Birds of South Asia. The Ripley Guide*, Vol. 2. Attributes and status. Smithsonian Institution & Lynx Edicions, Washington, D.C. & Barcelona.
- Rasmussen, P.C., Wardill, J.C., Lambert, F.R. & Riley, J. (2000). On the specific status of the Sangihe White-eye *Zosterops nehrkorni*, and the taxonomy of the Black-crowned White-eye *Z. atrifrons* complex. *Forktail* **16**: 69–81.
- Ratkowsky, A.V. (1979). The bird species of Mt Nelson in relation to microhabitat and recent bushfires. *Tasmanian Nat.* **57**: 12–18.
- Ratkowsky, A.V. (1983). Birds of the Mt. Wellington bush. *Tasmanian Bird Rep.* **12**: 18–21.
- Ratkowsky, A.V. (1984). The birds of Snake Plains, a sandstone outcropping on Mt. Wellington. *Tasmanian Nat.* **77**: 8.
- Ratkowsky, A.V. (1985). The effect of a severe fire on the number of bird species in a wet sclerophyll environment. *Tasmanian Nat.* **80**: 8–9.
- Ratkowsky, A.V. (1993a). The birds of the Carr Villa cemetery, Launceston. *Tasmanian Nat.* **113**: 7–8.
- Ratkowsky, A.V. (1993b). Birds of some Launceston reserves. *Tasmanian Bird Rep.* **22**: 15–22.
- Ratkowsky, A.V. & Ratkowsky, D.A. (1977). The birds of the Mt Wellington Range, Tasmania. *Emu* **77**(1): 19–22.
- Ratkowsky, A.V. & Ratkowsky, D.A. (1978). A survey of the birds of the Mt Wellington Range, Tasmania, during the non-breeding months. *Emu* **78**(4): 223–226.
- Ratkowsky, A.V. & Ratkowsky, D.A. (1980). A survey of the birds of two areas of sclerophyll bushland in southern Tasmania. *Emu* **80**(3): 169–170.
- Rauls, W. (1953). Pirol frißt Kartoffelfeldfrü. *Orn. Mitt.* **5**: 188. In German.
- Rawat, M. & Dookia, S. (2007). Unusual nesting of Purple Sunbird *Nectarinia asiatica* in Jodhpur, Rajasthan, India. *Birding Asia* **7**: 11.
- Reade, W. & Hosking, E.J. (1967). *Nesting Birds: Eggs and Fledglings*. Blandford Press, London.
- de Rebeira, C.P. & de Rebeira, S. (1977). Birds. Pp. 77–96 in: Kenneally, K.F. ed. (1977). *The Natural History of the Wongan Hills*. Handbook **11**. Western Australian Naturalists' Club, Perth, Western Australia.
- de Rebeira, P. & Congreve, P. (1982). Bird banding at Eyre. Pp. 20–27 in: Anon. (1982). *Eyre Bird Observatory Report 1979–1981*. RAOU Report 3. Royal Australasian Ornithologists Union, Melbourne, Victoria.
- Rebello, A.G. (1987a). Bird pollination in the Cape flora. Pp. 83–108 in: Rebello, A.G. ed. (1987). *A Preliminary Synthesis of Pollination Biology in the Cape Flora*. South African National Scientific Programmes Report **141**. National Committee for Ecosystem Research, Committee for Terrestrial Ecosystems & Council for Scientific and Industrial Research, Pretoria.
- Rebello, A.G. (1987b). Sunbird feeding at *Satyrium odorum* Sond. flowers. *Ostrich* **58**(4): 185–186.
- Rebello, A.G. (1987c). Visits to *Oldenburgia grandis* (Thunb.) Baillon (Asteraceae) by the Cape Sugarbird *Promerops cafer*. *Ostrich* **58**(4): 186–187.
- Rebello, A.G. (1991). Community organisation of sunbirds in the Afro-tropical region. Pp. 1180–1187 in: Bell, B.D., Cossee, R.O., Flux, J.E.C., Heather, B.D., Hitchmough, R.A., Robertson, C.J.R. & Williams, M.J. eds. (1991). *Acta XX. Congressus Internationalis Ornithologici Christchurch, New Zealand, 2–9 December 1990*. Vol. 2. New Zealand Ornithological Congress Tourist Board, Wellington, New Zealand. Pp. 645–1292.
- Recher, H.F. (1971). Sharing of habitat by three congeneric honeyeaters. *Emu* **71**(4): 147–152.
- Recher, H.F. (1975). A survey of the avifauna of Myall Lakes, NSW: report of the 1972 RAOU field-outing. *Emu* **75**(4): 213–225.
- Recher, H.F. (1977). Ecology of co-existing White-cheeked and New Holland Honeyeaters. *Emu* **77**(3): 136–142.
- Recher, H.F. (1981). Nectar-ceeding [sic] and its evolution among Australian vertebrates. Pp. 1639–1648 in: Keast, A. ed. (1981). *Ecological Biogeography of Australia*. Junk, The Hague, The Netherlands.
- Recher, H.F. (1985). Eucalypt forests, woodlands and birds: an introduction. Pp. 1–10 in: Keast et al. (1985).
- Recher, H.F. (2007). Conservation challenge of dispersive fauna. *Pacific Conserv. Biol.* **13**: 81–83.
- Recher, H.F. & Abbott, I.J. (1970a). The possible ecological significance of hawking by honeyeaters and its relation to nectar feeding. *Emu* **70**(2): 90.
- Recher, H.F. & Abbott, I.J. (1970b). Some differences in the use of habitat by White-eared and White-cheeked Honeyeaters. *Emu* **70**(3): 117–125.
- Recher, H.F. & Davis, W.E. (1988). The foraging profile of a wandoo woodland avifauna in early spring. *Austr. J. Ecol.* **23**(6): 514–527.
- Recher, H.F. & Holmes, R.T. (1985). Foraging ecology and seasonal patterns of abundance in a forest avifauna. Pp. 79–96 in: Keast et al. (1985).
- Recher, H.F., Gowing, G., Kavanagh, R., Shields, J. & Rohan-Jones, W. (1983). Birds, resources and time in a tablelands forest. *Proc. Ecol. Soc. Austr.* **12**: 101–123.
- Recher, H.F., Holmes, R.T., Schulz, M., Shields, J. & Kavanagh, R. (1985). Foraging patterns of breeding birds in eucalypt forest and woodland of south-eastern Australia. *Austr. J. Ecol.* **10**(4): 399–419.
- Recher, H.F., Kavanagh, R.P., Shields, J.M. & Lind, P. (1991). Ecological association of habitats and bird species during the breeding season in southeastern New South Wales. *Austr. J. Ecol.* **16**(3): 337–352.
- Recher, H.F., Thomas, D.G. & Milledge, D.R. (1971). Census of dry sclerophyll. *Emu* **71**(1): 40–43.
- Red'kin, Y. & Konovalova, M. (2006). Systematic notes on Asian birds. 63. The eastern Asiatic races of *Sitta europaea* Linnaeus, 1758. *Zool. Meded. Leiden* **80**(5): 241–261.
- Redman, N.J., Lambert, F.R. & Grimmett, R. (1984). Some observations of scarce birds in Nepal. *J. Bombay Nat. Hist. Soc.* **81**: 49–53.
- Reeb, F. (1977). Contribution à l'étude de l'avifaune et des migrations en Afghanistan. *Alauda* **45**: 293–333. In French.
- Reed, B.E. (1971). Near misses with van Hasselt's Sunbird. *Avicult. Mag.* **77**(1): 22–23.
- Reed, S. (1980). Birds of Savai'i, Western Samoa. *Notornis* **27**: 151–159.
- Reichel, J.D. & Glass, P.O. (1991). Checklist of the birds of the Mariana Islands. *Elepaio* **51**: 3–10.
- Reichenow, A. (1892). Zur Vogelfauna von Kamerun. *J. Orn.* **40**: 177–195. In German.
- Reichenow, A. (1899). Die Vögel der Bismarckinseln. *Mitt. Zool. Mus. Berlin* **1**: 1–106. In German.
- Reichenow, A. (1903). *Die Vögel Afrikas*. Vol. 2(2). J. Neumann, Neudamm, Germany. In German.
- Reichenow, A. (1915). Neue Arten. *J. Orn.* **63**: 124–129. In German.
- Reichhoff, J. (1977). Federzahl und Mauserverlauf bei einer gekäfigten Braunkopf-Schwanzmeise (*Aegithalos concinnus*). *Orn. Mitt.* **29**(10): 203–205. In German.
- Reid, J.R.W., Brissenden, P., Puckridge, J.T., Carpenter, G.A. & Paton, P. (1997). Comments on the distribution of five bird species in the Flinders Ranges: some new data and a reappraisal of historical records. *South Austr. Orn.* **32**(1): 113–118.
- Reid, N. (1983). Seasonal occurrence of the Mistletoebird in the inner north-eastern suburbs of Adelaide. *South Austr. Orn.* **29**(3): 60–63.
- Reid, N. (1987). The Mistletoebird and Australian mistletoes: co-evolution or coincidence? *Emu* **87**(2): 130–131.
- Reid, N. (1989). Dispersal of mistletoes by honeyeaters and flowerpeckers: components of seed dispersal quality. *Ecology* **70**(1): 137–145.
- Reid, N. (1990). Mutualistic interdependence between mistletoes (*Amyema quandang*), and Spiny-cheeked Honeyeaters and Mistletoebirds in an arid woodland. *Austr. J. Ecol.* **15**(2): 175–190.
- Reid, N. (1997). Behaviour, voice and breeding of the Mistletoebird *Dicaeum hirundinaceum* in arid woodland. *Victorian Naturalist* **114**(3): 135–142.
- Reid, N. & Cox, J.B. (1981). The Eastern Striated Pardalote *Pardalotus striatus ornatus* in the south-east of South Australia. *South Austr. Orn.* **28**(6): 154–155.
- Reid, W.H. & Fulbright, H.J. (1981). Impaled prey of the Loggerhead Shrike in the northern Chihuahuan Desert. *Southwest. Nat.* **26**: 204–205.
- Reilly, P. (1991a). The effect of wildfire on bush bird populations in six Victorian coastal habitats. *Corella* **15**(5): 134–142.
- Reilly, P. (1991b). The effect of wildfire on bird populations in a Victorian coastal habitat. *Emu* **91**(2): 100–106.
- Reinhardt, H. (1986). Beutesuchflug eines Pirol (*Oriolus oriolus*) Männchens im offenen Gelände. *Orn. Mitt.* **38**: 259. In German.
- Reino, L. (2005). *O Picaço-de-dorso-ruivo*. [The Red-backed Shrike]. Património Natural Transmontano. J. Azevedo, Mirandela, Portugal. 104 pp. In Portuguese.
- Reinsch, A. (1958). Einige bemerkenswerte Vogelbeobachtungen in Mittelfranken. *Orn. Mitt.* **10**: 69–71. In German.
- Reinsch, A. (1959a). Beobachtungen am Nest des Pirols (*Oriolus oriolus*). *Vogelwelt* **80**: 149–156. In German.
- Reinsch, A. (1959b). Ornithologische Beobachtungen aus Mittelfranken und Thüringen. *Orn. Mitt.* **11**: 133–134. In German.
- Reinsch, A. (1961). Rivalenkämpfe des Pirols (*Oriolus oriolus*). *Vogelwelt* **82**: 107–108. In German.
- Reinsch, A. & Warnecke, K. (1971). Zur Brutbiologie des Pirols (*Oriolus oriolus*). *Vogelwelt* **92**: 121–141. In German.
- Reinsch, H.H. (1984). Orioles. Pp. 476–477 in: Grzimek et al. (1984).
- Reis, K.R. & Garong, A.M. (2001). Late Quaternary terrestrial vertebrates from Palawan Island, Philippines. *Palaeogeogr. Palaeoclimatol. Palaeoecol.* **171**: 409–421.
- Rensch, B. (1928). Neue Vogelrassen von den Kleinen Sunda-Inseln. [Part 3]. *Orn. Monatsber.* **36**(3): 80–81. In German.
- Rensch, B. (1929). Beitrag zur Kenntnis der Vogelwelt der Inseln Alor und Lomblen. *J. Orn.* **77** (Suppl. 2): 197–207. In German.
- Rensch, B. (1931a). Die Vogelwelt von Lombok, Sumbawa und Flores. *Mitt. Zool. Mus. Berlin* **17**(4): 451–637. In German.
- Rensch, B. (1931b). Ueber einige Vogelsammlungen des Buitenzorgers Museums von den Kleinen Sunda-Inseln. *Treubia* **13**(3/4): 371–400. In German.
- Reynolds, T.D. (1979). The impact of Loggerhead Shrikes on nesting birds in a sagebrush environment. *Auk* **96**: 798–800.
- Rheindt, F.E. (2004a). An incident of elevational displacement of birds at Bukit Fraser, peninsular Malaysia. *Forktail* **20**: 130–131.
- Rheindt, F.E. (2004b). Notes on the range and ecology of Sichuan Treecreeper *Certhia tianquanensis*. *Forktail* **20**: 141–142.
- Rheindt, F.E. & Hutchinson, R.O. (2007a). A photoshot odyssey through the confused avian taxonomy of Seram and Buru (Southern Moluccas). *Birding Asia* **7**: 18–38.
- Rheindt, F.E. & Hutchinson, R.O. (2007b). New island records and new elevational records of birds from South Maluku, Indonesia. *Forktail* **23**: 158–161.
- Richards, A. & Rowland, R. (1995). List of birds recorded in Papua New Guinea during the period 16 October, 1992 to 29 November, 1992. *Muruk* **7**(2): 75–95.
- Richards, B. (1972). The nesting of the Spotted Pardalote. *Austr. Bird Watcher* **4**(5): 150–156.
- Richards, S.J. & Suryadi, S. eds. (2002). *A Biodiversity Assessment of Yongsu-Cyclops Mountains and the Southern Mamberamo Basin, Papua, Indonesia*. Rapid Assessment Program Bulletin of Biological Assessment **25**. Conservation International, Washington, D.C.
- Richardson, C. (1990). *Birds of the United Arab Emirates*. Hobby, Dubai & Warrington.
- Richardson, D.M. (1990). Cape Sugarbird feeding in sisal plants during summer. *Promerops* **193**: 9.
- Richardson, D.M. & Baker, A.J. (1981). Last record of the Cebu island subspecies of the Orange-bellied Flowerpecker *Dicaeum trigonostigma pallidus*. *Bull. Brit. Orn. Club* **101**: 275–276.
- Richardson, D.M., Macdonald, I.A.W., Holmes, P.M. & Cowling, R.M. (1992). Plant and animal invasions. Pp. 271–308 in: Cowling (1992).
- Richardson, K.C. & Wooller, R.D. (1986). The structures of the gastro-intestinal tracts of honeyeaters and other small birds in relation to their diets. *Austr. J. Zool.* **34**(2): 119–124.
- Richardson, K.C. & Wooller, R.D. (1988). The alimentary tract of a specialist frugivore, the Mistletoe Bird, *Dicaeum hirundinaceum*, in relation to its diet. *Austr. J. Zool.* **36**(4): 373–382.
- Richardson, K.C., Wooller, R.D. & Casotti, G. (1991). The relative sizes and asymmetry of kidneys in passerine birds from Australia and North America. *J. Anat. (London)* **175**: 181–185.
- Richardson, W.J. (1990). Timing of bird migration in relation to weather: updated review. Pp. 78–101 in: Gwinner (1990a).
- Ridd, A. (1988). Breeding the Collared Sunbird *Anthreptes collaris*. *Avicult. Mag.* **94**(3): 136–138.
- Riddell, R.C. (2000). Mimicry by African Golden Oriole. *Honeyguide* **46**: 34.
- Ridgely, I.S. & Gwynne, J.A. (1989). *A Guide to the Birds of Panama with Costa Rica, Nicaragua, and Honduras*. 2nd edition. Princeton University Press, Princeton, New Jersey.
- Ridgway, R. (1895). On birds collected by Doctor W.L. Abbott in the Seychelles, Amirantes, Gloriosa, Aldabra, and adjacent islands, with notes on habits, etc. by the collector. *Proc. US Natl. Mus.* **18**: 509–546.
- Ridgway, R. (1904). *The Birds of North and Middle America: a Descriptive Catalogue* [...]. Vol. 3(3). Government Printing Office, Washington, D.C.
- Ridpath, M.G. (1977). Predation on frogs and small birds by *Herodula werneri* (giglio-tos) (Mantidae) in tropical Australia. *J. Austr. Entomol. Soc.* **16**: 153–154.
- Ridpath, M.G. & Moreau, R.E. (1966). The birds of Tasmania: ecology and evolution. *Ibis* **108**(3): 348–393.
- Riehm, H. (1970). Ökologie und Verhalten der Schwanzmeise (*Aegithalos caudatus* L.). *Zool. Jb. Syst.* **97**: 338–400. In German with English summary.
- Rienks, J.H. & Catterall, C.P. (2000). A cautionary note on the use of modified prey in experiments on searching behaviour in birds. *Emu* **100**: 148–151.
- Riley, J. (1997). The birds of Sangihe and Talaud, North Sulawesi. *Kukila* **9**: 3–36.
- Riley, J. (2000). Birdwatching areas: Gunung Ambang Nature Reserve, North Sulawesi. *Bull. Oriental Bird Club* **32**: 56–58.

- Riley, J. (2002). Population size and the status of endemic and restricted range bird species on Sangihe Island, Indonesia. *Bird Conserv. Int.* **12**: 53–78.
- Riley, J. & Mole, J. (2001). The birds of Gunung Ambang Nature Reserve, North Sulawesi, Indonesia. *Forktail* **17**: 57–66.
- Riley, J., Hunowu, I., Wangko, M.F. & Wardill, J.C. (1999). The status, ecology and behavior of Elegant Sunbird *Aethopyga duyvenhoedei* on Sangihe, Indonesia. *Tropical Biodiversity* **6**(1/2): 113–122.
- Riley, J.H. (1924). A collection of birds from north and north-central Celebes. *Proc. US Natl. Mus.* **64**(16): 1–118.
- Riley, J.H. (1926). A collection of birds from the provinces of Yunnan and Szechwan, China, made for the National Geographic Society by Joseph F. Rock. *Proc. US Natl. Mus.* **70**: 1–70.
- Riley, J.H. (1931). A second collection of birds from the provinces of Yunnan and Szechwan, China, made for the National Geographic Society by Joseph F. Rock. *Proc. US Natl. Mus.* **80**: 1–91.
- Riley, J.H. (1934). One new genus and three new races of birds from the Malay region. *Proc. Biol. Soc. Washington* **47**: 115–118.
- Riley, J.H. (1938). Birds from Siam and the Malay Peninsula in the United States National Museum collected by Drs. Hugh M. Smith and William L. Abbott. *US Natl. Mus. Bull.* **172**: i–iv, 1–581.
- Ringleben, H. (1955). Der Mauerläufer in Nordwest-Deutschland. *Beitr. Naturkd. Niedersachsens* **8**: 41–44. In German.
- Rinke, D.R. (1984). Zur Biologie des Schuppenkopf-Honigfressers (*Fonchalo carmentaler*). *Trochilus* **5**: 96–100. In German with English summary.
- Rinke, D.R. (1986). Notes on the avifauna of Niuafo'ou island, Kingdom of Tonga. *Emu* **86**(2): 82–86.
- Rinke, D.R. (1987). The avifauna of 'Eua and its off-shore islet Kakaui, Kingdom of Tonga. *Emu* **87**: 26–34.
- Rinke, D.R. (1991). Birds of 'Ata and Late, and additional notes on the avifauna of Niuafo'ou, Kingdom of Tonga. *Notornis* **38**: 131–151.
- Rinke, D.R., Onnebrink, H. & Curio, E. (1992). Miscellaneous bird notes from the Kingdom of Tonga. *Notornis* **39**: 301–315.
- van Riper, S.G. (2000). Japanese White-eye *Zosterops japonicus*, No. **487** in: Poole, A. & Gill, F. eds. (2000). *The Birds of North America*, Vol. 13. The Birds of North America Inc., Philadelphia, Pennsylvania.
- Ripley, S.D. (1944). The bird fauna of the West Sumatran islands. *Bull. Mus. Comp. Zool. Harvard* **94**: 307–430.
- Ripley, S.D. (1949). Avian relicts and double invasions in peninsular India and Ceylon. *Evolution* **3**: 150–159.
- Ripley, S.D. (1950). Birds from Nepal, 1947–1949. *J. Bombay Nat. Hist. Soc.* **49**: 355–417.
- Ripley, S.D. (1953). Populations of Mrs. Gould's Sunbird, with comments on ranges and variation among related species of sunbirds. *J. Bombay Nat. Hist. Soc.* **51**(3): 690–696.
- Ripley, S.D. (1957). New birds from the Western Papuan islands. *Postilla Yale Peabody Mus.* **31**: 1–4.
- Ripley, S.D. (1959a). Comments on birds from the Western Papuan islands. *Postilla Yale Peabody Mus.* **38**: 13.
- Ripley, S.D. (1959b). Competition between sunbird and honeyeater species in the Moluccan Islands. *Amer. Naturalist* **93**: 127–132.
- Ripley, S.D. (1959c). Character displacement in Indian nuthatches (*Sitta*). *Postilla Yale Peabody Mus.* **42**: 1–11.
- Ripley, S.D. (1959d). Birds from Djaitolo, Halmahera. *Postilla Yale Peabody Mus.* **41**: 1–8.
- Ripley, S.D. (1960). Two new birds from Angola. *Postilla Yale Peabody Mus.* **43**: 1–3.
- Ripley, S.D. (1961a). *A Synopsis of the Birds of India and Pakistan, together with those of Nepal, Sikkim, Bhutan and Ceylon*. Bombay Natural History Society, Bombay, India.
- Ripley, S.D. (1961b). Aggressive neglect as a factor interspecific competition in birds. *Amk* **78**: 366–371.
- Ripley, S.D. (1962). Further comments on an Angolan sunbird. *Bull. Brit. Orn. Club* **82**(3): 42.
- Ripley, S.D. (1964). A systematic and ecological study of birds of New Guinea. *Peabody Mus. Nat. Hist. Yale Univ. Bull.* **19**: 1–87.
- Ripley, S.D. (1982). *A Synopsis of the Birds of India and Pakistan, together with those of Nepal, Bhutan, Bangladesh and Sri Lanka*. 2nd edition. Bombay Natural History Society & Oxford University Press, Bombay & Oxford.
- Ripley, S.D. & Bechler, B.M. (1989). Ornithogeographic affinities of the Andaman and Nicobar Islands. *J. Biogeogr.* **16**: 323–332.
- Ripley, S.D. & Bechler, B.M. (1990). Patterns of speciation in Indian birds. *J. Biogeogr.* **17**(6): 639–648.
- Ripley, S.D. & Bond, G.M. (1966). The birds of Socotra and Abd-el-Kuri. *Smithsonian Misc. Coll.* **151**: 1–37.
- Ripley, S.D. & Heinrich, G.H. (1966). Additions to the avifauna of northern Angola 2. *Postilla Yale Peabody Mus.* **95**: 1–29.
- Ripley, S.D. & Rabor, D.S. (1956). Birds from Canlaon Volcano in the highlands of Negros island in the Philippines. *Candor* **58**(4): 283–291.
- Ripley, S.D. & Rabor, D.S. (1958). Notes on a collection of birds from Mindoro island, Philippines. *Peabody Mus. Nat. Hist. Yale Univ. Bull.* **13**: i–iv, 1–83.
- Ripley, S.D. & Rabor, D.S. (1961). The avifauna of Mount Katanglad. *Postilla Yale Peabody Mus.* **50**: 1–20.
- Ripley, S.D. & Rabor, D.S. (1966). *Diaceum proprium*, new species (Aves: family Diaceidae). *Proc. Biol. Soc. Washington* **79**: 305–306.
- Ripley, S.D. & Rabor, D.S. (1968). Two new subspecies of birds from the Philippines and comments on the validity of two others. *Proc. Biol. Soc. Washington* **81**: 31–36.
- Ristow, D. (1966). Die Abnahme des Schwarzstirnwürger-Bestandes (*Lanius minor*) in der Eifel. *Charadrius* **2**: 4–12. In German.
- Ristow, D. (1971). Zur Verbreitung und Brutbiologie des Rotkopfwürgers (*Lanius senator*) in der Eifel und in ihren Randgebieten. *Charadrius* **7**: 97–100. In German.
- Ristow, D. (1977). Ein Nachtrag zum Schwarzstirnwürger (*Lanius minor*) und Rotkopfwürger (*Lanius senator*) in der Eifel. *Charadrius* **13**: 59–62. In German.
- Ristow, D., Wink, C. & Wink, M. (1986). Assessment of the Mediterranean autumn migration by prey analyses of Eleonora's Falcon. *Suppl. Ricerche Biol. Selvaggina* **10**: 285–295.
- Ritchison, G. (1981). Breeding biology of the White-breasted Nuthatch. *Loon* **53**: 184–187.
- Ritchison, G. (1983). Vocalisations of the White-breasted Nuthatch. *Wilson Bull.* **95**: 440–451.
- Rix, C.E. (1970). Birds of the Northern Territory. *South Austr. Orn.* **25**(6): 147–190.
- Rix, C.E. (1976). The birds of Sandy Creek Conservation Park. *Austr. Bird Watcher* **6**(6): 209–222; (8): 330–354.
- Roberts, G.J. (1979). *The Birds of South-East Queensland*. Queensland Conservation Council, Brisbane.
- Roberts, G.J. (1980). Records of interest from the Alice Springs region. *South Austr. Orn.* **28**(4): 99–102.
- Roberts, G.J. (1981). Field observations of the Grey Honeyeater in central Australia. *South Austr. Orn.* **28**(7): 190.
- Roberts, G.J. & Ingram, G.J. (1976). An annotated list of the land birds of Cooloolo. *Sunbird* **7**(1): 1–20.
- Roberts, N.L. (1955). A survey of the habit of nest-appropriation. Part 1. *Emu* **55**(2): 110–126.
- Roberts, P. (1993). *Birdwatcher's Guide to the Sydney Region*. Kangaroo Press, Sydney.
- Roberts, P.J. (1987). Longevity of Aldabran birds. *Safring News* **16**(1): 16.
- Roberts, T.J. (1992). *The Birds of Pakistan*, Vol. 2. Passeriformes: pitas to buntings. Oxford University Press, Karachi & Oxford.
- Robertson, B.C. (1996). Vocal mate recognition in a monogamous, flock-forming bird, the Silvereye, *Zosterops lateralis*. *Anim. Behav.* **51**: 303–311.
- Robertson, B.C. & Kikkawa, J. (1994). How do they keep it? – Monogamy in *Zosterops lateralis chlorocephala*. *J. Orn.* **135**: 459.
- Robertson, B.C., Degnan, S.M., Kikkawa, J. & Moritz, C.C. (2001). Genetic monogamy in the absence of paternity guards: the Capricorn Silvereye, *Zosterops lateralis chlorocephalus*, on Heron Island. *Behav. Ecol.* **12**: 666–673.
- Robertson, C.J.R. ed. (1985). *Reader's Digest Complete Book of New Zealand Birds*. Reader's Digest, Sydney.
- Robertson, C.J.R. (1996). Tui (*Prosthemadera novaeseelandiae*) mimic parakeet calls at Raoul Island. *Notornis* **43**(1): 52–53.
- Robertson, C.J.R., Hyvönen, P., Fraser, M.J. & Pickard, C.R. (2007). *Atlas of Bird Distribution in New Zealand 1999–2004*. Ornithological Society of New Zealand, Wellington, New Zealand.
- Robertson, I.S. (1980). Migrant Golden Oriole feeding on ground. *British Birds* **73**: 265.
- Robertson, J.S. (1962). Mackay report. *Emu* **61**(4): 270–274.
- Robertson, J.S. (1965). Migration of Yellow-faced Honeyeaters. *Austr. Bird Bander* **3**: 33–34.
- Robertson, J.S. & Woodall, P.F. (1982). Measurements, weights and seasonal variation of the Mangrove Honeyeater in south-east Queensland. *Corella* **6**(1): 1–5.
- Robertson, J.S. & Woodall, P.F. (1983). The status and movements of honeyeaters at Wellington Point, south-east Queensland. *Sunbird* **13**(1): 1–14.
- Robinson, D., Gamhold, N., Menckhorst, K., Mann, S. & Fleming, M. (1992). Further interesting bird records from the Gulf of Carpentaria and Arnhem Land. *North Territ. Naturalist* **13**: 16–24.
- Robinson, H.C. (1928). *The Birds of the Malay Peninsula: a General Account of the Birds Inhabiting the Region from the Isthmus of Kra to Singapore with the Adjacent Islands*. Vol. 2. The birds of the hill stations. H.F. & G. Witherby, London.
- Robinson, H.C. & Kloss, C.B. (1918). Results of an expedition to Korinchi Peak, Sumatra. 2. Birds. *J. Fed. Malay States Mus.* **8**: 81–284.
- Robinson, H.C. & Kloss, C.B. (1923). A nominal list of the birds of Sumatra. Result of an expedition to Korinchi Peak, Sumatra. Part 2. Vertebrates 5. *J. Fed. Malay States Mus.* **8**: 319–362.
- Robinson, H.C. & Kloss, C.B. (1924). On a large collection of birds chiefly from West Sumatra made by Mr. F. Jacobson. *J. Fed. Malay States Mus.* **11**(3/4): 189–350, pls. 6–11.
- Robinson, L.N. (1961). Observing the White-gaped Honeyeater. *Austr. Bird Watcher* **1**(5): 121–122.
- Robinson, P.A., Norris, A.R. & Martin, K. (2005). Interspecific nest sharing by Red-breasted Nuthatch and Mountain Chickadee. *Wilson Bull.* **117**(4): 400–402.
- Robinson, T. & Minton, C. (1989). The enigmatic Banded Stilt. *Birds International* **1**: 72–85.
- Robinson, C.R. (1986). Recent observations of birds in Xizang and Qinghai provinces, China. *Forktail* **2**: 67–82.
- Robson, C.R. (1988). Recent reports. *Bull. Oriental Bird Club* **7**: 34–40 [page 38].
- Robson, C.R. (1992). From the field. *Bull. Oriental Bird Club* **15**: 43–47 [page 45].
- Robson, C.R. (1994a). From the field. *Bull. Oriental Bird Club* **19**: 65–67.
- Robson, C.R. (1994b). From the field. *Bull. Oriental Bird Club* **30**: 52–56 [page 54].
- Robson, C.R. (1995). From the field. *Bull. Oriental Bird Club* **21**: 68–73 [page 73].
- Robson, C.R. (1996). From the field. *Bull. Oriental Bird Club* **23**: 50.
- Robson, C.R. (1998). From the field. *Bull. Oriental Bird Club* **28**: 44–48 [page 46].
- Robson, C.R. (1999a). From the field. *Bull. Oriental Bird Club* **29**: 51–56 [page 54].
- Robson, C.R. (1999b). From the field. *Bull. Oriental Bird Club* **30**: 52–56 [page 54].
- Robson, C.R. (2000a). From the field. *Bull. Oriental Bird Club* **32**: 66–76 [page 72].
- Robson, C.R. (2000b). *A Field Guide to the Birds of South-east Asia*. New Holland, London.
- Robson, C.R. (2001). From the field. *Bull. Oriental Bird Club* **33**: 68–78 [page 73].
- Robson, C.R. (2002a). From the field. *Bull. Oriental Bird Club* **35**: 83–93 [page 92].
- Robson, C.R. (2002b). From the field. *Bull. Oriental Bird Club* **36**: 61–71 [page 67].
- Robson, C.R. (2002c). *A Field Guide to the Birds of Thailand*. New Holland, London.
- Robson, C.R. (2003). From the field. *Bull. Oriental Bird Club* **29**: 72–79 [page 75].
- Robson, C.R. (2004a). From the field. *Birding Asia* **1**: 78–87 [page 81].
- Robson, C.R. (2004b). From the field. *Birding Asia* **2**: 98–106 [page 105].
- Robson, C.R. (2005a). From the field. *Birding Asia* **4**: 84–92 [page 86, 90].
- Robson, C.R. (2005b). *A Field Guide to the Birds of Thailand*, 2nd revised edition. New Holland, London.
- Robson, C.R. (2007). Borneo 28 July–14 August 2007 tour report. URL: [http://www.birdquest.co.uk/pdfs/report/malaysia%20\(Borneo\)%20rep%2007.pdf](http://www.birdquest.co.uk/pdfs/report/malaysia%20(Borneo)%20rep%2007.pdf) (download 30 October 2007).
- Robson, C.R. & Davidson, P. (1996). Some recent records of Philippine birds. *Forktail* **11**: 162–167.
- Robson, C.R., Buck, H.L., Farrow, D.S., Fisher, T. & King, B.F. (1998). A birdwatching visit to the Chin Hills, west Burma (Myanmar), with notes from nearby areas. *Forktail* **13**: 109–119.
- Robson, C.R., Eames, J.C., Nguyễn Cu & Truong Van La (1993a). Further recent records of birds from Viet Nam. *Forktail* **8**: 25–52.
- Robson, C.R., Eames, J.C., Nguyễn Cu & Truong Van La (1993b). Birds recorded during the third BirdLife/Forest Birds Working Group expedition in Viet Nam. *Forktail* **9**: 89–119.
- Rocamora, G. (1997a). Red Data bird. Seychelles Grey White-eye. *World Birdwatch* **19**(2): 20–21.
- Rocamora, G. ed. (1997b). *Rare and Threatened Species, Sites and Habitats Monitoring Programme in Seychelles*. Project G1 EMPS. Final Report. Vol. 1. Monitoring methodologies and priority actions. Ministry of Environment, BirdLife International & European Union, Cambridge, UK.
- Rocamora, G. (2008). Notes on the Seychelles Grey White-eye *Zosterops modestus*. Unpubl.
- Rocamora, G. & François, J. eds. (2000). *Seychelles White-eye Recovery Programme Phase 1 (May 1998–May 2000)*. Final Report. Ministry of Environment and Transport, International Union for Conservation of Nature and Natural Resources & Dutch Trust Fund, Cambridge, UK. 156 pp. (+ appendices).
- Rocamora, G. & Richardson, D.S. (2003). Genetic and morphological differentiation between remnant populations of an endangered species: the case of the Seychelles White-eye. *Ibis* **145** (online): E34–E44.
- Rocamora, G. & Yeatman-Berthelot, D. (1999). *Oiseaux Menacés et à Surveiller en France. Listes Rouges et Recherche de Priorités: Populations, Tendances, Menaces, Conservation*. Société d'Études Ornithologiques de France/Ligue pour la Protection des Oiseaux, Paris. In French.
- Rocamora, G., Henriette, E. & Constance, P. (2003). Successful conservation introduction of the Seychelles White-eye on Île de la Vierge, Seychelles. *IUCN Re-introduction News* **22**: 46.
- Rodewald, P.G., DeJaive, P.A. & Green, A.A. (1994). The birds of Korup National Park and Korup Project Area, Southwest Province, Cameroon. *Bird Conserv. Int.* **4**: 1–68.
- Rogacheva, E.V. [=H] (1992). *The Birds of Central Siberia*. Husum Druck- und Verlagsgesellschaft, Husum, Germany.
- Rogers, K., Rogers, A. & Rogers, D. (1986). *Bander's Aid: a Guide to Ageing and Sexing Bush Birds*. A. Rogers, St Andrews, Victoria.
- Rogers, K., Rogers, A. & Rogers, D. (1990). *Bander's Aid Supplement Number One*. Royal Australasian Ornithologists Union Report 67. Royal Australasian Ornithologists Union, Melbourne, Victoria.
- de Roo-de Ridder, A. & de Roo-de Ridder, F. (1969). The first records of *Cinnyris "ogilvie-granti"* (Bannerman) from the Congo Republic. *Rev. Zool. Bot. Afr.* **80**: 391–396.
- Rooke, I.J. (1972). *The Vocal Repertoire of the White-plumed Honeyeater*. BSc thesis, Monash University, Melbourne, Victoria.
- Rooke, I.J. (1979). *The Social Behaviour of the Honeyeater Phylidonyris novaehollandiae*. PhD thesis, University Western Australia, Perth, Western Australia.
- Rooke, I.J. (1984). The Silvereye (*Zosterops lateralis*, Aves: Zosteropidae): a review. *J. Roy. Soc. West. Austr.* **66**: 163–169.
- Rooke, I.J. (1985). *Survey of the White-breasted White-eye and the Norfolk Island Boobook Owl on Norfolk Island, October–November 1985*. RAOU Report **20**. Royal Australasian Ornithologists Union, Melbourne, Victoria.
- Rooke, I.J. & Knight, T.A. (1977). Alarm calls of honeyeaters with reference to locating sources of sound. *Emu* **77**(4): 193–198.
- Rooke, I.J., Bradshaw, S.D. & Langworthy, R.A. (1983). Aspects of the water, electrolyte and carbohydrate physiology of the Silvereye, *Zosterops lateralis* (Aves). *Austr. J. Zool.* **31**: 695–704.
- Rooke, I.J., Bradshaw, S.D. & Langworthy, R.A. & Tom, J.A. (1986). Annual cycle of physiological stress and condition of the Silvereye, *Zosterops lateralis* (Aves). *Austr. J. Zool.* **34**: 493–500.

- Roos, G. (1991). Visible bird migration at Falsterbo in autumn 1989, with a summary of the occurrence of six *Carduelis* species in 1973–90. *Anser* **30**: 229–253.
- Roos, S. & Part, T. (2004). Nest predators affect spatial dynamics of breeding Red-backed Shrikes (*Lanius collurio*). *J. Anim. Ecol.* **73**: 117–127.
- Root, T. (1988). *Atlas of Wintering North American Birds: an Analysis of Christmas Bird Count Data*. University of Chicago Press, Chicago & London.
- Rose, A.B. (1975). Domestic cats that kill wildlife. *Austr. Birds* **10**(1): 12–13.
- Rose, A.B. (1999). Notes on some non-nectar foods of some honeyeaters in eastern New South Wales. *Austr. Bird Watcher* **18**(1): 26–34.
- Rose, R.W. (1980). A survey of birds in the lower Gordon region, south-western Tasmania. *Pap. Proc. Roy. Soc. Tas.* **114**: 209–218.
- Roselaar, C.S. (1995). *Songbirds of Turkey. An Atlas of Biodiversity of Turkish Passerine Birds*. Pica Press, Robertsbridge, UK.
- Rosenberg, C.B.H. von (1867). Reis naar de Zuidoostereilanden, gedaan in 1865 op last der regering van Nederlandsch-Indië. *Werk K. Inst. Taal- Land- en Volkenk. Ned. Ind.* **2**: i–xxxvii, 1–112. In Dutch.
- Roshier, D. & Reid, J. (2003). On animal distributions in dynamic landscapes. *Ecography* **26**(4): 539–544.
- Ross, C.A. (1988). Weights of some New Caledonian birds. *Bull. Brit. Orn. Club* **108**: 91–93.
- Ross, J.A. (1912). Description of eggs of *Myzantha melanotis*. *Emu* **11**(3): 210.
- van Rossem, A.J. (1935). A note on the color of the eye of the Bush-tit. *Condor* **37**: 254.
- Rothaupt, G. (1991). *Gefährungsgradanalyse beim Raubwürger* *Lanius excubitor* und *Neutötter* *Lanius collurio*. MSc thesis, Zoologisches Institut der Georg-August-Universität Göttingen, Göttingen, Germany. In German.
- Rothschild, W. (1921). On a collection of birds from west-central and north-western Yunnan. *Novit. Zool.* **28**: 14–67.
- Rothschild, W. (1931). On a collection of birds made by Mr. F. Shaw Mayer in the Weyland Mountains, Dutch New Guinea, in 1930. *Novit. Zool.* **36**: 250–276.
- Rothschild, W. & Hartert, E.J.O. (1896a). Contributions to the ornithology of the Papuan Islands. 1. List of three small collections from British New Guinea, mostly brought together in the Owen Stanley Mountains. *Novit. Zool.* **3**(1): 8–19.
- Rothschild, W. & Hartert, E.J.O. (1896b). Contributions to the ornithology of the Papuan islands. 4. List of a collection made by Albert S. Meek on Fergusson, Trobriand, Egum and Woodlark Islands. *Novit. Zool.* **3**: 233–251.
- Rothschild, W. & Hartert, E.J.O. (1901). List of a collection of birds from Guadalcanar island, in the Solomon group. *Novit. Zool.* **8**: 373–382.
- Rothschild, W. & Hartert, E.J.O. (1907). List of a collection of birds made by Mr A.S. Meek in the mountains of the upper Aroa River and on the Angsbunga River, British New Guinea. *Novit. Zool.* **14**: 447–483.
- Rothschild, W. & Hartert, E.J.O. (1908). On a collection of birds from San Christoval, Solomon Islands. *Novit. Zool.* **15**: 359–365.
- Rothschild, W. & Hartert, E.J.O. (1923). A new bird from Buru. *Bull. Brit. Orn. Club* **43**: 117–118.
- Rothschild, W., Stresemann, E. & Paludan, K. (1932a). Die Vögel von Numfor. *Novit. Zool.* **38**: 188–207. In German.
- Rothschild, W., Stresemann, E. & Paludan, K. (1932b). Ornithologische Ergebnisse der Expedition Stein 1931–1932. 3. Die Vögel von Japan (= Jobi). *Novit. Zool.* **38**(1): 207–247. In German.
- Rothstein, S.I. (1982). Successes and failures in avian egg and nestling recognition with comments on the utility of optimality reasoning. *Amer. Zool.* **22**: 547–560.
- Rothstein, S.I. (2001). Relic behaviours, coevolution and the retention versus loss of host defences after episodes of avian brood parasitism. *Anim. Behav.* **61**: 95–107.
- Round, P.D. (1983). Some recent bird records from Northern Thailand. *Nat. Hist. Bull. Siam Soc.* **31**: 123–138.
- Round, P.D. (1988). *Resident Forest Birds in Thailand: their Status and Conservation*. Monograph 2. International Council for Bird Preservation, Cambridge, UK.
- Round, P.D. & Nadee, N. (2001). A record of *Oriolus trailii nigellicauda* from Thailand. *Nat. Hist. Bull. Siam Soc.* **49**(1): 117–119.
- Rounsevell, D.E. & Woinarski, J.C.Z. (1983). Status and conservation of the Forty-spotted Pardalote, *Pardalotus quadragintus* (Aves: Pardalotidae). *Austr. Wildl. Res.* **10**(2): 343–349.
- Rounsevell, D.E., Blackhass, S.A. & Thomas, D.G. (1977). *Birds of Maria Island: Results of a Field Survey and Literature Review*. Wildlife Division Technical Report 77/3. National Parks and Wildlife Service (Tasmania), Hobart, Tasmania.
- Routley, V. (1980). Some birds of the south Budawang Ranges. *Canberra Bird Notes* **5**(1): 24–36.
- Rowan, W. (1925). Relation of light to bird migration and development of changes. *Nature (London)* **115**: 494–495.
- Rowland, P. (1995). Birds collected in southern Sandaun Province, Papua New Guinea. *Muruk* **7**(2): 60–69.
- Rowley, I. (1976). Co-operative breeding in Australian birds. Pp. 657–666 in: Frith, H.J. & Calaby, J.H. eds. (1976). *Proceedings of the 16th International Ornithological Congress, 1974, Canberra*. Australian Academy of Science, Canberra.
- Rowley, I. & Russell, E.M. (1991). Demography of passerines in the temperate southern hemisphere. Pp. 22–44 in: Perrins, C.M., Lebreton, J.D. & Hirons, G. eds. (1991). *Bird Population Studies. Relevance to Conservation and Management*. Oxford University Press, Oxford, UK.
- Roxburgh, L. & Pinshow, B. (2000). Nitrogen requirements of an Old World nectarivore, the Orange-tufted Sunbird *Nectarinia osea*. *Physiol. Biochem. Zool.* **73**: 638–645.
- Rozendaal, F.G. & Dekker, R.W.R.J. (1989). Annotated checklist of the birds of the Dumoga-Bone National Park, North Sulawesi. *Kukila* **4**(3/4): 85–109.
- Rudnai, J. (1994). Blackheaded Oriole (*Oriolus larvatus*) nesting in a Langata garden. *Bull. East Afr. Nat. Hist. Soc.* **24**: 61–62.
- de Ruiter, M. (1995). Zur Haltung und Zucht von Streifenpirolen (*Oriolus sagittatus*). *Voliere* **18**(3): 74–75. In German.
- Ruiz-Campos, G. & Quintana-Barrios, L. (1991). First mainland record of the Red-breasted Nuthatch from Baja California, Mexico. *Western Birds* **22**: 189–190.
- Runciman, D. (1996). Activity budget of non-breeding Helmeted Honeyeaters. *Emu* **96**(1): 62–65.
- Runciman, D., Franklin, D.C. & Menkhurst, P.W. (1995). Movements of Helmeted Honeyeaters during the non-breeding season. *Emu* **95**(2): 111–118.
- Rüppell, E. (1836). *Neue Wirbelthiere zu der Fauna von Abyssinien gehörig, entdeckt und beschrieben [...]* – Vögel. Part 2 [pp. 17–48, pls. 7–18]. Siegmund Schmerber, Frankfurt am Main, Germany. In German.
- Rüppell, E. (1840). *Neue Wirbelthiere zu der Fauna von Abyssinien gehörig, entdeckt und beschrieben [...]* – Vögel. Part 4 [pp. 1–11, 81–116, pls. 31–42]. Siegmund Schmerber, Frankfurt am Main, Germany. In German.
- Rusila, Y. & Enis, W.H. (1995). *A Preliminary Survey on the Ecological Potential of the Cagar Alam Muara Kendawangan*. Perlindungan Hutan and Pelestarian Alam (PHPA) & Asian Wetland Bureau (AWB) Indonesia Programme, Bogor, Indonesia.
- Rustamov, A.K. (1958). *Ptitsy Turkmenistana. [The Birds of Turkmenistan]*. Vol. 2. Akademiya nauk Turkmenkoi SSR, Ashkhabad [Ashgabat], Turkmenistan. In Russian.
- Rutgers, A. & Norris, K.A. (1977). *Encyclopaedia of Aviculture*. Blandford, Poole, Dorset, UK.
- Ryan, J.V. (1981). The Regent Honeyeater: some early notes. *Bird Obs. Nunawading* **597**: 85.
- Sachtleben, T., Reidy, J.L. & Savidge, J.A. (2006). A description of the first Micronesian Honeyeater (*Myzomela rubra raffordii*) nests found on Saipan, Mariana Islands. *Wilson J. Orn.* **118**(3): 309–315.
- Safford, R.J. (1991). Status and ecology of the Mauritius Fody *Foudia rubra* and Mauritius Olive White-eye *Zosterops chloronothos*: two Mauritian passerines in danger. *Dodo* **27**: 113–138.
- Safford, R.J. (1997). Distribution studies of the forest-living native passerines of Mauritius. *Biol. Conserv.* **80**: 189–198.
- Safford, R.J. & Evans, M.I. (1992). Birds on the Comoro Islands, April 1991. *Scopas* **15**: 93–101.
- Safford, R.J. & Smart, L.M. (1996). The continuing presence of Macgregor's Bird of Paradise *Macgregoria pulchra* on Mount Edward Albert, Papua New Guinea. *Bull. Brit. Orn. Club* **116**(3): 186–188.
- Safriel, U.N. (1995). What's special about shrikes? Conclusions and recommendations. *Proc. West. Found. Vert. Zool.* **6**: 299–308.
- Sagar, P.M. (1985). Breeding of the Bellbird on the Poor Knights Islands, New Zealand. *New Zealand J. Zool.* **12**(4): 643–648.
- Sage, B. (1994). Mixed honeyeater flocks in Northern Queensland. *Austr. Bird Watcher* **15**(6): 260–264.
- Sagitov, A.K. & Bakaev, S.B. (1980). *Ekologiya gnezdovaniya Massovykh vidov ptits yugo-zapadnogo Uzbekistana. [Ecology of Mass Breeding Bird Species in Southwest Uzbekistan]*. Akademiya nauk Uzbekskoi SSR, Tashkent, Uzbekistan. In Russian.
- Salewski, V. (2001). The birds of Comoé National Park, Ivory Coast. *Malimbus* **22**: 55–74.
- Salighbaev, K.S. & Boghdanov, A.N. (1967). *Fauna Uzbekskoi SSR. [Fauna of the Uzbek SSR]*. Part 2. Ptitsy 4. Akademiya nauk Uzbekskoy SSR, Tashkent, Uzbekistan. In Russian.
- Salomonsen, F. (1933). Zur Systematik und Biologie von *Promerops*. *Orn. Monatsber.* **41**(2): 37–40. In German.
- Salomonsen, F. (1934). Notes on some Lemurian birds. *Proc. Zool. Soc. London* **1934**(2): 219–224.
- Salomonsen, F. (1952). Systematic notes on some Philippine birds. *Vidensk. Medd. Dan. Naturhist. Foren.* **114**: 341–364, plate 1.
- Salomonsen, F. (1953a). Et nyt navn for *Rhabdornis longirostris* Salomonsen. *Dansk Orn. Foren. Tidsskr.* **47**(2): 138–139. In Danish with English summary.
- Salomonsen, F. (1953b). Miscellaneous notes on Philippine birds. *Vidensk. Medd. Dansk Naturhist. Foren.* **115**: 205–281.
- Salomonsen, F. (1960a). Notes on flowerpeckers (Aves, Dicaeidae). 1. The genera *Melanocharis*, *Rhamphocaris*, and *Prionochilus*. *Amer. Mus. Novit.* **1990**: 1–28.
- Salomonsen, F. (1960b). Notes on flowerpeckers (Aves, Dicaeidae). 2. The primitive species of the genus *Dicaeum*. *Amer. Mus. Novit.* **1991**: 1–38.
- Salomonsen, F. (1960c). Notes on flowerpeckers (Aves, Dicaeidae). 3. The species group *Dicaeum concolor* and the superspecies *Dicaeum erythrothorax*. *Amer. Mus. Novit.* **2016**: 1–36.
- Salomonsen, F. (1961a). Notes on flowerpeckers (Aves, Dicaeidae). 4. *Dicaeum igniferum* and its derivatives. *Amer. Mus. Novit.* **2057**: 1–35.
- Salomonsen, F. (1961b). Notes on flowerpeckers (Aves, Dicaeidae). 5. The genera *Oreocharis*, *Paramythia*, and *Pardalotus* (except the superspecies *Pardalotus striatus*). *Amer. Mus. Novit.* **2067**: 1–24.
- Salomonsen, F. (1961c). Notes on flowerpeckers (Aves, Dicaeidae). 6. The superspecies *Pardalotus striatus*. *Amer. Mus. Novit.* **2068**: 1–31.
- Salomonsen, F. (1964). Some remarkable new birds from Dyaul Island, Bismarck Archipelago, with zoogeographical notes. *Biol. Sk. Kong. Danske Vid. Selsk.* **14**(1): 1–37, pls. 1–2.
- Salomonsen, F. (1965). Spændende fugle fra Noona Dan Ekspeditionen. *Naturens Verden* **1965**: 364–380. In Danish.
- Salomonsen, F. (1966a). Preliminary descriptions of new honeyeaters (Aves, Meliphagidae). *Breviora* **254**: 1–12.
- Salomonsen, F. (1966b). *Myzomela cruentata* Meyer (Aves, Meliphagidae) in the Bismarck Archipelago. Noona Dan Papers **20**. *Dansk Orn. Foren. Tidsskr.* **60**: 118–122.
- Salomonsen, F. (1967a). Family Dicaeidae, flowerpeckers. Pp. 166–208 in: Paynter (1967).
- Salomonsen, F. (1967b). Family Meliphagidae, honeyeaters. Pp. 338–450 in: Paynter (1967).
- Salomonsen, F. (1968). The moult migration. *Wildfowl* **19**: 5–24.
- Salomonsen, F. (1973). [Review:] Philippine birds – John Eleuthère du Pont 1971. *Auk* **90**(4): 922–926.
- Salomonsen, F. (1985). Flowerpecker. Pp. 228–230 in: Campbell & Lack (1985).
- Salomonsen, F. & Ford, H.A. (1985). Honeyeater. Pp. 287–288 in: Campbell & Lack (1985).
- Salter, B. (1957). Courtship behaviour of the Eastern Spinebill. *Emu* **57**(1): 64–66.
- Salvadori, T. (1875). Catalogo di una collezione di uccelli del gruppo di Halmahera e di varie località della Papusia, inviati in dono al Museo Civico di Genova dal Sig. A.A. Bruijn. *Ann. Mus. Civ. Storia Nat. Genova Ser. 1, no. 7* (47–50): 749–796. In Italian.
- Salvadori, T. (1876). Descrizione di cinquantotto nuove specie di uccelli, ed osservazioni intorno ad altre poco note, della Nuova Guinea e di altre Isole Papuane, raccolte dal Dr. Odoardo Beccari e dai cacciatori del Sig. A.A. Bruijn. *Ann. Mus. Civ. Storia Nat. Genova Ser. 1, no. 7* (56–61) (1875): 896–976. In Italian.
- Salvadori, T. (1878). Descrizione di trentuna specie nuove di uccelli della sottoregione papuana, e note intorno ad altre poco conosciute. *Ann. Mus. Civ. Storia Nat. Genova Ser. 1, no. 12*: 317–347. In Italian.
- Salvadori, T. (1879). Catalogo degli uccelli delle Isole Kei. *Ann. Mus. Civ. Storia Nat. Genova Ser. 1, no. 14*: 628–670. In Italian.
- Salvadori, T. (1892). Uccelli di Engano raccolti dal Dott. E. Modigliani. *Ann. Mus. Civ. Storia Nat. Genova Ser. 2, no. 12*: 123–142. In Italian.
- Salvadori, T. (1894). Viaggio di Lamberto Loria nella Papusia orientale. XII. Caratteri di cinque specie nuove di uccelli della Nuova Guinea orientale-meridionale. *Ann. Mus. Civ. Storia Nat. Genova Ser. 2, no. 14*: 150–152. In Italian.
- Salvo, G. (1988). Note sulla biologia dell'Averla cinerina, *Lanius minor*, in Sicilia. *Riv. Ital. Orn. (Ser. 2)* **58**(1/2): 96–98. In Italian.
- Sammler, S. (2007). *Studien zur Avifauna im Tieflandregenwald des Wildlife Sanctuary Banyang-Mbo, Südwestkamerun*. MSc thesis, University of Rostock, Rostock, Germany. In German.
- Samwald, O. & Samwald, F. (1993). Die historische Brutverbreitung und aktuelle Situation des Schwarzstirnwürgers (*Lanius minor*) in der Steiermark. *Egretta* **36**(1): 1–8. In German with English summary.
- Sandberg, R., Moore, F.R., Bäckman, J. & Löhmus, M. (2002). Orientation of nocturnally migrating Swainson's Thrush at dawn and dusk: the importance of energetic condition and geomagnetic cues. *Auk* **119**: 201–209.
- Saniga, M. (1993). Some knowledge on the Wallcreeper (*Tichodroma muraria* L.) in the Malá and Vel'ká Fatra mountains. *Tichodroma* **5**: 143–153. In Slovak with English summary.
- Saniga, M. (1995a). Recent knowledge of the breeding biology of Wallcreeper (*Tichodroma muraria*) in the Malá and Vel'ká Fatra mountains, Slovakia. *Sylvia* **31**: 26–37.
- Saniga, M. (1995b). Seasonal distribution, habitat, and territory of Wallcreeper (*Tichodroma muraria*) in the Vel'ká Fatra mountains (West Carpathians). *Biologia (Bratislava)* **50**: 195–202.
- Saniga, M. (1995c). Seasonal distribution, altitudinal and horizontal migration of the Wallcreeper (*Tichodroma muraria*) in the Malá Fatra mountains, Slovak Carpathians. *Folia Zool. (Brno)* **44**: 237–246.
- Saniga, M. (1995d). Variability in coloration of Wallcreeper. *Dutch Birding* **17**(4): 141–145.
- Saniga, M. (1999). *An Ecological and Ethological Study of Wallcreeper (Tichodroma muraria) in the Slovak Carpathians*. Folia Zoologica Monographs 2. Institute of Vertebrate Biology, Academy of Sciences of the Czech Republic, Brno, Czech Republic. 54 pp.
- Saniga, M. (2000). Characteristic types of flight and climbing and variability in coloration of the throat and breast of the Wallcreeper *Tichodroma muraria*. *Monticola* **8**: 225–233.
- Saniga, M. (2001). Successful breeding of very close relatives in the Wallcreeper *Tichodroma muraria*. *Vogelwelt* **122**(2): 101–103.
- Saniga, M. (2002). Foraging habits of the Wallcreeper *Tichodroma muraria*. *Vogelwelt* **123**(3): 161–164.
- Saniga, M. (2003). Conspicuous colouring and visual display in Wallcreeper. *Dutch Birding* **25**: 319–322.
- Saniga, M. (2004). Features of the Wallcreeper *Tichodroma muraria* breeding habitat in the West Carpathians. *Monticola* **9**: 222–227.
- Santharam, V. (1996a). Nest of Thickbilled Flowerpecker. *J. Bombay Nat. Hist. Soc.* **93**(2): 296.

- Santharam, V. (1996b). Seasonal movements in Small Sunbird (*Nectarinia minima*) and Emerald Dove (*Chalcophaps indica*). *J. Bombay Nat. Hist. Soc.* **93**(2): 296–297.
- Sapir, N. (2003). Six new breeding bird-species in Israel during 1995–2002. *Israel J. Zool.* **49**(2/3): 203–218.
- Sarasin, F. (1913). Die Vögel Neu-Caledoniens und der Loyalty Inseln. Pp. 1–78 in: Sarasin, F. & Roux, J. eds. (1913). *Nova Caledonia: Forschungen in Neu-Caledonien und auf den Loyalty-Inseln*. Vol. 1(1). Zoologie. C.W. Kreidel, Wiesbaden, Germany. In German.
- Sarasin, P. & Sarasin, F. (1905). *Reisen in Celebes*. C.W. Kreidel, Wiesbaden, Germany. In German.
- Sardin, J.P. (1984). Le Tichodrome échelette (*Tichodroma muraria*) en Charente et dans la région centre-ouest. *Pica* **3**: 83–86. In French.
- Sargeant, D.E. (1994). Recent ornithological observations from São Tomé and Príncipe islands. *Bull. Afr. Bird Club* **1**: 96–102.
- Sauer, F. (1957). Die Stemenorientierung nächtlich ziehender Grasmücken (*Sylvia atricapilla*, *borin* und *curruca*). *Z. Tierpsychol.* **14**: 29–70. In German.
- Sauer, J.R., Hines, J.E. & Fallon, J. (2004). *The North American Breeding Bird Survey: Results and Analysis 1966–2003*. Version 2004.1. United States Geological Survey, Patuxent Wildlife Research Center & Environment Canada/Canadian Wildlife Service, Laurel, Maryland.
- Sauer, J.R., Orsillo, S. & Peterjohn, B.G. (1995). Geographic patterns in relative abundances and population trends of breeding and wintering Loggerhead Shrikes in North America. *Proc. West. Found. Vert. Zool.* **6**: 128–141.
- Saunders, A.S.J. (1993). Seasonal variation in the distribution of the Noisy Friarbird *Philemon corniculatus* and the Red Wattlebird *Anthochaera carunculata* in eastern New South Wales. *Austr. Bird Watcher* **15**(2): 49–59.
- Saunders, A.S.J. & Burgin, S. (2001). Selective foraging by Red Wattlebirds, *Anthochaera carunculata*, and Noisy Friarbirds, *Philemon corniculatus*. *Emu* **101**(2): 163–166.
- Saunders, A.S.J., Ambrose, S.J. & Burgin, S. (1995). Gape width and prey selectivity in the Noisy Friarbird *Philemon corniculatus* and Red Wattlebird *Anthochaera carunculata*. *Emu* **95**(4): 297–300.
- Saunders, A.S.J., Burgin, S. & Jones, H. (2003). The importance of nectar in the diet of large honeyeaters. *Corella* **27**(1): 1–12.
- Saunders, D.A. & Ingram, J.A. (1995). *Birds of Southwestern Australia. An Atlas of Changes in the Distribution and Abundance of the Wheatbelt Fauna*. Surrey Beatty & Sons, Chipping Norton, New South Wales.
- Saunders, D.A. & de Rebeira, C.P. (1991). Values of corridors to avian populations in a fragmented landscape. Pp. 221–240 in: Saunders, D.A. & Hobbs, R.J. eds. (1991). *Nature Conservation 2: the Role of Corridors*. Surrey Beatty & Sons, Chipping Norton, New South Wales.
- Saunders, J. (1983). Birds of the Waite Arboretum: 1972–1981. *South Austr. Orn.* **29**(2): 40–41.
- Scammell, K.M. (1963). Breeding in Malachite Sunbird. *Avicult. Mag.* **70**: 158–162.
- Schäfer, E. (1938). Ornithologische Ergebnisse zweier Forschungsreisen nach Tibet. *J. Orn.* **86** (Suppl.): 1–349. In German.
- Schäfer, E. & Meyer de Schauensee, R.M. (1938). Zoological results of the second Dolan Expedition to Western China and eastern Tibet, 1934–1936. Part 2. Birds. *Proc. Acad. Nat. Sci. Philadelphia* **40**: 185–260.
- Scharnke, H. (1932). Ueber den Bau der Zunge der Nectariniidae, Promeropidae und Drepanididae nebst Bemerkungen zur Systematik der blütenbesuchenden Passeres. *J. Orn.* **80**(1): 114–123. In German.
- Scharnke, H. (1933). Ueber eine rückgebildete Honigfresser-Zunge. *J. Orn.* **81**(2): 355–359. In German.
- Schaub, M. (1996a). Zum Ansiedlungsverhalten des Rotkopfwürgers *Lanius senator* in der Nordwestschweiz. *Orn. Beob.* **93**: 163–168. In German.
- Schaub, M. (1996b). Jagdverhalten und Zeitbudget von Rotkopfwürgern *Lanius senator* in der Nordwestschweiz. *J. Orn.* **137**: 213–227. In German with English summary.
- Schedvin, N. (1996). Where do the Regents roam? *Wingspan* **6**(4): 13–15.
- Schernekau, J. (1977). Aufzucht von drei Gartenbaumläufers. *Gefiederte Welt* **101**(12): 222–225. In German.
- Schickendanz, D. (1978). Über Haltung und Pflege des Waldbaumläufers. *Gefiederte Welt* **102**(7): 131. In German.
- Schifferli, L. (2001). Birds breeding in a changing farmland. *Acta Orn. (Warszawa)* **36**: 25–51.
- Schipper, C. (1998). *The Social Organisation of the Migratory Yellow-faced Honeyeater Lichenostomus chrysops during the Breeding Season*. BSc thesis, Department of Zoology, La Trobe University, Melbourne, Victoria.
- Schipper, C., Shanahan, M., Cook, S. & Thornton, I.W.B. (2001). Colonization of an island volcano, Long Island, Papua New Guinea, and an emergent island, Motmot, in its caldera lake. 3. Colonization by birds. *J. Biogeogr.* **28**(11/12): 1339–1352.
- Schlamowitz, R., Hainsworth, F.R. & Wolf, L.L. (1976). On the tongues of sunbirds. *Condor* **78**(1): 104–107.
- Schleicher, B., Hoi, H., Valera, F. & Hoi-Leitner, M. (1997). The importance of different paternity guards in the polygynandrous Penduline Tit (*Remiz pendulinus*). *Behaviour* **134**(11/12): 941–959.
- Schleicher, B., Valera, F. & Hoi, H. (1993). The conflict between nest guarding and mate guarding in Penduline Tits (*Remiz pendulinus*). *Ethology* **95**(2): 157–165.
- Schmalflug, H. (1977). Verzögerte Ausbildung des Augenringes bei jungen Brillenvögeln (Zosteropidae). *J. Orn.* **118**(2): 199–200. In German.
- Schmid, C.K. (1993). Birds of Nokopo. *Muruk* **6**(2): 1–61.
- Schmid, H., Luder, R., Naef-Daenzer, B., Graf, R. & Zbinden, N. (1998). *Schweizer Brutvogelatlas: Verbreitung der Brutvögel in der Schweiz und im Fürstentum Liechtenstein, 1993–1996. Atlas des Oiseaux Nicheurs de Suisse: Distribution des Oiseaux Nicheurs en Suisse et au Liechtenstein en 1993–1996*. Schweizerische Vogelwarte, Sempach, Switzerland. In German and French with English and Italian summaries.
- Schmidt, D. (1982). *The Birds of the Serengeti National Park, Tanzania*. British Ornithologists' Union Checklist 5. British Ornithologists' Union, Tring, UK.
- Schmidt, B.L. (1978). Birds of the Cobar region, New South Wales. *Austr. Birds* **12**(4): 61–86.
- Schmidt, E. (1980). Untersuchungen zur Nahrungsökologie des Schwarzstirnwürgers *Lanius minor*. *Ökol. Vögel* **2**: 177–188. In German.
- Schmidt, R.K. (1955). Incubation and fledging periods of the Cape White-eye. *Ostrich* **26**: 157.
- Schmidt, R.K. (1964). The Lesser Double-collared Sunbird, *Cinnyris chalybeus* (Linnaeus) in the southwestern Cape. *Ostrich* **35**: 86–94.
- Schmidt, R.K. (1991). Lesser Double-collared Sunbirds nesting in gardens. *Promerops* **197**: 12.
- Schmitt, A. (1931). Brillenvogelzüchtung. *Gefiederte Welt* **60**: 1–4. In German.
- Schmutz, E. (1977). *Die Vögel der Manggarai (Flores)*. Published privately, Ruteng, Flores. In German.
- Schnell, G.D., Watt, D.J. & Douglas, M.E. (1985). Statistical comparison of proximity matrices: applications in animal behaviour. *Anim. Behav.* **33**: 239–253.
- Schneller, E. (1980). Aufzucht eines Pirols. *Gefiederte Welt* **104**(2): 28–30. In German.
- Schodde, R. (1956). Some birds of the Burra Creek. *South Austr. Orn.* **22**: 3–5, 12.
- Schodde, R. (1975). *Interim List of Australian Songbirds. Passerines*. Royal Australasian Ornithologists Union, Melbourne, Victoria.
- Schodde, R. (1976). *A Survey of the Fauna of the Lower McArthur River Region, Northern Territory*. CSIRO Division of Wildlife Research for Mimets Development, Canberra.
- Schodde, R. (1977). Contributions to Papuanian ornithology. 6. Survey of the birds of southern Bougainville island, Papua New Guinea. *CSIRO Wildl. Res. Tech. Pap.* **34**: 1–103.
- Schodde, R. (1978a). The identity of five type-specimens of New Guinean birds. *Emu* **78**(1): 1–6.
- Schodde, R. (1978b). The status of endangered Papuanian birds. Pp. 133–145 & appendix pp. 185–206 in: Tyler, M.J. ed. (1978). *The Status of Endangered Australasian Wildlife*. Royal Zoological Society of South Australia, Adelaide.
- Schodde, R. (1981). Bird communities of the Australia mallee: composition, derivation, distribution, structure and seasonal cycles. Pp. 387–442 in: di Castri, F., Goodall, D.W. & Specht, R.L. eds. (1981). *Ecosystems of the World. II. Mediterranean-type Shrublands*. Elsevier Scientific Publishing, Amsterdam.
- Schodde, R. (1982). Origin, adaptation and evolution of birds in arid Australia. Pp. 191–224 in: Barker, W.R. & Greenslade, P.J.M. eds. (1982). *Evolution of the Flora and Fauna of Arid Australia*. Peacock Press, Adelaide.
- Schodde, R. (1989). New subspecies of Australian birds. *Canberra Bird Notes* **13**(4) (1988): 119–122.
- Schodde, R. (1992). Towards stabilizing the nomenclature of Australian birds: neotypification of *Myzomela sanguinolenta* (Latham, 1801), *Microeca fasciata* (Latham, 1801) and *Microeca leucophaea* (Latham, 1801). *Bull. Brit. Orn. Club* **112**(3): 185–190.
- Schodde, R. & Glover, B. (1955). Excursion to Moorook. *South Austr. Orn.* **21**: 65–72.
- Schodde, R. & Hitchcock, W.B. (1968). *Contributions to Papuanian Ornithology. 1. Report on the Birds of the Lake Kutubu Area, Territory of Papua and New Guinea*. CSIRO Division Wildlife Research Technical Paper 13. CSIRO Division of Wildlife Research, Melbourne, Australia. 73 pp.
- Schodde, R. & Mason, I.J. (1975). Occurrence, nesting and affinities of the White-throated Grass-wren *Amytornis woodwardi* and White-lined Honeyeater *Meliphaga albilineata*. *Emu* **75**(1): 12–18.
- Schodde, R. & Mason, I.J. (1999). *The Directory of Australian Birds: a Taxonomic and Zoogeographic Atlas of the Biodiversity of Birds in Australia and its Territories*. Vol. 1. Passerines. CSIRO Publishing, Collingwood, Victoria.
- Schodde, R. & Tidemann, S.C. eds. (1986). *Reader's Digest Complete Book of Australian Birds*. Revised edition. Reader's Digest, Sydney.
- Schodde, R. & Tidemann, S.C. eds. (1990). *Reader's Digest Complete Book of Australian Birds*. 2nd edition. Reader's Digest Services, Sydney.
- Schodde, R., Fullagar, P. & Hermes, N. (1983). *A Review of Norfolk Island Birds: Past and Present*. Australian National Parks and Wildlife Service Special Publication 8. Australian National Parks and Wildlife Service, Canberra. Vii, 119 pp.
- Schodde, R., Mason, I.J. & Christidis, L. (1992). Regional, age and sexual differentiation in the Regent Honeyeater *Xanthomyza phrygia*. *Corella* **16**(1): 23–28.
- Schodde, R., Mason, I.J. & McKean, J.L. (1979). A new subspecies of *Philemon buceroides* from Arnhem Land. *Emu* **79**(1): 24–30.
- Schodde, R., van Tets, G.F., Champion, C.R. & Hope, S. (1975). Observations on birds at glacial altitudes on the Carstensz Massif, Western New Guinea. *Emu* **75**: 65–72.
- Schoeman, M.E. (1990). Behaviour observations of Greater Double-collared Sunbird. *Hornbill* **23**: 22–23.
- Schoenjahn, J. (2003). First record of a Painted Honeyeater *Grantiella picta* for Western Australia. *Austr. Field Orn.* **20**(3): 107–109.
- Schön, M. (1979). Zum zwischenartlichen Verhalten des Raubwürgers *Lanius excubitor* gegenüber Vögeln und Säugern. *Ökol. Vögel* **1**: 99–126. In German.
- Schön, M. (1994a). Morphologische Grundlagen einiger Greifvogel-Eigenschaften des Raubwürgers (*Lanius excubitor*). *Ökol. Vögel* **16**: 1–10. In German with English summary.
- Schön, M. (1994b). Geschlechts-, Alters- und individuelle Zeichnungsmerkmale des Raubwürgers (*Lanius excubitor*) im Vergleich mit anderen Würgern: zur Wirksamkeit von Zeichnungsmustern. *Ökol. Vögel* **16**: 11–80. In German with English summary.
- Schön, M. (1994c). Zu Brutverhalten und Paarbildung des Raubwürgers (*Lanius e. excubitor*): Paarbildung, Brutverlauf und Familien-Auflösung im Gebiet der südwestlichen Schwäbischen Alb. *Ökol. Vögel* **16**: 81–172. In German with English summary.
- Schön, M. (1994d). Zur Brutbiologie des Raubwürgers (*Lanius e. excubitor*): Gelege-, Brut-Größe und Bruterfolg im Gebiet der südwestlichen Schwäbischen Alb im Vergleich mit anderen Populationen. *Ökol. Vögel* **16**: 173–217. In German with English summary.
- Schön, M. (1994e). Bestandsdichte und -entwicklung, Geschlechts-, Altersverteilung und Gruppen-Bildung in einer Raubwürger-Population (*Lanius e. excubitor*) im Gebiet der südwestlichen Schwäbischen Alb. *Ökol. Vögel* **16**: 219–252. In German with English summary.
- Schön, M. (1994f). Kennzeichen des Raubwürger-Lebensraumes (*Lanius e. excubitor*) im Gebiet der südwestlichen Schwäbischen Alb: jahreszeitliche Nutzung und Revier-Größe, Struktur-Merkmale und -Veränderungen, Kleinststrukturen und Bewirtschaftung. *Ökol. Vögel* **16**: 253–496. In German with English summary.
- Schön, M. (1994g). Zur Struktur der Nestplätze des Raubwürgers (*Lanius e. excubitor*): Typen, Umgebung und Schutz, Wechsel und Wiederbenutzung von Nestern. *Ökol. Vögel* **16**: 497–566. In German with English summary.
- Schön, M. (1994h). Begleit-Vogelarten des Raubwürgers (*Lanius e. excubitor*) im Gebiet der südwestlichen Schwäbischen Alb: der Raubwürger als Anzeiger für extensiv bewirtschaftete halboffene Landschaften. *Ökol. Vögel* **16**: 567–581. In German with English summary.
- Schön, M. (1995a). Habitat structure, habitat changes, and causes of decline in the Great Grey Shrike (*Lanius excubitor*) in southwestern Germany. *Proc. West. Found. Vert. Zool.* **6**: 142–149.
- Schön, M. (1995b). Breeding behaviour of the Great Grey Shrike in southwestern Germany. *Proc. West. Found. Vert. Zool.* **6**: 235–241.
- Schön, M. (1996). Raptor-like passerines – some similarities and differences of shrikes (*Lanius*) and raptors. *Ökol. Vögel* **18**: 173–216. In German with English summary.
- Schön, M. (1998a). On the evolution of the northern and southern group of subspecies in the Great Grey Shrike superspecies (*Lanius excubitor*). Pp. 9–13 in: Josef & Lohrer (1998).
- Schön, M. (1998b). Conservation measures and implementation for the Great Grey Shrike (*Lanius excubitor*) in the southwestern Schwäbische Alb of southwestern Germany. Pp. 68–73 in: Josef & Lohrer (1998).
- Schön, M. (2000). Naturschutz-Konzeption und Landschaftspflege-Maßnahmen für Halboffen-Landschaften am Beispiel des Raubwürger-Lebensraumes *Lanius excubitor* im Gebiet der südwestlichen Schwäbischen Alb. *Ökol. Vögel* **22**(2): 131–235. In German with English summary.
- Schonert, B. (1996). Erstbeobachtung eines Mauerläufers (*Tichodroma muraria*) in Berlin. *Berliner Orn. Bericht* **6**(2): 109–115. In German with English summary.
- Schönfeld, M. (1994). *Die Beutelmäuse Remiz pendulinus mit einer umfassenden Übersicht der Familie Remizidae*. Die Neue Brehm-Bücherei **559**. Westarp Wissenschaften, Magdeburg, Germany. In German.
- Schönfeld, M. (1999). Contributions towards biometrics and moult of German birds (Part 3) (Aves: Passeriformes: Aegithalidae, Paridae, Sittidae, Remizidae). *Zool. Abh. Mus. Tierk. Dresden* **50**(2): 329–349. In German with English summary.
- Schönfeld, M. (2001). Beiträge zur Biometrie und Mäuser deutscher Vögel (Teil 6) (Aves: Passeriformes: Motacillidae, Troglodytidae, Prunellidae, Oriolidae, Laniidae, Passeridae, Fringillidae, Emberizidae). *Zool. Abh. Mus. Tierk. Dresden* **51**(2): 403–433. In German with English summary.
- Schönfeld, M. (2003). Contributions towards biometrics and moult of German birds. Tree-creeper and Short-toed Tree-creeper from the Süderbergland/Nordrhein-Westfalen (Aves, Passeriformes, Certhiidae). Part VII/1. *Zool. Abh. Mus. Tierk. Dresden* **53**: 113–129. In German with English summary.
- Schönfeld, M. (2006a). Contributions towards biometrics and moult of German Short-toed Tree-creeper (Aves: Passeriformes: Certhiidae). Part VII/2. *Zool. Abh. Mus. Tierk. Dresden* **55**: 139–175. In German with English summary.
- Schönfeld, M. (2006b). Contributions towards biometrics and moult of the Tree-creeper (*Certhia familiaris macrodactyla* C. L. Brehm, 1831) (Aves: Passeriformes: Certhiidae). Part VII/3. *Zool. Abh. Mus. Tierk. Dresden* **56**: 113–150. In German with English summary.
- Schönwetter, M. & Meise, W. (1980). *Handbuch der Oologie*. Vol. 3(28). Passeriformes [Aegithalidae to Dicaeidae]. Akademie-Verlag, Berlin. In German.
- Schönwetter, M. & Meise, W. (1981). *Handbuch der Oologie*. Vol. 3(29/30). Passeriformes 2. Akademie-Verlag, Berlin. In German.
- Schönwetter, M. & Meise, W. (1983). *Handbuch der Oologie*. Vol. 3(37). Passeriformes 2. Akademie-Verlag, Berlin. In German.

- Schouteden, H. (1938). *Exploration du Parc National Albert – Mission G. F. de Witte (1933–1935)*. Vol. 9. Oiseaux. Institut des Parcs Nationaux du Congo belge, Bruxelles. In French.
- Schouteden, H. (1949). Contribution à l'étude de la faune ornithologique du Katanga (Congo belge). *Rev. Zool. Bot. Afr.* **42**: 158–174. In French.
- Schouteden, H. (1959). Un nectariniide nouveau pour la faune congolaise: *Nectarinia bocagei* Shell. *Rev. Zool. Bot. Afr.* **59**: 326–328. In French.
- Schrader, N.W. (1981). Birds recorded at Sandringham Station, S.W. Queensland during August–September 1980. *Austr. Bird Watcher* **9**(3): 80–87.
- Schreurs, T. (1936). *Lanius collurio* L. und *Lanius senator* L. Ein Beitrag zur Biologie zweier Würgerarten. *J. Orn.* **84**: 442–470. In German.
- Schulenberg, T.S. & Randrianasolo, H. (2002). A rapid ornithological assessment of the Reserve Naturelle Intégrale d'Ankarafantsika. *RAP Bull. Biol. Assess.* **23**: 88–97. In English and French.
- Schulz, M. (1991). Observations on birds in snow gum woodland and alpine heathland during mid winter in south-eastern Australia. *Austr. Bird Watcher* **14**(3): 95–102.
- Schulz, M. & Kristensen, K. (1994). Notes on selected bird species on the south-western coast of Tasmania, between Port Davey and Cape Sorell. *Austr. Bird Watcher* **15**(6): 265–272.
- Schumacher, D.M. (1964). Ages of some captive wild birds. *Condor* **66**: 309.
- Schürer, U. (1987). Proteavögel, Kap-Honigfresser und Natal-Honigfresser. *Trochilus* **8**(1): 3–6. In German with English summary.
- Schürer, U. & Bock, J. (1993). Kap-Honigfresser: Haltung und Zucht im Zoologischen Garten Wuppertal. *Gefiederte Welt* **117**(5): 150–152. In German.
- Schüz, E. (1990). Bilder zur Brutpflege afrikanischer Beutelmäisen (*Anthoscopus* species). *Ökol. Vögel* **12**(2): 205–212. In German with English summary.
- Schwan, T.G. & Hikes, N. (1979). Fiscal Shrike predation on the bat *Pipistrellus kuhli* in Kenya. *Biotropica* **11**(1): 21.
- Schwind, H. von (1968). Beobachtungen über das Vorkommen der Würgerart *Lanius souzai* in S.W.A. *Mitt. Orn. Arbeitsgr. SWA Wiss. Ges.* **4**: 1–4. In German.
- Slater, P.L. (1879). [On birds from Duke-of-York Island]. *Proc. Zool. Soc. London* **29**: 448–449.
- Slater, P.L. (1883). Additional notes on birds collected in the Timor-Laut, or Tenimbar, group of islands by Mr. Henry O. Forbes. *Proc. Zool. Soc. London* **1883**(2): 194–200, pls. 26–28.
- Slater, P.L. (1893). Notes on *Paramythia montium* and *Amalocichla sclateriana*. *Ibis Ser.* **6**, no. 5: 243–246, plate 7.
- Slater, W.L. (1930). *Systema Avium Aethiopicarum. A Systematic List of the Birds of the Ethiopian Region*. Part 2. British Ornithologists' Union, London.
- Slater, W.L. & Mackworth-Praed, C. (1918). A list of the birds of the Anglo-Egyptian Sudan, based on the collections of Mr A. L. Butler, Mr. A. Chapman and Capt. H. Lynes, R. N., and Major Cuthbert Christy, R.A.M.C. (T.F.). Part 2. Alaudidae–Hirundinidae. *Ibis Ser.* **10**, no. 6: 602–720.
- Slater, W.L. & Moreau, R.E. (1933). Taxonomic and field notes on some birds of north-eastern Tanganyika Territory. *Ibis Ser.* **13**, no. 3: 187–219.
- Scoble, J. & Clarke, M.F. (2006). Nectar availability and flower choice by Eastern Spinebills foraging on mountain correa. *Anim. Behav.* **72**: 1387–1394.
- Scofield, R.P., McAllan, I.A.W., Palma, R. & Worthy, T.H. (2005). Stabilisation of the genus-group name of the New Zealand Bellbird. *Notornis* **52**(3): 171–172.
- Scott, D.A., Hamadani, H.M. & Mirhosseini, A.A. (1975). *The Birds of Iran*. Department of the Environment, Teheran. In Persian with English introduction and scientific index.
- Scott, J.M., Mountainspring, S., Ramsey, F.L. & Kepler, C.B. (1986). *Forest Bird Communities of the Hawaiian Islands: their Dynamics, Ecology, and Conservation*. Studies in Avian Biology **9**. Cooper Ornithological Society, Camarillo, California.
- Scott, M. (2006). The Turkestan Shrike on the Outer Hebrides. *Birding World* **19**(9): 393.
- Scott, S.N., Clegg, S.M., Blomberg, S.P., Kikkawa, J. & Ownes, I.P.E.O. (2003). Morphological shifts in island-dwelling birds: the roles of generalist foraging and niche expansion. *Evolution* **57**: 2147–2156.
- Scott, T.A. & Morrison, M.L. (1990). Natural history and management of the San Clemente Loggerhead Shrike. *Proc. West. Found. Vert. Zool.* **4**: 23–57.
- Scott, T.A. & Morrison, M.L. (1995). Opportunistic foraging behavior of Loggerhead Shrikes. *Proc. West. Found. Vert. Zool.* **6**: 186–193.
- Scott, W.E. (1946). Birds observed on Espiritu Santo, New Hebrides. *Auk* **63**(3): 362–368.
- Seale, A. (1901). Report of a mission to Guam. Bernice P. Bishop Mus. *Occas. Papers* **1**: 17–60.
- Seale, J. (1977). Observations. *Papua New Guinea Bird Soc. Newsl.* **137**: 3–4.
- Seale, J. (1980). Nest of Streak-headed Honeyeater *Pycnopygus sticticephalus* at Moitaka, Port Moresby, N.C.P. *Papua New Guinea Bird Soc. Newsl.* **165**: 162–33.
- Seavy, N.E. (2006). Physiological correlates of habitat association in East African sunbirds (Nectariniidae). *J. Zool., London* **270**: 290–297.
- Secomb, D. (1995). Blue-faced Honeyeaters feeding Yellow-throated Miner nestlings. *Austr. Bird Watcher* **16**(2): 75–76.
- Seddon, N., Ekstrom, J.M.M., Capper, D.R., Isherwood, I.S., Muna, R., Pople, R.G., Tarimo, E. & Timothy, J. (1999a). The importance of the Nilo and Nguu North Forest Reserves for the conservation of montane forest birds, Tanzania. *Biol. Conserv.* **87**: 59–72.
- Seddon, N., Ekstrom, J.M.M., Capper, D.R., Isherwood, I.S., Muna, R., Pople, R.G., Tarimo, E. & Timothy, J. (1999b). Notes on the ecology and conservation status of key bird species in Nilo and Nguu North Forest Reserves, Tanzania. *Bird Conserv. Int.* **9**: 9–28.
- Sedgwick, E.H. (1940). Birds of the Rockingham district. Part 2. *Emu* **40**(3): 237–245.
- Sedgwick, E.H. (1947). Northern Territory bird notes. Part 2. Concluded. *Emu* **46**(5): 349–378.
- Sedgwick, E.H. (1949a). Mixed associations of small birds in the south-west of Western Australia. *Emu* **49**(1): 9–13.
- Sedgwick, E.H. (1949b). Bird movements in the Wheatbelt of Western Australia. *West. Austr. Nat.* **2**(2): 25–33.
- Sedgwick, E.H. (1952). Bird life at Leonora, Western Australia. *Emu* **52**(4): 285–296.
- Sedgwick, E.H. (1955). Bird-life at Wooraloo. Part 1. *West. Austr. Nat.* **5**(2): 39–43.
- Sedgwick, E.H. (1962). A Williams bird list. *West. Austr. Nat.* **8**(4): 87–96.
- Sedgwick, E.H. (1968). A Collie bird list. *West. Austr. Nat.* **10**(8): 189–194.
- Sedgwick, E.H. (1973a). Birds of the Harvey district. *West. Austr. Nat.* **12**(6): 131–139.
- Sedgwick, E.H. (1973b). Birds of the Bengier Swamp. *West. Austr. Nat.* **12**(7): 147–155.
- Sedgwick, E.H. (1984). Birds recorded near Harvey along a west to east transect of the south-west coastal plain of Western Australia. *Austr. Bird Watcher* **10**(5): 157–160.
- Sedgwick, E.H. (1986). Further notes on the avifauna of the Gibb Rock area, Western Australia. *Austr. Bird Watcher* **11**(6): 171–180.
- Sedgwick, E.H. (1988a). The status of bird species in the rural town of Harvey, Western Australia. *Austr. Bird Watcher* **12**(7): 222–232.
- Sedgwick, E.H. (1988b). An Australian bird wave. *Austr. Bird Watcher* **12**(7): 241.
- Sedgwick, E.H. & Morrison, P.C. (1949). Observations on the lower Murchison RAOU Camp, September 1948. *Emu* **48**(3): 212–242.
- Sedgwick, L.E. (1964). Birds of the Stirling Ranges, Western Australia. *Emu* **64**(1): 7–19.
- Seeböhm, H. (1890). *The Birds of the Japanese Empire*. R. H. Porter, London.
- Sefe, K.M., Payne, R.B. & Sorenson, M.D. (2003). Phylogenetic relationships of African sunbird-like warblers: Moho (*Hypergerus atriceps*), Green Hylia (*Hylia prasina*) and Tit-hylia (*Pholidornis ruficauda*). *Ostrich* **74**(1/2): 8–17.
- Seiler, H.W. & Fraser, M.W. (1985). Ageing and sexing guide: Cape Sugarbirds *Promerops cafer*. *Safring News* **14**: 91–92.
- Seiler, H.W. & Prys-Jones, R.P. (1989). Mate competition, mate guarding, and unusual timing of copulations in the Cape Sugarbird (*Promerops cafer*). *Ostrich* **60**(4): 159–164.
- Serle, W. (1940). Field observations on some Northern Nigerian birds. Part 2. *Ibis Ser.* **14**, no. 4: 1–47.
- Serle, W. (1943a). Notes on East African birds. *Ibis* **85**(1): 55–92.
- Serle, W. (1943b). Further field observations on Northern Nigerian birds. *Ibis* **85**(4): 413–437.
- Serle, W. (1949). The birds of Sierra Leone. Part 4. *Ostrich* **20**: 114–126.
- Serle, W. (1950). A contribution to the ornithology of the British Cameroons. *Ibis* **92**: 602–638.
- Serle, W. (1951). The Double-collared Sunbird *Cinnyris reichenowi* Sharpe. *Nigerian Field* **16**: 20–21.
- Serle, W. (1956). The Splendid Sunbird (*Cinnyris coccinigaster* (Latham)). *Nigerian Field* **21**: 78.
- Serle, W. (1957). A contribution to the ornithology of the eastern region of Nigeria. [Part 2]. *Ibis* **99**: 628–685.
- Serle, W. (1963). A new race of sunbird from West Africa. *Bull. Brit. Orn. Club* **83**: 118–119.
- Serle, W. (1965). A third contribution to the ornithology of the British Cameroons. [Part 2]. *Ibis* **107**(2): 230–246.
- Serle, W., Morel, G.J. & Hartwig, W. (1977). *A Field Guide to the Birds of West Africa*. Collins, London.
- Serventy, D.L. (1937). Local migration in the Perth district, Western Australia. *Emu* **37**: 90–94.
- Serventy, D.L. (1948). The birds of the Swan River district, Western Australia. *Emu* **47**(4): 241–286.
- Serventy, D.L. (1970). Torpidity in Australian birds. *Emu* **70**: 201–202.
- Serventy, D.L. (1977). The use of data on the distribution of birds to monitor climatic changes. *Emu* **77**(4): 162–166.
- Serventy, D.L. (1984). Honey eaters. Pp. 344–347 in: Grzimek *et al.* (1984).
- Serventy, D.L. & Whittell, H.M. (1962). *Birds of Western Australia*. 3rd edition. University of Western Australia Press, Perth, Western Australia.
- Serventy, D.L. & Whittell, H.M. (1976). *Birds of Western Australia*. 5th edition. University of Western Australia Press, Perth, Western Australia.
- Sevastopulo, D.G. (1980a). Sunbird building in close proximity to a wasp's nest. *Entomol. Mon. Mag.* **115**: 26.
- Sevastopulo, D.G. (1980b). Collared Sunbird (*Anthreptes collaris* Vieillot) building near wasp's nests. *Entomol. Mon. Mag.* **116**: 3.
- Severinghaus, L.L. (1996). Territory strategy of the migratory Brown Shrike *Lanius cristatus*. *Ibis* **138**: 460–465.
- Shackelford, D. (2006). *Rockjumper Papua New Guinea 2006 Trip Reports*. Published privately, Cape Town. URL: http://rockjumper.co.za/02_destination_b_reports_png_2006_june.htm; http://rockjumper.co.za/02_destination_b_reports_png_2006_july.htm (download 1 August 2007).
- Shaffer, F. & Alvo, R. (1996). Brown Creeper – Grimpereau brun – *Certhia americana*. Pp. 748–751 in: Gauthier, J. & Aubry, Y. eds. (1996). *The Breeding Birds of Québec. Atlas of the Breeding Birds of Southern Québec*. Association Québécoise des Groupes d'Ornithologues, The Province of Quebec Society for the Protection of Birds & Canadian Wildlife Service, Montréal, Québec.
- Shannon, T.G.D. ed. (1984). *Western Australian Bird Report 1982*. RAOU Report **6**. Royal Australasian Ornithologists Union, Melbourne, Victoria.
- Sharland, M.S.R. (1925). Tasmania's indigenous birds. *Emu* **25**: 94–103.
- Sharland, M.S.R. (1929). Land birds of Lord Howe Island. *Emu* **29**(1): 5–11, pls. 2–3.
- Sharland, M.S.R. (1944). The Lyrebird in Tasmania. *Emu* **44**(1): 64–71.
- Sharland, M.S.R. (1958). *Tasmanian Birds*. Angus & Robertson, Sydney.
- Sharma, S. & Kashyap, R.K. (1999). Purple Sunbird *Nectarinia asiatica* (Latham) – a new pest of grapes under agroclimatic conditions of Hissar, Haryana. *J. Bombay Nat. Hist. Soc.* **96**(2): 322.
- Sharma, V.L. (1989). Chromosome studies of *Zosterops palpebrosa palpebrosa* (Zosteropidae: Aves). *Cytobios* **58**: 79–84.
- Sharp, A. & Sewell, S. (1995). Extensions to the known distributions of some birds of south-central Queensland. *Sunbird* **25**: 49–59.
- Sharp, S.P. & Hatchwell, B.J. (2005). Individuality in the contact calls of cooperatively breeding Long-tailed Tits (*Aegithalos caudatus*). *Behaviour* **142**(11/12): 1559–1575.
- Sharp, S.P. & Hatchwell, B.J. (2006). Development of family specific contact calls in the Long-tailed Tit *Aegithalos caudatus*. *Ibis* **148**(4): 649–656.
- Sharpe, R.B. (1877). *Catalogue of the Passeriformes, or Perching Birds, in the Collection of the British Museum*. Vol. 3. Coliiformae, containing the families Corvidae, Paradisidae [sic], Oriolidae, Dieruridae, and Prionopidae. Trustees of the British Museum, London.
- Sharpe, R.B. (1885). *Catalogue of the Passeriformes, or Perching Birds, in the Collection of the British Museum*. Vol. 10. Fringilliformes: Part 1, containing the families Dicaeidae, Hirundinidae, Ampelidae, Mniotiltidae, and Motacillidae. Trustees of the British Museum, London.
- Sharpe, R.B. (1888). On a collection of birds from the island of Palawan. *Ibis Ser.* **5**, no. 6: 193–204, pls. 3–4.
- Sharpe, R.B. (1897). [On *Paramythia montium*]. *Bull. Brit. Orn. Club* **6**(7): 41–42.
- Sharpe, R.B. (1903). *A Hand-list of the Genera and Species of Birds*. Vol. 4. Trustees of the British Museum (Natural History), London.
- Sharpe, R.B. (1909). *A Hand-list of the Genera and Species of Birds*. Vol. 5. Trustees of the British Museum (Natural History), London.
- Shaw, J.R. (2001a). On sunbirds drinking. *Honeyguide* **47**: 195.
- Shaw, J.R. (2001b). Further interactions between birds and chameleons. *Honeyguide* **47**: 197.
- Sheldon, F.H. (1985). The taxonomy and biography of the Thick-billed Flowerpecker complex in Borneo. *Auk* **102**(3): 606–612.
- Sheldon, F.H. & Francis, C.M. (1985). The birds and mammals of Mount Trusmadi. *Sabah Soc. J.* **8**(1): 77–88.
- Sheldon, F.H. & Gill, F.B. (1996). A reconsideration of songbird phylogeny, with emphasis on the evolution of titmice and their sylvioid relatives. *Syst. Biol.* **45**(4): 473–495.
- Sheldon, F.H., Moyle, R.G. & Kennard, J. (2001). *Ornithology of Sabah: History, Gazetteer, Annotated Checklist, and Bibliography*. Ornithological Monographs **52**. American Ornithologists' Union, Washington, D.C.
- Sheldon, F.H., Slikas, B., Kinnarney, M., Gill, F.B., Zhao, E. & Silverio, B. (1992). DNA-DNA hybridization evidence of phylogenetic relationships among major lineages of *Parus*. *Auk* **109**(1): 173–185.
- Shelley, G.E. (1876–1880). *A Monograph of the Nectariniidae, or Family of Sun-birds*. Published privately, London.
- Shepherd, C.R., Sukumaran, J. & Wich, S.A. (2004). *Open Season: an Analysis of the Pet Trade in Medan, Sumatra 1997–2001*. TRAFFIC Southeast Asia, Petaling Jaya, Selangor, Malaysia. 60 pp.
- Shepherd, L.D. & Lambert, D.M. (2007). The relationships and origins of the New Zealand wattlebills (Passeriformes, Callaeatidae) from DNA sequence analyses. *Mol. Phylog. Evol.* **43**(2): 480–492.
- Sheppard, D.M. (1958). Bird notes from Molo 2. The garden. *J. East Afr. Nat. Hist. Soc.* **23**: 6–8.
- Shields, J.M. (1984). Discovery of new rainforest bird species, Eungella Honeyeater. *Austr. Nat. Hist.* **21**(5): 171–176.
- Shields, J.M. & Recher, H.F. (1984). Breeding bird censuses: an evaluation of four methods for use in sclerophyll forest. *Corella* **8**(2): 29–41.
- Shields, J.M., Kavanagh, R.P. & Rohan-Jones, W.G. (1985). Forest avifauna of the upper Hastings River. Pp. 55–64 in: Keast *et al.* (1985).
- Shingleton, K. (2006). Figbird swallowing gravel. *Bird Obs. Nunawading* **84**: 14.
- Shirihai, H. (1996). *The Birds of Israel: a Complete Avifauna and Bird Atlas of Israel*. Academic Press, London.
- Shorrock, G. (2003). Description of the nest site and eggs of Giant Nuthatch *Sitta magna*. *Bull. Oriental Bird Club* **38**: 53–54.
- Short, L.L. & Horne, J.F.M. (2003). A Kenya nest and behavioural notes on the Green-headed Sunbird *Cyanomitra (Nectarinia) verticalis*. *Bull. Brit. Orn. Club* **123**(3): 186–190.
- Short, L.L. & Horne, J.F.M. (2006). *The Avifauna of an Upland Seasonal Woodland in Central Kenya: Ecology, Behavior, Breeding*. Bonner Zoologische Monographien **53** (2005). Zoologisches Forschungsmuseum Alexander Koenig, Bonn.

Short / Smythies

- Short, L.L., Horne, J.F.M. & Muringo-Gichuki, C. (1990). Annotated check-list of the birds of East Africa. *Proc. West. Found. Vert. Zool.* **4**(3): 61–246.
- Short, L.L., Horne, J.F.M. & Schodde, R. (1983). Vocal behaviour, morphology, and hybridization of Australian Spotted and Yellow-rumped Pardalotes (Aves, *Pardalotus*). *Amer. Mus. Novit.* **2756**: 1–15.
- Showler, D.A. & Davidson, P. (1996). The Socotra Sunbird *Nectarinia halfouri*. *Sandgrouse* **17**: 148–150.
- Showler, D.A. & Farrow, D.S. (2003). A new record of Long-tailed Tit *Aegithalos caudatus* in Syria. *Sandgrouse* **25**(2): 147–148.
- Shurcliff, K.S. (1986). Life-styles and food resources of birds in inland environments. Pp. 102–110 in: Ford & Paton (1986).
- Shuxia Zhang, Lan Yang, Xiaojun Yang & Junxing Yang (2007). Molecular phylogeny of the yuhinas (Sylviidae: Yuhina): a paraphyletic group of babblers including *Zosterops* and Philippine *Stachyris*. *J. Orn.* **148**(4): 417–426.
- Sibley, C.G. (1951). Notes on the birds of New Georgia, Central Solomon Islands. *Condor* **53**: 81–92.
- Sibley, C.G. (1970). A comparative study of the egg-white proteins of passerine birds. *Peabody Mus. Nat. Hist. Yale Univ. Bull.* **32**: 1–131.
- Sibley, C.G. (1996). *Birds of the World*, Version 2.0. Thayer Birding Software, Naples, Florida.
- Sibley, C.G. & Ahlquist, J.E. (1974). The relationships of the African sugarbirds (*Promerops*). *Ostrich* **45**: 22–30.
- Sibley, C.G. & Ahlquist, J.E. (1980). The relationships of the “primitive insect-eaters” (Aves: Passeriformes) as indicated by DNA-DNA hybridization. Pp. 1215–1220 in: Nöhring, R. ed. (1980). *Acta XVII Congressus Internationalis Ornithologici*. Deutsche Ornithologen-Gesellschaft, Berlin.
- Sibley, C.G. & Ahlquist, J.E. (1983). The phylogeny and classification of birds based on the data of DNA-DNA hybridization. *Curr. Orn.* **1**: 245–292.
- Sibley, C.G. & Ahlquist, J.E. (1985a). The phylogeny and classification of the passerine birds, based on comparisons of the genetic material, DNA. Pp. 83–121 in: Ilyichev, V.D. & Gavrilov, V.M. eds. (1985). *Acta of the XVIII International Ornithological Congress, Moscow, August 16–24, 1982*. Vol. 1. Nauka, Moscow.
- Sibley, C.G. & Ahlquist, J.E. (1985b). The phylogeny and classification of the Australo-Papuan passerine birds. *Emu* **85**(1): 1–14.
- Sibley, C.G. & Ahlquist, J.E. (1990). *Phylogeny and Classification of Birds: a Study in Molecular Evolution*. Yale University Press, New Haven & London.
- Sibley, C.G. & Monroe, B.L. (1990). *Distribution and Taxonomy of Birds of the World*. Yale University Press, New Haven & London.
- Sibley, C.G. & Monroe, B.L. (1993). *A Supplement to Distribution and Taxonomy of Birds of the World*. Yale University Press, New Haven & London.
- Sibley, C.G., Ahlquist, J.E. & Monroe, B.L. (1988). A classification of the living birds of the world based on DNA-DNA hybridization studies. *Auk* **105**(3): 409–423.
- Sibley, D.A. (2000). *The Sibley Guide to Birds*. The National Audubon Society & Alfred A. Knopf, New York.
- Sibson, R.B. (1987). More Laishleyana: Red Wattlebird and White-faced Heron. *Notornis* **34**(1): 81–83.
- Sibson, R.B. (1993). Bellbirds eating fruits of strawberry trees. *Notornis* **40**: 177.
- Siebers, H.C. (1930). Fauna Buruana. Aves. *Treubia* **7** (Suppl. 5): 165–303, pls. 4–5. In German.
- Siegfried, W.R. (1985a). Nest site fidelity of Malachite Sunbird and parasitism by Klaas’s Cuckoo. *Ostrich* **56**: 277.
- Siegfried, W.R. (1985b). Sugarbird (1). Pp. 566–567 in: Campbell, B. & Lack, E. eds. (1985). *A Dictionary of Birds*. T.&A.D. Poyser, Calton, UK.
- Siegfried, W.R., Rebelo, A.G. & Prys-Jones, R.P. (1985). Stem thickness of *Erica* plants in relation to avian pollination. *Oikos* **45**: 153–155.
- Siemens, L. (1983). Field notes from AUEA biology department. *Bull. East Afr. Nat. Hist. Soc.* **14**: 71.
- Sievi, J.R. (1974). Breeding habits of the Yellow-bellied Sunbird. *Honeyguide* no. **79** [vol. 19(4)]: 42–43.
- Silva, K. (1975). Observations [Manus and Mussau islands, Bismarck Archipelago]. *Papua New Guinea Bird Soc. Newsl.* **112**: 4–7.
- da Silva, R. (1992). High tide at Negombo Lagoon. *Bull. Oriental Bird Club* **15**: 15–17.
- de Silva Garza, H.G. (1993). Bronze-cuckoo *Chrysococcyx* sp. parasitizes Green-backed Honeyeater *Glycichaera fallax*. *Muruk* **6**(1): 44.
- Silveira, C.E. (1995). The Black-eared Miner. *Austr. Bird Watcher* **16**(3): 96–109.
- Simek, J. (2001). Patterns of breeding fidelity in the Red-backed Shrike (*Lanius collurio*). *Ornis Fenn.* **78**: 61–71.
- Simpson, K.N.G. (1997). A brief review of the Mistletoebird *Dicaeum hirundinaceum* (Shaw) 1793 (Aves: Dicaeidae) and an introductory bibliography. *Victorian Naturalist* **114**(3): 143–148.
- Simpson, K.N.G. & Day, N. (1984). *The Birds of Australia – a Book of Identification*. Lloyd O’Neil, South Yatta, Victoria.
- Simpson, K.N.G., Day, N. & Trusler, P. (2004). *Field Guide to the Birds of Australia*. 7th edition. Viking Penguin Books, Ringwood, Victoria.
- Sims, R.W. (1956). Birds collected by Mr. F. Shaw-Mayer in the Central Highlands of New Guinea 1950–1951. *Bull. Brit. Mus. (Nat. Hist.) Zool.* **3**(10): 387–438.
- Sinclair, I. & Langrand, O. (1998). *Birds of the Indian Ocean Islands*. Struik, Cape Town.
- Sinclair, I. & Ryan, P. (2003). *A Comprehensive Illustrated Field Guide: Birds of Africa South of the Sahara*. Struik Publishers, Cape Town.
- Sinclair, I., Hockey, P.A.R. & Tarboton, W.R. (1993). *Birds of Southern Africa*. Struik Publishers, Cape Town.
- Sinclair, I., Hockey, P.A.R. & Tarboton, W.R. (2002). *Susol Birds of Southern Africa*. Struik Publishers, Cape Town.
- Sinclair, I., Spottiswoode, C., Cohen, C., Mills, M., Cassidy, R., vaz Pinto, P. & Ryan, P. (2004). Birding western Angola. *Bull. Afr. Bird Club* **11**: 152–160.
- Singh, A.P. (2000). Birds of lower Garhwal Himalayas: Dehra Dun valley and neighbouring hills. *Forktail* **16**: 101–124.
- Singh, P. (1995). Recent bird records from Arunachal Pradesh, India. *Forktail* **10**: 65–104.
- Skead, C.J. (1953). A study of the Black Sunbird, *Chalcomitra a. amethystina* (Shaw). *Ostrich* **24**: 159–166.
- Skead, C.J. (1954). A study of the Larger Double-collared Sunbird, *Cinnyris a. afra* (Linnaeus). *Ostrich* **25**: 76–88.
- Skead, C.J. (1959). A study of the Cape Penduline Tit *Anthoscopus minutus minutus* (Shaw & Nodder). *Ostrich* **3** (Suppl): 274–288.
- Skead, C.J. (1962). A study of the Collared Sunbird, *Anthreptes collaris*. *Ostrich* **33**: 38–40.
- Skead, C.J. (1964a). Birds of the macchia on the eastern Amatole Mountains, Cape Province. *Ostrich* **35**: 228–233.
- Skead, C.J. (1964b). Sugarbirds in the Amatole Mountains, King William’s Town, Cape Province. *Ostrich* **35**: 236.
- Skead, C.J. (1967). *The Sunbirds of Southern Africa. Also the Sugarbirds, the White-eyes and the Spotted Creeper*. Trustees of the South African Bird Book Fund & A.A. Balkema, Cape Town & Amsterdam.
- Skead, C.J. & Ranger, G.A. (1958). A contribution to the biology of the Cape Province White-eyes (*Zosterops*). *Ibis* **100**: 319–333.
- Skead, D.M. (1963). Gurney’s Sugarbird *Promerops gurneyi* Verreaux, in the Natal Drakensberg. *Ostrich* **34**: 160–164.
- Skerrett, A. & Bullock, I. (1992). *A Birdwatcher’s Guide to Seychelles*. Prion, Perry, Huntingdon, UK.
- Skerrett, A., Bullock, I. & Disley, T. (2001). *Birds of Seychelles*. Christopher Helm, London.
- Skinner, N.J. (1969). Notes on the breeding of the Pygmy Long-tailed Sunbird *Hedydipna platura* at Zaria. *Bull. Nigerian Orn. Soc.* **6**: 124–126.
- Skinner, N.J. (1985). Migration patterns for the more common Palaearctic migrants observed in south-eastern Botswana. *Babbler (Botswana)* **9**: 20–21.
- Skinner, N.J. (1989). The nest record card scheme. *Babbler (Botswana)* **18**: 47–48.
- Skinner, N.J. (1995). The breeding seasons of birds in Botswana. 1. Passerine families. *Babbler (Botswana)* **29**(30): 9–23.
- Skoracki, M. & Sikora, B. (2003). Quill mites (Acari: Prostigmata: Syringophilidae) from African passeriform birds. *Zootaxa* **129**: 1–10.
- Skutch, A.F. (1987). *Helpers at Birds’ Nests: a Worldwide Survey of Cooperative Breeding and Related Behavior*. University of Iowa Press, Iowa City, Iowa.
- Slack, H.E. (1992). Entanglement in nest material causes mortality of young Loggerhead Shrikes. *North Amer. Bird Bander* **17**: 60.
- Slack, H.E. (1994). Age and sex related characteristics of the Loggerhead Shrike (*Lanius l. ludovicianus*) in coastal Mississippi. *North Amer. Bird Bander* **19**: 84–87.
- Slack, R.S. (1975). Effects of prey size on Loggerhead Shrike predation. *Auk* **92**: 812–814.
- Slater, P. (1959). Breeding periods of birds in the Kimberley Division, Western Australia. *West. Austr. Nat.* **7**(2): 35–41.
- Slater, P. (1962). Breeding of birds in the lower Wongong valley. *West. Austr. Nat.* **8**(5): 124–126.
- Slater, P. (1974). *A Field Guide to Australian Birds*. Vol. 2. Passerines. Rigby, Adelaide.
- Slater, P., Slater P. & Slater, R. (2003). *The Slater Field Guide to Australian Birds*. New Holland Publishers, London.
- Slater, P.J. (1991). The response of Silvereyes to individual variation in their territorial song. *Emu* **91**: 36–40.
- Slater, P.J. (1993). The relationship between individual variation in song and ecology in the Capricorn Silvereye. *Emu* **93**: 145–155.
- Slater, P.J. (1994). Niche overlap between three sympatric, short-billed honeyeaters in Tasmania. *Emu* **94**(3): 186–192.
- Slater, P.J. (1995). The interaction of bird communities with vegetation and season in Brisbane Forest Park. *Emu* **95**(3): 194–207.
- Slikas, B., Jones, I.B., Derrickson, S.R. & Fleischer, R.C. (2000). Phylogenetic relationships of Micronesian white-eyes based on mitochondrial sequence data. *Auk* **117**(2): 355–365.
- Sloane, S.A. (1992). *Supernumeraries at Bushitit (Psaltriparus minimus) Nests: Incidence, Origins, and Proximate Causes*. PhD thesis, University of Michigan, Ann Arbor, Michigan.
- Sloane, S.A. (1996). Incidence and origins of supernumeraries at Bushitit (*Psaltriparus minimus*) nests. *Auk* **113**: 757–770.
- Sloane, S.A. (2001). Bushitit (*Psaltriparus minimus*). No. **598** in: Poole, A. & Gill, F. eds. (2001). *The Birds of North America*. Vol. 15. The Birds of North America Inc., Philadelphia, Pennsylvania.
- Smales, I.J. (1988). *The Status of the Helmeted Honeyeater Lichenostomus melanops cassidix (Gould)*. Department of Conservation, Forests and Lands (Victoria), Melbourne, Victoria.
- Smales, I.J., Craig, S.A., Williams, G.A. & Dunn, R.W. (1990). The Helmeted Honeyeater: decline, conservation and recent initiatives for recovery. Pp. 225–238 in: Clark, T.W. & Seebeck, J.H. eds. (1990). *Management and Conservation of Small Populations*. Chicago Zoological Society, Chicago.
- Smales, I.J., Menkhurst, P.W. & Horrocks, G. (1995). The Helmeted Honeyeater recovery program: a view of its organization and operation. Pp. 35–44 in: Bennett, A., Backhouse, G. & Clark, T. eds. (1995). *People and Nature Conservation: Perspectives on Private Land Use and Endangered Species Recovery*. Surrey Beatty & Sons, Chipping Norton, New South Wales.
- Smales, I.J., Miller, M., Middleton, D. & Franklin, D.C. (1992). Establishment of a captive-breeding programme for the Helmeted Honeyeater *Lichenostomus melanops cassidix*. *Int. Zoo Yb.* **31**: 57–63.
- Smedley, D.I. (1977). Sexing of Lewin’s Honeyeaters. *Corella* **1**(2): 34.
- Smit, J.T., Zeegers, T., van den Heuvel, E. & Roels, B. (2007). Unidentified nuthatch in Siberia Altay in July 2006. *Dutch Birding* **29**: 162.
- Smith, A.J. & Robertson, B.I. (1978). Social organization of Bell Miners. *Emu* **78**(4): 169–178.
- Smith, A.N.H. & Westbrooke, I.M. (2004). Changes in bird conspicuousness at Puroora Forest. *Notornis* **51**(1): 21–25.
- Smith, C.E. & Filardi, C.E. (2007). Patterns of molecular and morphological variation in some Solomon Island land birds. *Auk* **124**(2): 479–493.
- Smith, E.L. & Kruse, K.C. (1992). The relationship between land-use and the distribution and abundance of Loggerhead Shrikes in south-central Illinois. *J. Field Orn.* **63**: 420–427.
- Smith, G.P. (1991). Behavioural differences between some birds around Lae and at Keravat, East New Britain. *Muruk* **5**(1): 25–27.
- Smith, H.G. & Nilsson, J.A. (1987). Intraspecific variation in migratory pattern of a partial migrant, the Blue Tit (*Parus caeruleus*): an evaluation of different hypotheses. *Auk* **104**: 109–115.
- Smith, H.M. (1949). Papuan dialect names of New Guinea birds. *Auk* **66**(2): 214.
- Smith, J.M.B. (1976). Notes on birds breeding above 3,215 metres on Mt Wilhelm, Papua New Guinea. *Emu* **76**(4): 220–221.
- Smith, K.D. (1972). Do some Wallcreepers migrate? *British Birds* **65**: 36–37.
- Smith, L., Larkins, D. & Pegler, J. (1984). Garden plants attractive to birds. *Austr. Birds* **18**(2): 17–32.
- Smith, L.A. & Johnstone, R.E. (1974). First record of White-lined Honeyeater in Northern Kimberley, WA. *Emu* **74**: 58.
- Smith, L.A. & Johnstone, R.E. (1985). The birds of Lake MacLeod, upper West Coast, Western Australia. *West. Austr. Nat.* **16**(4): 83–87.
- Smith, L.A., Johnstone, R.E. & Dell, J. (1987). Birds. Pp. 29–41 in: Burbidge, A.A. & McKenzie, N.L. eds. (1987). *The Islands of the North-west Kimberley: Western Australia*. Wildlife Research Bulletin of Western Australia 7. Department of Fisheries and Wildlife (Western Australia), Perth, Western Australia.
- Smith, L.E. & Chafer, C.J. (1987). The avifauna of Bass Point, New South Wales. *Austr. Birds* **21**(1): 1–18.
- Smith, P. (1984). The forest avifauna near Bega, New South Wales. 1. Differences between forest types. *Emu* **84**(4): 200–210.
- Smith, P. (1985a). Effects of intensive logging on birds in eucalypt forest near Bega, New South Wales. *Emu* **85**(1): 15–21.
- Smith, P. (1985b). Woodchip logging and birds near Bega, New South Wales. Pp. 259–271 in: Keast *et al.* (1985).
- Smith, P. (1989). Changes in a forest bird community during a period of fire and drought near Bega, New South Wales. *Austr. J. Ecol.* **14**(1): 41–54.
- Smith, P.W. & Smith, S.A. (1994). Preliminary assessment of the Brown-headed Nuthatch in the Bahamas. *Bahamas J. Sci.* **1**(2): 22–26.
- Smith, S.M. (1972). The ontogeny of impaling behaviour in the Loggerhead Shrike, *Lanius ludovicianus* L. *Behaviour* **42**: 232–247.
- Smith, S.M. (1973a). An aggressive display and related behavior in the Loggerhead Shrike. *Auk* **90**: 287–298.
- Smith, S.M. (1973b). Food manipulation by young passerines and the possible evolutionary history of impaling by shrikes. *Wilson Bull.* **85**: 318–322.
- Smith, S.M. (1980). Demand behavior: a new interpretation of courtship feeding. *Condor* **82**: 291–295.
- Smith, T.B., Holder, K., Girman, D., O’Keefe, K., Larison, B. & Chan, Y. (2000). Comparative avian phylogeography of Cameroon and Equatorial Guinea mountains: implications for conservation. *Mol. Ecol.* **9**(10): 1505–1516.
- Smythies, B.E. (1949). A reconnaissance of the N’Mai Hka drainage, northern Burma. *Ibis* **91**: 627–648.
- Smythies, B.E. (1957). An annotated checklist of the birds of Borneo. *Sarawak Mus. J. (New Ser.)* **7**(9): 523–818.
- Smythies, B.E. (1960). *The Birds of Borneo*. Oliver and Boyd, Edinburgh & London.
- Smythies, B.E. (1984). Flower peckers (mistletoe birds). Pp. 329–331 in: Grzimek *et al.* (1984).
- Smythies, B.E. (1986). *The Birds of Burma*. 3rd revised edition. Nimrod Press, Liss, UK.
- Smythies, B.E. & Cranbrook, Earl of (1981). *The Birds of Borneo*. 3rd edition. The Malayan Nature Society & The Sabah Society, Kuala Lumpur & Kota Kinabalu.

- Smythies, B.E. & Davison, G.W.H. (1999). *The Birds of Borneo*. 4th edition. Natural History Publications (Borneo) & The Sabah Society, Kota Kinabalu, Sabah, Malaysia.
- Sniegowski, P.D., Ketterson, E.D. & Nolan, V. (1988). Can experience alter the avian annual cycle? Results of migration experiments with Indigo Buntings. *Ethology* **79**: 333–341.
- Snouckaert van Schauburg, R. (1931). Les Zosteropides. *Aulauda* **3**: 13–27. In French.
- Snow, D.W. (1950). The birds of São Tomé and Príncipe in the Gulf of Guinea. *Ibis* **92**(4): 579–595.
- Snow, D.W. (1967a). Family Aegithalidae – Long-tailed tits and bush tits. Pp. 52–61 in: Paynter (1967).
- Snow, D.W. (1967b). Family Remizidae – Penduline tits. Pp. 62–70 in: Paynter (1967).
- Snow, D.W. & Moreau, R.E. (1955). The gender of *Zosterops*. *Bull. Brit. Orn. Club* **75**: 44.
- Snow, D.W. & Perrins, C.M. eds. (1998). *Handbook of the Birds of Europe, the Middle East and North Africa. The Birds of the Western Palearctic*. Vol. 2 Passerines. Concise edition. Oxford University Press, Oxford, UK.
- Sody, H.J.V. (1955). Enkele opmerkingen over vogelcultuur op Java in het algemeen en over vogelplanten in het bijzonder. *Madjalah Ilmu Alam Untuk Indonesia* **111**: 178–196. In Dutch.
- Sokolov, L.V., Shapoval, A.P., Yefremov, V.D., Kosarev, V. & Markovets, M.Y. (2004). Timing and dynamics of autumn passage of the Long-tailed Tit *Aegithalos caudatus* on the Courish Spit (eastern Baltic). *Avian Ecol. Behav.* **12**: 31–52.
- Sokolov, E.P. & Vietinghoff-Scheel, E. von (1992). *Lanius sphenocercus* Cabanis. 18th instalment in: Dathe, H. & Loskot, W.M. eds. (1992). *Atlas der Verbreitung palaearktischer Vögel*. Akademie-Verlag, Berlin. In German.
- Solari, C. & Schudel, H. (1988). Nahrungserwerb des Neuntöters *Lanius collurio* während der Fortpflanzungszeit. *Orn. Beob.* **85**: 81–90. In German.
- van Someren, V.G.L. (1922). Notes on the birds of East Africa. *Novit. Zool.* **29**(1): 1–246, pls. 1–7.
- van Someren, V.G.L. (1944). On the races of *Oriolus monacha* (Gmelin) and the status of *Oriolus percivali* O.–Grant. *Bull. Brit. Orn. Club* **64**: 52–55.
- van Someren, V.G.L. (1956). Days with birds: studies of habits of some East African species. *Fieldiana Zool.* **38**: 1–520.
- Sommerberg, L. (1975). The Wall Creeper reached Finland in an aeroplane. *Lintumies* **10**: 32.
- Sonerud, G.A. (1989). Allocation of prey between self-consumption and transport in two different-sized central place foragers. *Ornis Scand.* **20**: 69–71.
- Song Yujun, Gao Junfeng, Liu Xiaoyong, Li Jinnin, Wang Bin, Wang Dianjun & Wang Baoing (1984). New records of breeding birds of Natuyal [=Natural] Reserve, Zuo Jia, Jilin province. *J. Northeast Normal Univ.* **1**(1): 81–85. In Chinese with English summary.
- Sonobe, K. ed. (1982). *A Field Guide to the Birds of Japan*. Wild Bird Society of Japan, Tokyo.
- Sonter, C. (1978). Distributional status of the Red-browed Pardalote in N.S.W. *Austr. Bird Watcher* **7**(5): 158–160.
- Sonter, C. (1980). Birds of the Berwerre Peninsula, Jervis Bay, ACT. *Canberra Bird Notes* **5**(3): 3–23.
- Sonter, C. (1984). The Olive-backed Oriole in Sunraysia. *Austr. Bird Watcher* **10**: 206–208.
- Sonter, C. (1986). A third specimen record and additional notes on the Spotted Pardalote *Pardalotus punctatus* in Sunraysia. *Austr. Bird Watcher* **11**(6): 181–184.
- Soobramoney, S., Downs, C.T. & Adams, N.J. (2004a). Territorial behaviour and time budgets of the Fiscal Shrike *Lanius collaris* along an altitudinal gradient in South Africa. *Afr. Zool.* **39**: 137–143.
- Soobramoney, S., Downs, C.T. & Adams, N.J. (2004b). Variability in foraging behaviour and prey of the Fiscal Shrike Shrike, *Lanius collaris*, along an altitudinal gradient in South Africa. *Ostrich* **75**(3): 133–140.
- Soobramoney, S., Downs, C.T. & Adams, N.J. (2005). Morphological variation in the Common Fiscal *Lanius collaris* along an altitudinal gradient in Southern Africa. *Ostrich* **76**(3/4): 130–141.
- Sora, H. (1997). The first breeding record of the Tree Creeper *Certhia familiaris* from Shikoku. *Jap. J. Orn.* **46**(1): 55. In Japanese with English summary.
- Sorbi, S. (1987). Observations de Tichodromes échelettes (*Tichodroma muraria*) en Belgique. *Aves* **24**: 34–38. In French.
- Spaar, R. (1997). Flight strategies of migrating raptors: a comparative study of interspecific variation in flight characteristics. *Ibis* **139**: 523–535.
- Spaar, R. & Bruderer, B. (1996). Soaring migration of Steppe Eagles *Aquila nipalensis* in southern Israel: flight behaviour under various wind and thermal conditions. *J. Avian Biol.* **27**: 289–301.
- Sparrow, S.C. (1982). A repeat nesting of Bellbirds. *Notornis* **29**(3): 195–196.
- Spellman, G.M. & Klicka, J. (2006). Testing hypotheses of Pleistocene population history using coalescent simulations: phylogeography of the Pygmy Nuthatch (*Sitta pygmaea*). *Proc. Royal Soc. London (Ser. B Biol. Sci.)* **273**(1605): 3057–3063.
- Spellman, G.M. & Klicka, J. (2007). Phylogeography of the White-breasted Nuthatch (*Sitta carolinensis*): diversification in North American pine and oak woodlands. *Mol. Ecol.* **16**(8): 1729–1740.
- Spennemann, A. (1908). Ornithologische Mitteilungen aus Semarang. [Part 3]. *Gefiederte Welt* **37**: 364–365. In German.
- Spennemann, A. (1932). Das Pirolpärchen (*Oriolus chinensis maculatus* Vieill.) vom Durenbaum in Parakan-Salam. *Ardea* **21**: 90–110. In German.
- Spennemann, D.H.R. (1999). Exploitation of bird plumages in the German Mariana Islands. *Micronesica* **31**(2): 309–318.
- Spierenburg, P. (2005). *Birds in Bhutan. Status and Distribution*. Oriental Bird Club, Bedford, UK.
- Spottiswoode, C. (1993). Orangebreasted Sunbirds feeding on the ground. *Promerops* **208**: 16–17.
- Springer, M.S., Higuchi, H., Ueda, K., Minton, J. & Sibley, C.G. (1995). Molecular evidence that the Bonin Islands “Honeyeater” is a white-eye. *J. Yamashina Inst. Orn.* **27**(2): 66–77.
- Srinivasulu, C. (2004). Birds of Kawal Wildlife Sanctuary, Andhra Pradesh, India. *J. Bombay Nat. Hist. Soc.* **101**(1): 3–25.
- St Paul, R. & McKenzie, H.R. ed. (1975). A bushman's seventeen years of noting birds. Introduction and part A (Bellbird and Tui). *Notornis* **22**(2): 122–130.
- van de Staaij, J.W.M. & Fokker, W. (1991). Rotskruiper in Amsterdam in winters van 1989/90 en 1990/91. *Dutch Birding* **13**: 135–139. In Dutch.
- Stahlbaum, G. (1966). Pirol (*Oriolus oriolus*) badet im Flügel. *Orn. Mitt.* **18**: 141. In German.
- Stanger, M., Clayton, M., Schodde, R., Wombey, J. & Mason, I. (1998). *CSIRO List of Australian Vertebrates. A Reference with Conservation Status*. CSIRO Publishing, Melbourne, Victoria.
- Stanley, M.C. & Lill, A. (2001a). Accessibility as a factor influencing frugivory by Silvereyes (*Zosterops lateralis*): field comparisons with aviary experiments. *Austr. J. Zool.* **49**: 171–182.
- Stanley, M.C. & Lill, A. (2001b). Response of Silvereyes (*Zosterops lateralis*) to dietary tannins: the paradox of secondary metabolites in ripe fruit. *Austr. J. Zool.* **49**: 633–640.
- Stanley, M.C. & Lill, A. (2002a). Does seed packaging influence fruit consumption and seed passage in an avian frugivore? *Condor* **104**: 136–145.
- Stanley, M.C. & Lill, A. (2002b). Importance of seed ingestion to an avian frugivore: an experimental approach to fruit choice based on seed load. *Auk* **119**: 175–184.
- Stanley, M.C. & Lill, A. (2002c). Avian fruit consumption and seed dispersal in a temperate Australian woodland. *Austr. Ecol.* **27**(2): 137–148.
- Stanley, M.C., Smallwood, E. & Lill, A. (2002). The response of captive Silvereyes (*Zosterops lateralis*) to the colour and size of fruit. *Austr. J. Zool.* **50**: 205–213.
- Stansbury, C.D. (2001). Dispersal of the environmental weed bridal creeper, *Asparagus asparagoides*, by Silvereyes, *Zosterops lateralis*, in south-western Australia. *Emu* **101**: 39–45.
- Stark, A.C. (1900). *The Fauna of South Africa – The Birds of South Africa*. Vol. 1. R.H. Porter, London.
- Starks, J. (1987). The status and distribution of the Black-eared Miner (*Manorina melanotis*) in Victoria. *Arthur Rylah Inst. Environ. Res. Tech. Rep.* **49**: 1–22.
- Start, A.N. & Fuller, P.J. (1983). Birds. Pp. 94–108 in: Burbidge, A.A. & McKenzie, N.L. eds. (1983). *Wildlife of the Great Sandy Desert*. Wildlife Research Bulletin of Western Australia **12**. Department of Fisheries and Wildlife (Western Australia), Perth, Western Australia.
- Start, A.N. & Fuller, P.J. (1995). Grey Honeyeater breeding records and habitat in the Pilbara, Western Australia. *West. Austr. Nat.* **20**(3): 121–123.
- Statfield, A.J. & Capper, D.R. eds. (2000). *Threatened Birds of the World*. Lynx Edicions & BirdLife International, Barcelona & Cambridge.
- Statfield, A.J., Crosby, M.J., Long, A.J. & Wege, D.C. eds. (1998). *Endemic Bird Areas of the World: Priorities for Biodiversity Conservation*. BirdLife Conservation Series 7. BirdLife International, Cambridge, UK.
- Staub, J.J.F. (1988). Evolutionary trends in some Mauritian phanerogams in relation to their pollinators. *Proc. Royal Soc. Arts Sci. Mauritius* **5**(1): 7–78.
- Stauber, W. & Ullrich, B. (1970). Der Einfluß des naßkalten Frühjahres 1969 auf eine Population des Rotrückenküglers (*Lanius collurio*) und Rotkopfküglers (*Lanius senator*) in Südwestdeutschland. *Vogelwelt* **91**: 213–222. In German.
- Stead, E.F. (1932). *The Life Histories of New Zealand Birds*. Search Publications, London.
- Steadman, D.W. (1995). Prehistoric extinctions of Pacific island birds: biodiversity meets zooarchaeology. *Science (Washington, D.C.)* **267**: 1123–1131.
- Steadman, D.W. (1999). The prehistory of vertebrates, especially birds, on Tinian, Aguiguan, and Rota, Northern Mariana Islands. *Micronesica* **31**(2): 319–345.
- Steadman, D.W. & Franklin, J. (2000). A preliminary survey of landbirds on Lakeba, Lau Group, Fiji. *Emu* **100**(3): 227–235.
- Steadman, D.W. & Freifeld, H.B. (1998). Distribution, relative abundance, and habitat relationships of landbirds in the Vava'u group, Kingdom of Tonga. *Condor* **100**: 609–628.
- Steadman, D.W., Franklin, J., Drake, D.R., Freifeld, H.B., Bolick, L.A., Smith, D.T. & Motley, T.J. (1999). Conservation status of forests and vertebrate communities in the Vava'u island group, Tonga. *Pacific Conserv. Biol.* **5**: 191–207.
- Steer, J. & van Horik, J. (2006). North Island Robin (*Petroica australis longipes*) food caches are stolen by Stitchbirds (*Notiomystis cincta*) and Bellbirds (*Anthornis melanura*). *Notornis* **53**(3): 315–316.
- Stein, G.H.W. (1936). Ornithologische Ergebnisse der Expedition Stein 1931–1932. 5. Beiträge zur Biologie papuanischer Vögel. *J. Orn.* **84**: 21–57. In German.
- Steinbacher, J. (1984a). Philippine creepers. Pp. 325–326 in: Grzimek *et al.* (1984).
- Steinbacher, J. (1984b). Sugarbirds. Page 347 in: Grzimek *et al.* (1984).
- Steinheimer, F.D. (1999). The Mountain Black-eye *Chlorocharis emiliae* (Zosteropidae) as a rhododendron flower visitor on Mt Kinabalu, Sabah, Malaysia. *Fortkall* **15**: 100–101.
- Steinheimer, F.D. (2006). *Nectarinia senegalensis cruentata* Rüppell, 1845 (Aves, Passeriformes): proposed conservation of the subspecific name. *Bull. Zool. Nomencl.* **63**: 42–45.
- Steinheimer, F.D. (2008a). Lectotype designation for *Cinnyris proteus* Rüppell, 1840 (Nectariniidae). *Bull. Brit. Orn. Club* **128**(2): 142–144.
- Steinheimer, F.D. (2008b). *Leptocoma* Cabanis, 1851 given priority over *Chalcostetha* Cabanis, 1851 (Nectariniidae) on first reviser principle. *Zootaxa*. In press.
- Stepanyan, L.S. (1956). [Breeding biology of the White-browed Tit-warbler]. *Zoologicheskii Zhurnal* **35**: 470–471. In Russian.
- Stepanyan, L.S. (1959). [Birds of the Terskey Ala-Too (Tien Shan)]. *Uchen. Zap. Moskov. Obl. Ped. Inst. (Zool.)* **71**(4): 24–141. In Russian.
- Stepanyan, L.S. (1978). *Sostav i raspreделение ptits fauny SSSR: Vorob'inoobraznye*. [Composition and Distribution of the Bird Fauna of the USSR: Passeriformes]. Nauka, Moscow. In Russian.
- Stepanyan, L.S. (1985a). *Aethopyga christinae sokolovi* Stepanyan, ssp. nov. (Nectariniidae, Aves) from South Vietnam. *Ornitologiya* **20**: 133–138.
- Stepanyan, L.S. (1985b). [On the rare form of Green-tailed Sunbirds *Aethopyga nipalensis ezrai* (Nectariniidae, Aves) from South Vietnam]. *Byull. Mosk. Obsch. Ispyt. Prir. (Otd. Biol.)* **90**(1): 34–36. In Russian.
- Stepanyan, L.S. (1990). *Konspekt ornitologicheskoi fauny SSSR. [Conspectus of the Ornithological Fauna of the USSR]*. Nauka, Moscow. In Russian with English summary.
- Stepanyan, L.S. (2000). The new subspecies *Certhia brachydactyla* (Aves, Certhiidae) from the north-western Caucasus. *Zoologicheskii Zhurnal* **79**(3): 333–337. In Russian with English summary.
- Stepanyan, L.S. (2003). [Conspectus of the Ornithological Fauna of Russia and Adjacent Territories (within the Borders of the USSR as a Historic Region)]. Akademkniga, Moscow. In Russian.
- Stephan, B. (1965). Die Zahl der Armschwingen bei den Passeriformes. *J. Orn.* **106**(4): 446–458. In German.
- Stevens, G.W. & Tedder, J.L.O. (1973). *A Honiara Bird Guide*. British Solomon Islands Scout Association, Honiara, Solomon Islands.
- Stevens, J. & Louette, M. (1999). Land bird abundance and the conservation of biodiversity on the island of Mayotte (Indian Ocean). *Aulauda* **67**: 123–139.
- Stevens, J., Herremans, M. & Louette, M. (1992). Conserving the endemic birds of the Comoro Islands. 2. Populations fluctuations on Ngazidja. *Bird Conserv. Int.* **2**: 81–91.
- Stevenson, T. & Fanshawe, J. (2002). *Field Guide to the Birds of East Africa: Kenya, Tanzania, Uganda, Rwanda, Burundi, T.&A.D. Poyser*, London.
- Stewart, A.M. (1980). *The Social Organisation and Foraging Ecology of the Tui* (Prothemadera novaeaealandiae). MSc thesis, University of Auckland, Auckland, New Zealand.
- Steyn, P. (1973). A nest of Gurney's Sugarbird. *Honeyguide* **no. 73** [vol. 18(2)]: 29–30.
- Steyn, P. (1997). Cape Sugarbird. Pollinator of proteas. *Africa Birds & Birding* **2**(4): 27–32.
- Stickney, E.H. (1997). *A Little Bird Told Me So: Birds in Mythology and History*. Rutledge Books, Danbury, Connecticut.
- Stinson, C.W. & Stinson, D.W. (1994). Nest size, clutch size, and incubation behavior in the Golden White-eye. *J. Field Orn.* **65**: 65–69.
- Stoddart, D.R. ed. (1984). *Biogeography and Ecology of the Seychelles Islands*. W. Junk, The Hague, The Netherlands.
- Stokes, T. (1974). Notes on territory and territorial behaviour in four species of Australian birds. *Canberra Bird Notes* **2**(11): 3–8.
- Stokes, T. (1978). Nest and egg of the Barred Honeyeater of New Caledonia. *Emu* **78**: 40–41.
- Stokes, T. (1979). Roosting and awakening of some inland Australian birds. *Corella* **3**: 77–81.
- Stokes, T. (1980). Notes on the landbirds of New Caledonia. *Emu* **80**: 81–86.
- Stokes, T., Sheils, W. & Dunn, K. (1984). Birds of the Cocos (Keeling) Islands, Indian Ocean. *Emu* **84**: 23–28.
- Stone, A.C. (1917). Simulation of death by the White-eared Honey-eater (*Ptilotis leucotis*). *Emu* **17**(2): 110–111.
- Stone, C. (1996). The role of psyllids (Hemiptera: Psyllidae) and Bell Miners (*Manorina melanophrys*) in canopy dieback of Sydney blue gum (*Eucalyptus saligna* Sm.). *Austr. J. Ecol.* **21**(4): 450–458.
- Stone, C. (2005). Bell-miner-associated dieback at the tree crown scale: a multi-trophic process. *Austr. Forestry* **68**(4): 237–241.
- Stones, A.J., Lucking, R.S., Davidson, P.J. & Wahyu Raharjaningtrah (1997). Checklist of the birds of the Sula Islands (1991), with particular reference to Taliabu island. *Kukila* **9**: 37–55.
- Stopher, J.J. (1946). Birds of Guam. *Auk* **63**: 534–540.
- Stopper, H. (1988). Winterbeobachtungen des Mauerläufers (*Tichodroma muraria*) im Neckartal bei Rottenburg. *Orn. Mitt.* **40**: 246–248. In German.
- Storer, P. & Eastwood, C. (1991). Notes on the birds of New Britain. *Mituk* **5**(1): 27–31.
- Storr, G.M. (1974). Some birds observed on southern Eyre Peninsula. *South Austr. Orn.* **18**: 31–37.
- Storr, G.M. (1953). Birds of the Cooktown and Laura districts, Northern Queensland. *Emu* **53**(3): 225–248.
- Storr, G.M. (1965). The avifauna of Rottnest Island, Western Australia. 3. Land birds. *Emu* **64**(3): 172–180.
- Storr, G.M. (1967). List of Northern Territory birds. *Spec. Publ. West. Austr. Mus.* **4**: 1–90.
- Storr, G.M. (1973). List of Queensland birds. *Spec. Publ. West. Austr. Mus.* **5**: 1–177.
- Storr, G.M. (1977). Birds of the Northern Territory. *Spec. Publ. West. Austr. Mus.* **7**: 1–130.

Storr, G.M. (1984). Revised list of Queensland birds. *Records West. Austr. Mus.* **19** (Suppl.): 1–189.

Storr, G.M. (1991). Birds of the South-west Division of Western Australia. *Records West. Austr. Mus.* **35** (Suppl.): 1–150.

Storr, G.M., Johnstone, R.E., Dell, J. & Smith, L.A. (1975). Birds of the Prince Regent River Reserve, north-west Kimberley. Pp. 75–84 in: Miles, J.M. & Burbidge, A.A. eds. (1975). *A Biological Survey of the Prince Regent River Reserve, North-west Kimberley, Western Australia*. Wildlife Research Bulletin of Western Australia 3. Department of Fisheries and Wildlife (Western Australia), Perth, Western Australia.

Storr, G.M., Lendon, A.H. & McKechnie, R.W. (1952). Some observations in south-eastern South Australia and adjacent parts of Victoria. *South Austr. Orn.* **20**(7): 70–77.

Stott, K. (1947). Notes on Saipan birds. *Auk* **64**: 523–527.

Stott, R.D.E. (1993). Birds new to the Kunming area. *Hong Kong Bird Rep.* **1992**: 167–175.

Stove, K. ed. (1994). A second bird atlas of the Adelaide region. Part 2. Distribution maps 1984–1985. *South Austr. Orn.* **31**(8): 195–265.

Stoyanov, G.P. (2004). Ein Beitrag zur Verbreitung des Felsenkleibers *Sitta neumeyer* in Bulgarien. *Orn. Mitt.* **56**(5): 160–165. In German.

Strange, M. (2000). *A Photographic Guide to the Birds of Southeast Asia. Including the Philippines & Borneo*. Periplus, Singapore.

Strange, M. (2001). *A Photographic Guide to the Birds of Indonesia*. Periplus, Singapore.

Strange, M. & Jeyarajasingam, A. (1993). *Birds: a Photographic Guide to the Birds of Peninsular Malaysia and Singapore*. Sun Tree Publishing, Singapore.

Stranger, R.H. (1993). A bird list from the Maylands Peninsula, suburban Perth, WA. *West. Austr. Nat.* **19**(3): 257–264.

Stresemann, E. (1914a). Die Vögel von Seran (Ceram). *Novit. Zool.* **21**: 25–153, pls. 3–5. In German.

Stresemann, E. (1914b). Beiträge zur Kenntnis der Avifauna von Buru. *Novit. Zool.* **21**(4): 358–400. In German.

Stresemann, E. (1919a). Über die europäischen Baumläufer. *Verh. Orn. Ges. Bayern* **14**(1): 39–74, plate 1. In German.

Stresemann, E. (1919b). Über die Formen der Gruppe *Aegithalos caudatus* und ihre Kreuzungen. *Beitr. Zoogeogr. Palaarkt. Reg.* **1**: 3–24. In German.

Stresemann, E. (1921). Die Mäuser der Singvögel im Dienste der Systematik. *J. Orn.* **69**(1): 102–106. In German.

Stresemann, E. (1931a). Die Zosteropiden der Indo-australischen Region. *Mitt. Zool. Mus. Berlin* **17**(2): 201–238. In German.

Stresemann, E. (1931b). Le Lorient argenté *Oriolus mellianus* Stres. *Oiseau et RFO (Nouv. Sér.)* **1**: 202–207. In French.

Stresemann, E. (1939). *Zosterops siamensis* Blyth – eine gelbbäuchige Rasse von *Zosterops palpebrosa*. *J. Orn.* **87**: 156–164. In German.

Stresemann, E. & Heinrich, G. (1940a). Die Vögel des Mount Victoria. *Mitt. Zool. Mus. Berlin* **24**(2): 151–264. In German.

Stresemann, E. & Heinrich, G. (1940b). Die Vögel von Celebes. Part 3 (Passeres). Systematik und Biologie. *J. Orn.* **88**(1): 1–135. In German.

Stresemann, E. & Paludan, K. (1932a). Einleitung und die übrigen Gruppen. Pp. 127–188 in: Rothschild, W., Stresemann, E. & Paludan, K. (1932). Ornithologische Ergebnisse der Expedition Stein 1931–32. I. Die Vögel von Waigau. *Novit. Zool.* **38**: 127–188. In German.

Stresemann, E. & Paludan, K. (1932b). Einleitung und die übrigen Gruppen. Pp. 207–247 in: Rothschild, W., Stresemann, E. & Paludan, K. (1932). Ornithologische Ergebnisse der Expedition Stein 1931–32. III. Die Vögel von Japan (=Jobi). *Novit. Zool.* **38**: 207–247. In German.

Stresemann, E. & Stresemann, V. (1971). Die postnuptiale und die praenuptiale Vollmauser der asiatischen Würger *Lanius tigrinus* und *L. cristatus*. *J. Orn.* **112**: 373–395. In German.

Stresemann, E., Meise, W. & Schönwetter, M. (1937). Aves Beickianae. Beiträge zur Ornithologie von Nordwest-Kansu nach den Forschungen von Walter Beick (†) in den Jahren 1926–1933. *J. Orn.* **85**: 375–576. In German.

Stuart Baker, E.C. (1922). *The Fauna of British India, Including Ceylon and Burma. Birds.* Vol. 1, 2nd edition. Taylor and Francis, London.

Stuart Baker, E.C. (1926). *The Fauna of British India, Including Ceylon and Burma. Birds.* Vol. 3, 2nd edition. Taylor and Francis, London.

Stuart Baker, E.C. (1932). *The Nidification of Birds of the Indian Empire.* Vol. 1. Corvidae–Cinclidae. Taylor and Francis, London.

Stuart Baker, E.C. (1934). *The Nidification of Birds of the Indian Empire.* Vol. 3. Ploceidae–Asionidae. Taylor and Francis, London.

Stuart Baker, E.C. (1942). *Cuckoo Problems.* H.F. & G. Witherby, London.

Stuart, S.N. & Hutton, J.M. eds. (1977). The avifauna of the East Usambara Mountains, Tanzania. Cambridge, UK. Unpubl.

Stuart, S.N. & Jensen, F.P. (1985). The avifauna of the Uluguru Mountains, Tanzania. *Gerfaut* **75**: 155–197.

Stuart, S.N. & Jensen, F.P. (1986). The status and ecology of montane forest bird species in western Cameroon. Pp. 38–105 in: Stuart, S.N. ed. (1986). *Conservation of Cameroon Montane Forests*. Report Cameroon Montane Forest Survey, November 1983–April 1984. International Council for Bird Preservation, Cambridge, UK.

Stuart, S.N. & van der Willigen, J.A. (1980). Is Moreau's Sunbird *Nectarinia moreaui* a hybrid species? *Scopas* **4**(3): 56–58.

Stuart, S.N., Jensen, F.P. & Brøgger-Jensen, S. (1987). Altitudinal zonation of the avifauna in Mwanihana and Magombara forests, eastern Tanzania. *Gerfaut* **77**: 165–186.

Sturmhuber, C., Berger, B., Dallinger, R. & Föger, M. (1998). Mitochondrial phylogeny of the genus *Regulus* and implications on the evolution of breeding behavior in sylvioid songbirds. *Mol. Phylog. Evol.* **10**: 144–149.

Subramanya, S. & Radhamani, T.R. (1993). Pollination by birds and bats. *Curr. Sci.* **65**: 201–209.

Sudhava, W. (1991). Nutzung von Gebäuden durch den Gartenbaumläufer (*Certhia brachydactyla*) zur Nahrungssuche, als Schlafplatz und zur Brut. *Corax* **14**(2): 133–135. In German with English summary.

Sudilovskaya, A.M. (1935). [On the relationship of the ecotypes and geographical races of *Leptopoecile sophiae* Sev.]. *Byull. Mosk. Obsh. Ispyt. Prir. (Otd. Biol.)* **44**: 253–261. In Russian.

Suhonen, J. & Kuitunen, M. (1991). Intersexual foraging niche differentiation within the breeding pair in the Common Treecreeper *Certhia familiaris*. *Ornis Scand.* **22**(4): 313–318.

Sujatnika, Jepson, P., Soehartono, T.R., Crosby, M.J. & Mardiasuti, A. (1995). *Conserving Indonesian Biodiversity: the Endemic Bird Area Approach*. [Melestarikan Keanekaragaman Hayati Indonesia: Pendekatan Daerah Burung Endemik]. Government Nature Conservation Department (PHPA) & BirdLife International Indonesia Programme, Jakarta. In English and Indonesian.

Sultana, A. & Khan, J.A. (2000). Birds of oak forests in the Kumaon Himalaya, Uttar Pradesh, India. *Forktail* **16**: 131–146.

Sun Yuehua & Martens, J. (2005). New distribution of the Sichuan Treecreeper in the Qinling Mountains, Shaanxi. *Chinese J. Zool.* **40**: 33. In Chinese with English title.

Sunarto & Melisch, R. (1995). Die Vogelwelt zweier Mangrovenbestände in Westjava, Indonesien. *Mitt. Zool. Ges. Arten- u. Populationsschutz* **11**(1): 15–17. In German.

Sundar, K.S.G. & Chanda, J. (2002). Foliage-dew bathing in Oriental White-eye *Zosterops palpebrosus*, family Zosteropidae. *J. Bombay Nat. Hist. Soc.* **99**: 318–319.

Sundevall, C.J. (1872). *Methodi Naturalis Avium Dispositionum Tentamen*. Samson & Wallin, Stockholm. In Latin with French and Swedish introduction. [English translation: Nicholson, F. (1889). R.H. Porter, London].

Suorsa, P. & Hakkarainen, H. (2007). Ageing and sexing in the Eurasian Treecreeper. *Ahula* **4**: 146–150.

Suorsa, P., Helle, H., Huhta, E., Jantti, A., Nikula, A. & Hakkarainen, H. (2003). Forest fragmentation is associated with primary sex ratio in the Treecreeper (*Certhia familiaris*). *Proc. Royal Soc. London (Ser. B Biol. Sci.)* **270**: 2215–2222.

Suorsa, P., Helle, H., Koivunen, V., Huhta, E., Nikula, A. & Hakkarainen, H. (2004). Effects of forest patch size on physiological stress and immunocompetence in an area-sensitive passerine, the Eurasian Treecreeper (*Certhia familiaris*): an experiment. *Proc. Royal Soc. London (Ser. B Biol. Sci.)* **271**: 435–440.

Surmacki, A., Kucztzski, L. & Tryjanowski, P. (2006). Eggshell patterning in the Red-backed Shrike *Lanius collurio*: relation to egg size and potential function. *Acta Orn. (Warszawa)* **41**: 145–151.

Suter, M.F. (1945). Plaintive Cuckoo (?) parasitising Purple Sunbird. *J. Bombay Nat. Hist. Soc.* **45**: 235.

Sutton, J. (1924). An ornithological trip around Eyre Peninsula. *South Austr. Orn.* **7**: 118–159.

Suzuki, T. (1993). Singing activity of the Bonin Islands Honeyeater *Apalopteron familiare*. *J. Yamashina Inst. Orn.* **25**: 93–101.

Suzuki, T. & Morioka, H. (2005). Distribution and extinction of the Ogasawara Islands Honeyeater *Apalopteron familiare* on Chichijima, Ogasawara Islands. *J. Yamashina Inst. Orn.* **37**(1): 45–49.

Suzuki, T., Kawakami, K. & Higuchi, H. (1999). A convenient method for estimating the breeding density of a threatened passerine bird *Apalopteron familiare*, endemic to the Ogasawara (Bonin) Islands, Japan. *J. Yamashina Inst. Orn.* **31**: 80–87.

Svårdson, G. (1957). The 'invasion' type of bird migration. *British Birds* **50**: 314–343.

Svensen, J.O., Hansen, L.A., Fjeldså, J., Rahner, M.C., Pedersen, L.B., Kisbye, H., Edvardsen, E. & Kiure, J. (1995). Section 5. Ornithology. Pp. 33–54 in: Svensen, J.O. & Hansen, L.A. eds. (1995). *Report on the Unguru Biodiversity Survey 1993*. The Royal Society for the Protection of Birds, Danish Centre for Tropical Biodiversity & Tanzania Forestry Research Institute, Sandy, UK.

Svensson, L. (1992). *Identification Guide to European Passerines*. 4th edition. Published privately, Stockholm.

Svensson, L., Grant, P.J., Mullarney, K. & Zetterström, D. (1999). *Collins Bird Guide – The most Complete Field Guide to the Birds of Britain and Europe*. HarperCollins, London.

Swainson, G.W. (1970). Co-operative rearing in the Bell Miner. *Emu* **70**(4): 183–188.

de Swardt, D.H. (1990). Ageing and sexing: Gurney's Sugarbird *Promerops gurneyi*. *Safring News* **19**(1/2): 57–60.

de Swardt, D.H. (1991a). Measurements and moult in the Greater Doublecollared Sunbird. *Safring News* **20**: 21–25.

de Swardt, D.H. (1991b). The seasonal movements of Gurney's Sugarbird *Promerops gurneyi* in the Lydenburg area, Transvaal. *Ostrich* **62**(1/2): 40–44.

de Swardt, D.H. (1992a). Distribution, biometrics and moult of Gurney's Sugarbird *Promerops gurneyi*. *Ostrich* **63**(1): 13–20.

de Swardt, D.H. (1992b). Cape Sugarbird at Jagersfontein, southern Orange Free State. *Ostrich* **63**(2/3): 136.

de Swardt, D.H. (1992c). Notes on the breeding biology of Gurney's Sugarbird. *Ostrich* **63**(2/3): 136–137.

de Swardt, D.H. (1992d). Olive Sunbird breeding at the Natal botanical gardens. *Albatross* **312**: 17–18.

de Swardt, D.H. (1993). Factors affecting the densities of nectarivores in *Protea roupelliae* woodland. *Ostrich* **64**(4): 172–177.

de Swardt, D.H. (1995). Malachite Sunbird ringing in the Free State. *Safring News* **24**: 15–18.

de Swardt, D.H. (1997). Gurney's Sugarbird *Promerops gurneyi*. Pp. 486–487 in: Harrison *et al.* (1997).

de Swardt, D.H. (1998). *Aspects of the Behaviour and Ecology of Gurney's Sugarbird Promerops gurneyi Verreaux, 1871*, in Protea woodland, South Africa. MSc thesis, University of the Free State, Bloemfontein, South Africa.

de Swardt, D.H. (2001a). Notes on post-nesting period and breeding success of Gurney's Sugarbird. *Ostrich* **72**(3/4): 200–201.

de Swardt, D.H. (2001b). Preliminary observations on Malachite Sunbird movements in the Free State. *Ostrich* **72**(3/4): 203–206.

de Swardt, D.H. (2002). Moults and eclipse plumage of Malachite Sunbirds, *Nectarinia famosa*, in the Free State, South Africa. *Ostrich* **73**(3/4): 176–179.

de Swardt, D.H. (2003). Malachite Sunbird recaptured after ten years. *Afring News* **32**(1): 11.

de Swardt, D.H. (2004). Greatest longevity record for Gurney's Sunbird [sic] *Promerops gurneyi*. *Afring News* **33**(2): 38–39.

de Swardt, D.H. & Bothma, N. (1992). Notes on the breeding biology of Gurney's Sugarbird. *Ostrich* **63**: 136–137.

de Swardt, D.H. & Louw, S. (1994). The diet and foraging behaviour of Gurney's Sugarbird, *Promerops gurneyi*. *Navors. Nas. Mus. Bloemfontein* **10**(5): 245–258.

de Swardt, D.H. & Peach, W.J. (2001). Annual survival of Gurney's Sugarbird, *Promerops gurneyi*. *Ostrich* **72**(3/4): 206–209.

de Swardt, D.H. & Schoeman, S. (1997). Sunbird recaptures and seasonal movements at Lydenburg, Mpumalanga province. *Safring News* **26**: 13–15.

de Swardt, D.H., Symes, C.T., Downs, C.T. & McFarlane, M. (2004). An analysis of biometric data of the Malachite Sunbird *Nectarinia famosa* from five regions in South Africa. *Afring News* **33**(1): 10–14.

Swennen, C., Howes, J.R., Ruttanadukul, N., Stikvoort, E. & Ardsungern, S. (1986). *Evaluation of the Littoral Ecosystem at Three Sites in South Thailand in 1985*. Prince of Songkhla University Report 1. Interward, Kuala Lumpur.

Swynnerton, C.F.M. (1908). Further notes on the birds of Gazaland. *Ibis Ser.* **9**, no. 2: 1–107.

Swynnerton, C.F.M. (1916). Short cuts by birds to nectaries. *J. Linn. Soc. London (Bot.)* **43**: 381–415.

Sydemann, W.J. (1989). Effects of helpers on nestling care and breeder survival in Pygmy Nuthatches. *Condor* **91**(1): 147–155.

Sydemann, W.J., Güntert, M. & Balda, R.P. (1988). Annual reproductive yield in the cooperative Pygmy Nuthatch (*Sitta pygmaea*). *Auk* **105**(1): 70–77.

Sykes, D.T. (1984). Unusual nesting site of Collared Sunbird. *WBC News* **124**: 2.

Symes, C.T. & Marsden, S.J. (2005). Notes on breeding of Salvadori's Teal *Anas waiguiensis* and other birds in Crater Mountain Wildlife Management Area, Papua New Guinea. *Bull. Brit. Orn. Club* **125**(1): 11–27.

Symes, C.T., Downs, C.T. & Brown, M. (2001). Movements and timing of moult and breeding of the Cape White-eye *Zosterops pallidus* in KwaZulu-Natal. *Afring News* **30**(1): 35–39.

Symes, C.T., Downs, C.T. & McLean, S. (2001). Seasonal occurrence of the Malachite Sunbird, *Nectarina famosa*, and Gurney's Sugarbird, *Promerops gurneyi*, in KwaZulu-Natal, South Africa. *Ostrich* **72**(1/2): 45–49.

Symes, C.T., Nicolson, S.W. & McKechnie, A.E. (2008). Response of avian nectarivores to the flowering of *Aloe malotrichi*: a nectar oasis during dry South African winters. *J. Orn.* **149**(1): 13–22.

Szabo, J.K., Davy, P.J., Hooper, M.J. & Astheimer, L.B. (2007). Predicting spatio-temporal distribution for eastern Australian birds using Birds Australia's Atlas data: survey method, habitat and seasonal effects. *Emu* **107**(2): 89–99.

Szeczykutowicz, A., Adamski, Z., Hromada, M. & Tryjanowski, P. (2006). Patterns in the distribution of avian lice (Phthiraptera: Amblycera, Ischnocera) living on the Great Grey Shrike *Lanius excubitor*. *Parasitol. Res. (Berlin)* **98**: 507–510.

Taburton, M.K. (1992). Weights of some birds from Fiji. *Bull. Brit. Orn. Club* **112**: 34–36.

Tadmor-Melamed, H., Markman, S., Arieli, A., Distl, M., Wink, M. & Izhaki, I. (2004). Limited ability of Palestine Sunbirds *Nectarinia osea* to cope with pyridine alkaloids in nectar of tree tobacco *Nicotiniana glauca*. *Functional Ecol.* **18**: 844–850.

Takagi, M. (1996a) A sexual difference in plumage of Brown Shrikes, subspecies *Lanius cristatus superciliosus*. *J. Yamashina Inst. Orn.* **28**: 103–105.

Takagi, M. (1996b). Sexual size dimorphism and sex determination of a Brown Shrike subspecies, *Lanius cristatus superciliosus*. *Jap. J. Orn.* **45**: 187–190.

Takagi, M. (1999). Some avian morphological traits: age-related morphological difference of the Bull-headed Shrike *Lanius bucephalus*. *Ibis* **141**: 140–141.

- Takagi, M.** (2000). Plumage, morphology, distribution and breeding ecology of the Bull-headed Shrikes on Minami-daito island. *J. Yamashina Inst. Orn.* **32**: 12–23. In Japanese with English summary.
- Takagi, M.** (2001). Some effects of inclement weather conditions on the survival and condition of Bull-headed Shrike nestlings. *Ecol. Res.* **16**: 55–63.
- Takagi, M.** (2002a). Change in body mass in relation to breeding phase in Bull-headed Shrikes. *Ecol. Res.* **17**: 411–414.
- Takagi, M.** (2002b). Reproductive performance and nestling growth of the Brown Shrike subspecies *Lanius cristatus superciliosus* in Hokkaido. *J. Yamashina Inst. Orn.* **34**: 30–38.
- Takagi, M.** (2002c). Prudent investment in rearing nestlings in Bull-headed Shrikes. *Ecol. Res.* **17**: 617–624.
- Takagi, M.** (2002d). Hatching pattern and egg volume variation within a clutch in relation to sibling competition. *Proc. Jap. Soc. Comp. Endocrinology* **17**: 4–5.
- Takagi, M.** (2003a). Different age-effects on reproductive performance in relation to breeding stage in Bull-headed Shrikes. *J. Ethol.* **21**: 9–14.
- Takagi, M.** (2003b). Philopatry and habitat selection in Bull-headed and Brown Shrikes. *J. Field Orn.* **74**: 45–52.
- Takagi, M.** (2003c). Seasonal change of egg volume variation within a clutch in the Bull-headed Shrike, *Lanius bucephalus*. *Can. J. Zool.* **81**: 287–293.
- Takagi, M.** (2004). The timing of clutch initiation in Bull-headed Shrikes (*Lanius bucephalus*) in relation to re-nesting or second nesting. *Ornis Fenn.* **81**: 84–90.
- Takagi, M. & Abe, S.** (1996). Seasonal change of nest site and nest success in Bull-headed Shrikes. *Jap. J. Orn.* **45**: 167–174.
- Takagi, M. & Ogawa, I.** (1995). Comparative studies on nest sites and diet of *Lanius bucephalus* and *L. cristatus* in northern Japan. *Proc. West. Found. Vert. Zool.* **6**: 200–203.
- Talmage, M.E.** (1993). Cooperative feeding by Red Wattlebirds and White-plumed Honeyeaters February 1993. *Victorian Orn. Res. Group Notes* **28**(1/2): 19–24.
- Tan, R.** (2001). Black-naped Oriole *Oriolus chinensis*. URL: http://www.naturia.per.sg/buloh/birds/Oriolus_chinensis.htm (download 25 November 2007).
- Tarboton, W.R.** (2001). *A Guide to the Nests and Eggs of Southern African Birds*. Struik, Cape Town.
- Tarboton, W.R., Lewis, M. & Kemp, A.** (1978). The status of the Black Sparrowhead [sic: hawk] in Transvaal. *Bokmakierie* **30**: 56–59.
- Tarburton, M.K.** (1992). Weights of some birds from Fiji. *Bull. Brit. Orn. Club* **112**(1): 34–36.
- Tarburton, M.K.** (2001). Observations on the status of the land birds, wading birds and seabirds of Samoa. *Emu* **101**(4): 349–360.
- Tarr, H.E.** (1948). Birds of Dunk Island, North Queensland. *Emu* **48**(1): 8–13.
- Taylor, I.** (1987). Breeding data from suburban gardens, Canberra, 1981 to 1984. *Canberra Bird Notes* **12**(1): 8–13.
- Taylor, I.M.** (1986). The status of the Yellow-tufted Honeyeater in the Canberra district. *Canberra Bird Notes* **11**(3): 100–103.
- Taylor, J.S.** (1946). Notes on the Malachite Sunbird, *Nectarinia famosa*. *Ostrich* **17**: 254–257.
- Taylor, J.S.** (1949). Dipterous parasites of nestling birds. *Ostrich* **20**: 171.
- Taylor, M. ed.** (1992). *Birds of the Australian Capital Territory. An Atlas*. Canberra Ornithologists Group & National Capital Planning Authority, Canberra, Australian Capital Territory.
- Taylor, P.W.** (1987). Birds of the Port Wakefield district, 1968–1985. *South Austr. Orn.* **30**(3): 62–73.
- Taylor, R., Duckworth, P., Johns, T. & Warren, B.** (1997). Succession in bird assemblages over a seven-year period in regrowth dry sclerophyll forest in south-east Tasmania. *Emu* **97**(3): 220–230.
- Taylor, T.W.** (1934). Breeding of New Zealand *Zosterops*. *Avicult. Mag.* **12**: 246–247.
- Taylor, W.K.** (1970a). Some taxonomic comments on the genus *Auriparus*. *Auk* **87**(2): 363–366.
- Taylor, W.K.** (1970b). Molts of the Verdin *Auriparus flaviceps*. *Condor* **72**: 493–496.
- Taylor, W.K.** (1971). A breeding biology study of the Verdin *Auriparus flaviceps* (Sundevall) in Arizona. *Amer. Midl. Nat.* **85**(2): 289–328.
- Tehsin, R.H. & Tehsin, H.** (1998). White-eye (*Zosterops palpebrosa*) feeding the chicks of Paradise Flycatcher (*Terpsiphone paradisi*). *J. Bombay Nat. Hist. Soc.* **95**: 348.
- Telfer, E.S.** (1992). Habitat change as a factor in the decline of the Western Canadian Loggerhead Shrike *Lanius ludovicianus* population. *Can. Field-Nat.* **106**: 321–326.
- Telfer, E.S., Adam, C., DeSmet, K. & Wershler, R.** (1989). Status and distribution of the Loggerhead Shrike in Western Canada. *Can. Wildl. Serv. Progress Notes* **184**: 1–4.
- Telleria, J.L., Asensio, B. & Díaz, M.** (1999). *Aves Ibéricas*. Vol. 2. Passeriformes. J. M. Reyero, Madrid.
- Temple, P.** (1969). *Nawok! The New Zealand Expedition to New Guinea's Highest Mountains*. Dent, London.
- Temple, S.A.** (1974). Wildlife in Mauritius today. *Oryx* **12**: 584–590.
- Temple, S.A.** (1981). Applied island biogeography and the conservation of endangered island birds in the Indian Ocean. *Biol. Conserv.* **20**: 147–161.
- Temple, S.A.** (1995a). When and where are shrike populations limited? *Proc. West. Found. Vert. Zool.* **6**: 6–10.
- Temple, S.A.** (1995b). Priorities for shrike research and conservation. *Proc. West. Found. Vert. Zool.* **6**: 296–298.
- Templeton, C.N. & Greene, E.** (2007). Nuthatches eavesdrop on variations in heterospecific chickadee mobbing alarm calls. *Proc. Natl. Acad. Sci. USA* **104**(13): 5479–5482.
- Templeton, M.T.** (1992). Birds of Nanango, south-east Queensland. *Sunbird* **22**(4): 87–110.
- Tennyson, A.J.D. & Millener, P.R.** (1994). Bird extinctions and fossil bones from Mangere Island, Chatham Islands. *Notornis* **41** (Suppl.): 165–178.
- Tenovuo, J. & Varrelä, J.** (1998). Identification of the Great Grey Shrike complex in Europe. *Alula* **1**: 2–11.
- Terborgh, J. & Diamond, J.M.** (1970). Niche overlap in feeding assemblages of New Guinea birds. *Wilson Bull.* **82**: 29–52.
- Terres, J.K.** (1980). *The Audubon Society Encyclopedia of North American Birds*. Alfred A. Knopf, New York.
- Terrill, S.B.** (1990). Ecophysiological aspects of movements by migrants in the wintering quarters. Pp. 130–143 in: Gwinner (1990a).
- Terrill, S.B. & Ohmart, R.D.** (1984). Facultative extension of fall migration by Yellow-rumped Warblers (*Dendroica coronata*). *Auk* **101**: 427–438.
- Terrill, S.E. & Rix, C.E.** (1944). A honeyeaters' banquet. *South Austr. Orn.* **17**(2): 17–18.
- Terrill, S.E. & Rix, C.E.** (1950). The birds of South Australia: their distribution and habitat. *South Austr. Orn.* **19**: 53–100.
- van Tets, I.G. & Nicolson, S.W.** (2000). Pollen and nitrogen requirements of the Lesser Double-collared Sunbird. *Auk* **117**: 826–830.
- Thair, S.** (1976). The Yellowish Honeyeater *Meliphaga flavescens*. *Papua New Guinea Bird Soc. Newsl.* **127**: 10.
- Thaler, E.** (1997). Der Vogel, der aus der Kälte kam – das Purpurhähnchen *Leptopoecile sophiae* – Haltung, Verhalten und Zucht. [Parts 1–2]. *Gefiederte Welt* **121**(5): 158–160; **121**(6): 189–192. In German.
- Thaler-Kottek, E.** (1988). Kleinvogelhaltung im Alpenzoo Innsbruck. *Gefiederte Welt* **112**: 247–249. In German.
- Thayer, J.E. & Bangs, O.** (1912). Some Chinese vertebrates, Aves. *Mem. Mus. Comp. Zool. Harvard* **40**(4): 137–200.
- Thet Zaw Naing** (2003). Ecology of the White-browed Nuthatch *Sitta victoriae* in Natmataung National Park, Myanmar, with notes on other significant species. *Forktail* **19**: 57–62.
- Thévenot, M., Vernon, R. & Bergier, P.** (2003). *The Birds of Morocco: an Annotated Checklist*. British Ornithologists' Union Checklist **20**. British Ornithologists' Union & British Ornithologists' Club, Tring, UK.
- Thewlis, R.M., Duckworth, J.W., Anderson, G.Q.A., Dvorak, M., Evans, T.D., Nemeth, E., Timmins, R.J. & Wilkinson, R.J.** (1996). Ornithological records for Laos, 1992–1993. *Forktail* **11**: 47–100.
- Thibault, J.C.** (1983). *Les Oiseaux de la Corse: Histoire et Répartition aux XIXe et XXe Siècles*. Parc Naturel Régional de la Corse, Ajaccio, Corse. In French.
- Thibault, J.C. & Bonaccorsi, G.** (1999). *The Birds of Corsica. An Annotated Checklist*. British Ornithologists' Union Checklist **17**. British Ornithologists' Union, Tring, UK.
- Thibault, J.C. & Jenouvrier, S.** (2006). Annual survival rates of adult male Corsican Nuthatches *Sitta whiteheadi*. *Ringed & Migration* **23**: 85–88.
- Thibault, J.C. & Villard, P.** (2005a). Reproductive ecology of the Corsican Nuthatch. *Bird Study* **52**: 282–288.
- Thibault, J.C. & Villard, P.** (2005b). Taking quick advantage of a crisis: behaviour of Corsican Nuthatches after a wildfire. *British Birds* **98**: 158–159.
- Thibault, J.C., Moneglia, P. & Beck, N.** (2002). Les conséquences de l'incendie de l'été 2000 sur l'effectif de la Sittelle corse (*Sitta whiteheadi*) dans la vallée de la Restonica, Corse. *Alauda* **70**: 431–436. In French.
- Thibault, J.C., Prodon, R., Villard, P. & Seguin, J.F.** (2006). Habitat requirements and foraging behaviour of the Corsican Nuthatch *Sitta whiteheadi*. *J. Avian Biol.* **37**(5): 477–486.
- Thibault, J.C., Seguin, J.F., Villard, P. & Prodon, R.** (2002). Le pin laricio (*Pinus nigra laricio*) est-il une espèce clé pour la Sittelle corse (*Sitta whiteheadi*)? *Rev. Écol. (Terre Vie)* **57**(3/4): 329–341. In French with English summary.
- Thielecke, G.** (1961). Stammesgeschichte und geographische Variation des Gesanges unserer Baumläufer (*Certhia familiaris* L. und *Certhia brachydactyla* Brehm). *Z. Tierpsychol.* **18**: 188–204. In German.
- Thielecke, G.** (1962). Versuche mit Klangattrappen zur Klärung der Verwandtschaft der Baumläufer *Certhia familiaris* L., *C. brachydactyla* Brehm und *C. americana* Bonaparte. *J. Orn.* **103**(2/3): 266–271. In German.
- Thielecke, G.** (1973). On the origin of divergence of learned signals (songs) in isolated populations. *Ibis* **115**(4): 511–516.
- Thielecke, G.** (1986). Waldbaumläufer (*Certhia familiaris*) singen bei Sympatrie mit dem Gartenbaumläufer (*C. brachydactyla*) nicht kontrastreicher. *J. Orn.* **127**(1): 43–49. In German with English summary.
- Thielecke, G.** (1987). Langjährige Dialektkonstanz beim Gartenbaumläufer (*Certhia brachydactyla*). *J. Orn.* **128**(2): 171–180. In German with English summary.
- Thielecke, G.** (1992). Stabilität und Änderungen von Dialekten und Dialektgrenzen beim Gartenbaumläufer (*Certhia brachydactyla*). *J. Orn.* **133**(1): 43–59. In German with English summary.
- Thomas, D.A.G.** (1947). Birds seen in the Northern Territory. *South Austr. Orn.* **18**: 55–60, 62–65.
- Thomas, D.G.** (1965). Birds of the R.A.O.U. 1964 field outing, Bicheno district, Tasmania. *Emu* **64**(3): 220–228.
- Thomas, D.G.** (1968). Bird movements in southern Victoria and Tasmania 1965–66. First report of the Individual Observation Points Scheme. *Emu* **68**(1): 42–84.
- Thomas, D.G.** (1969). Individual Observation Points second annual report, August 1966–July 1967. *Emu* **68**(4): 249–271.
- Thomas, D.G.** (1972). Birds of a suburban garden. *Tasmanian Nat.* **31**: 5–8.
- Thomas, D.G.** (1979). *Tasmanian Bird Atlas*. University of Tasmania, Hobart, Tasmania.
- Thomas, D.G.** (1986). Foraging of honeyeaters in an area of Tasmanian sclerophyll forest. *Emu* **80**(2): 55–58.
- Thomas, D.G.** (1986). The birds of Mt Wellington – comparison of two 10 ha plots of dry and wet sclerophyll. *Tasmanian Bird Rep.* **15**: 11–16.
- Thomas, R. & Wheeler, J.** (1983). *Birds of the Ballarat Region*. Published privately, Linton, Victoria.
- Thomas, W.W.** (1964). A preliminary list of the birds of Cambodia. Unpubl.
- Thomas, W.W. & Poole, C.M.** (2003). An annotated list of the birds of Cambodia from 1859 to 1970. *Forktail* **19**: 103–127.
- Thompson, B.** (1992). Recently fledged Long-tailed Tits in February. *British Birds* **85**: 618–619.
- Thompson, H.A.F.** (1978). Common birds of the Darwin suburbs. *North. Territ. Naturalist* **1**: 7–12.
- Thompson, H.A.F.** (1983). Birds recorded on a visit to South Goulburn Island, Northern Territory. *Sunbird* **13**(2): 21–30.
- Thompson, M.C.** (1966). Birds from North Borneo. *Univ. Kansas Publ. Mus. Nat. Hist.* **17**(8): 377–433.
- Thompson, P.M. & Johnson, D.L.** (2003). Further notable bird records from Bangladesh. *Forktail* **19**: 85–102.
- Thomson, D.F.** (1935). *Birds of Cape York Peninsula: Ecological Notes. Field Observations, and Catalogue of Specimens Collected on Three Expeditions to North Queensland*. H.J. Green, Melbourne & Adelaide.
- Thomson, G.M.** (1922). *The Naturalisation of Animals and Plants in New Zealand*. Cambridge University Press, Cambridge, UK.
- Thonnerieux, Y., Walsh, J.F. & Bortoli, L.** (1989). L'avifaune de la ville de Ouagadougou et ses environs (Burkina Faso). *Malimbus* **11**(1): 7–40. In French with English summary.
- Thornton, I.W.B., Zann, R.A. & van Balen, S. [= B.]** (1993). Colonization of Rakata (Krakatau Is.) by non-migrant land birds from 1883 to 1992 and implications for the value of island equilibrium theory. *J. Biogeogr.* **20**: 441–452.
- Thorpe, J.** (1975). Notes on flowerpeckers, their allies and their habits. *Foreign Birds* **39**(2): 75–77.
- Tian Yingzhou, Guan Shaorong & Li Song** (1995). [The discovery of Red-winged Wall Creeper in Liu Panshui, Guizhou province]. *Chinese J. Zool.* **30**(2): 50. In Chinese.
- Tiechurst, C.B.** (1918). The plumage of the Purple Honeysucker (*Arachnechthra asiatica*). *J. Bombay Nat. Hist. Soc.* **25**: 286–287.
- Tidemann, S.C. & Wilson, B.A.** (1992). Bird assemblages in relation to habitat measures in Gregory National Park, Northern Territory. *J. Roy. Soc. West. Austr.* **75**(1): 9–18.
- Tidemann, S.C., Wilson, S.J. & Marples, T.G.** (1988). Some results from a long-term bird-banding project in the Brindabella Range, A.C.T. *Corella* **12**(1): 1–6.
- Tietze, D.T.** (2007). *Differentiation Processes in Treecreepers (Aves: Certhia): Phylogeny, Vocalisations, Morphometrics*. PhD thesis, Johannes Gutenberg-Universität Mainz, Germany. In English with German summary.
- Tietze, D.T. & Martens, J.** (2008). African Spotted Creepers (*Salpornis pilonotus*) make up a species on their own. MS.
- Tietze, D.T., Martens, J. & Sun Yuehua** (2006). Molecular phylogeny of treecreepers (*Certhia*) detects hidden diversity. *Ibis* **148**: 477–488.
- Tilford, T.** (2003). *A Photographic Guide to Birds of Java, Sumatra and Bali*. New Holland, London.
- Timewell, C.A.R. & Mac Nally, R.** (2004). Diurnal foraging-mode shifts and food availability in nectarivore assemblages during winter. *Austr. Ecol.* **29**(3): 264–277.
- Timmins, R.** (1992). Is the Cebu Flowerpecker extinct? *Bull. Oriental Bird Club* **15**: 10–11.
- Tingay, A. & Tingay, S.R.** (1983). Bird communities in the karri forest of Western Australia. Report to Australian Conservation Foundation. Unpubl.
- Tjorve, K.M.C.** (2007). What can nest record cards tell us about timing of nesting and nesting success of Cape Sugarbirds (*Promerops cafer*)? *Ostrich* **78**(3): 649–652.
- Tjorve, K.M.C. & Scholtz, G.** (2007). Morphological characteristics of Cape Sugarbirds (*Promerops cafer*) from Helderberg Nature Reserve. *Afr. Zool.* **42**(2): 199–203.
- Tjorve, K.M.C., Geertsema, G.H. & Underhill, L.G.** (2005). Do sugarbirds feed on arthropods inside or outside *Protea* inflorescences? *Emu* **105**: 293–297.
- Tokue, K. & Ford, H.A.** (2006). Influence of food and nest predation on the life histories of two large honeyeaters. *Emu* **106**(4): 273–281.
- Tokue, K. & Ford, H.A.** (2007). The influence of patterns of food abundance on the breeding seasons and clutch-size of Red Wattlebirds and Noisy Friarbirds. *Emu* **107**(2): 151–155.
- Tolhurst, L.P.** (1988). Range extension for Red-headed *Myzomela erythrocephala*. *Muruk* **3**(2): 54.
- Tolhurst, L.P.** (1990). Extension of the known range of Helmeted Friarbird *Philemon buceroides*. *Muruk* **4**(2): 62.

Tolhurst / Vaucher

- Tolhurst, L.P. (1991). Recent observations from the Eastern Highlands, Enga and Gulf Provinces. *Muruk* 5(1): 15–18.
- Tolhurst, L.P. (1992). Helmeted Friarbird *Philemon buceroides* feeding on red ants. *Muruk* 5(3): 143.
- Tolhurst, A.P. & Larsen, J.L. (2003). Observations from Manus Province. *Muruk* 6(1): 15–18.
- Tomek, T. (2002). The birds of North Korea. Passeriformes. *Acta Zool. Cracoviensia* 45(1): 1–235.
- Tomlinson, W. (1950). Bird notes chiefly from the northern frontier district of Kenya. Part 2. *J. East Afr. Nat. Hist. Soc.* 19: 225–250.
- Tong Junchang, Zhou Weiwei, Yang Xueming & Jiang Muli (1985). Studies on the breeding ecology of the Penduline Tit [*Remiz pendulinus consobrinus*]. *Acta Zool. Sinica* 31(2): 154–161. In Chinese with English summary.
- Took, J.M.E. (1966). The nest of Souza's Shrike *Lanius souzae*. *Ostrich* 37: 155–156.
- Tottrup, A.P. & Larsen, J.L. (2005). First description of the egg with other notes on the biology of Loveridge's Sunbird *Nectarinia loveridgei*. *Scopas* 25: 37–40.
- Tottrup, A.P., Larsen, J.L. & Burgess, N.D. (2004). A first estimate of the population size of Loveridge's Sunbird *Nectarinia loveridgei*, endemic to the Uluguru Mountains, Tanzania. *Bird Conserv. Int.* 14(1): 25–32.
- Tracey, J.P., Woods, R., Roshier, D., West, P. & Saunders, G.R. (2004). The role of birds in the transmission of avian influenza for Australia: an ecological perspective. *Emu* 104(2): 109–124.
- Traill, B.J. (1985). Bird populations in pine plantations and native forest in Gippsland, Victoria. *Austr. Bird Watcher* 11(3): 74–79.
- Traill, B.J., Collins, E., Peake, P. & Jessup, S. (1996). Current and past status of the birds of Chiltern – a box-ironbark forest in north-eastern Victoria. *Austr. Bird Watcher* 16(8): 309–326.
- Trainor, C.R. (2002a). Birds of Gunung Tambora, Sumbawa, Indonesia: effects of altitude, the 1815 cataclysmic volcanic eruption and trade. *Forktail* 18: 49–61.
- Trainor, C.R. (2002b). The birds of Adonara, Lesser Sunda, Indonesia. *Forktail* 18: 93–100.
- Trainor, C.R. (2002c). Status and habitat associations of birds on Lembata island, Wallacea, Indonesia, with reference to a simple technique for avifaunal survey on small islands. *Bird Conserv. Int.* 12: 365–381.
- Trainor, C.R. (2002d). An expedition to Damar island, south-west Maluku, Indonesia. *Bull. Oriental Bird Club* 36: 18–23.
- Trainor, C.R. (2003a). The birds of Lembata, Lesser Sunda, Indonesia. *Kukula* 12: 39–53.
- Trainor, C.R. (2003b). Recent bird observations from Kisar island, Lesser Sunda. *Kukula* 12: 54–58.
- Trainor, C.R. (2005a). Species richness, habitat use and conservation of birds of Alor island, Lesser Sunda, Indonesia. *Emu* 105: 127–135.
- Trainor, C.R. (2005b). Birds of Tapuifu Peninsula, Roti Island, Lesser Sunda, Indonesia. *Forktail* 21: 121–131.
- Trainor, C.R. (2007a). Birds of Damar island, Banda Sea, Indonesia. *Bull. Brit. Orn. Club* 127(4): 300–321.
- Trainor, C.R. (2007b). Changes in bird species composition on a remote and well-forested Wallacean island, South-east Asia. *Biol. Conserv.* 140: 273–385.
- Trainor, C.R. & Soares, T. (2004). Birds of Atauro Island, Timor-Leste (East Timor). *Forktail* 20: 41–48.
- Trainor, C.R., Coates, B.J., Bishop, K.D. & Gardner, D. (2007). *As Aves de Timor-Leste. Burung-burung di Timor-Leste*. The Birds of Timor-Leste. BirdLife International & Dove Publications, Jakarta, Indonesia.
- Trainor, C.R., Santana, F., Pinto, P., Xavier, A.F., Safford, R. & Grimmett, R. (2008). Birds, birding and conservation in Timor-Leste. *Birding Asia* 9: 16–45.
- Travis, J. (1982). A method for the statistical analysis of time energy budgets. *Ecology* 63: 19–25.
- Traylor, M.A. (1962). Notes on the birds of Angola, passerines. *Publ. Cult. Co. Diamantes Angola* 58: 53–142.
- Traylor, M.A. (1967). A collection of birds from Szechwan. *Fieldiana Zool.* 53(1): 1–67.
- Traylor, M.A. (1968). Family Estrildidae – waxbills, grass finches, and mannikins (African). Pp. 306–390 in: Paynter, R.A. ed. (1968). *Check-list of Birds of the World. A Continuation of the Work of James L. Peters*. Vol. 14. Museum of Comparative Zoology, Cambridge, Massachusetts.
- Traylor, M.A. & Archer, A.L. (1982). Some results of the Field Museum 1977 Expedition to South Sudan. *Scopas* 6(1): 5–12.
- Traylor, M.A. & Parelis, D. (1967). A collection of birds from the Ivory Coast. *Fieldiana Zool.* 51: 91–117.
- Tree, A.J. (1988). Ringing report for the association 1986/87. *Honeyguide* 34: 86–88.
- Tree, A.J. (1990). Notes on sunbird movements and nectar sources in Zimbabwe. *Honeyguide* 36: 171–182.
- Tree, A.J. (1991). A ringing guide to selected species of Zimbabwean sunbirds. *Safring News* 20: 13–20.
- Tree, A.J. (1997a). Bronze Sunbird *Nectarinia kilimensis*. Page 491 in: Harrison *et al.* (1997).
- Tree, A.J. (1997b). Purplebacked Sunbird *Nectarinia bifasciata*. Pp. 496–497 in: Harrison *et al.* (1997).
- Tree, A.J. (1997c). Copper Sunbird *Nectarinia cuprea*. Page 498 in: Harrison *et al.* (1997).
- Tree, A.J. (1997d). Miombo Doublecollared Sunbird *Nectarinia manoensis*. Pp. 502–503 in: Harrison *et al.* (1997).
- Tree, A.J. (1997e). Yellowbellied Sunbird *Nectarinia venusta*. Pp. 506–507 in: Harrison *et al.* (1997).
- Tree, A.J. (1997f). Whitebellied Sunbird *Nectarinia talatata*. Pp. 508–509 in: Harrison *et al.* (1997).
- Tree, A.J. (1997g). Grey Sunbird *Nectarinia veronii*. Pp. 512–513 in: Harrison *et al.* (1997).
- Tree, A.J. (1997h). Olive Sunbird *Nectarinia olivacea*. Pp. 514–515 in: Harrison *et al.* (1997).
- Tree, A.J. (1997i). Scarletchested Sunbird *Nectarinia senegalensis*. Pp. 516–517 in: Harrison *et al.* (1997).
- Tree, A.J. (1997j). Black Sunbird *Nectarinia amethystina*. Pp. 518–520 in: Harrison *et al.* (1997).
- Tree, A.J. (1997k). Violetbacked Sunbird *Antheptes longuemareii*. Page 521 in: Harrison *et al.* (1997).
- Tree, A.J. (1997m). Collared Sunbird *Antheptes collaris*. Pp. 524–525 in: Harrison *et al.* (1997).
- Tree, A.J. (2001). Evidence for eclipse plumage in the Lesser Doublecollared Sunbird. *Afring News* 30(1): 30–31.
- Tree, A.J. (2002). Xanthochroism in a Cape White-eye [*sic*]. *Bee-eater* [& BirdLife E Cape News] 53(2): 29.
- Tree, A.J., Hustler, K., Aspinwall, D.R. & Fernsby, N. (1991). Shelley's Sunbird in Zimbabwe: the first certain record south of the Zambezi. *Honeyguide* 37: 120–122.
- Trémont, S. & Williams, B. (1999). Observations at nests of the Painted Honeyeater *Grantiella picta*. *Austr. Bird Watcher* 18(2): 49–58.
- Tristram, H.B. (1876). Notes on a collection of birds from the New Hebrides. *Ibis Ser.* 3, no. 6: 259–267.
- Tristram, H.B. (1879). Notes on collections of birds sent from New Caledonia, from Lifu (one of the Loyalty Islands), and from the New Hebrides by E.L. Layard, C.M.G. &c. *Ibis Ser.* 4, no. 3: 180–195.
- Tristram, H.B. (1894). On some birds from Bugotu, Solomon Islands, and Santa Cruz. *Ibis Ser.* 6, no. 6: 28–31.
- Trollope, J. (1987). Breeding the Japanese White-eye. *Avicult. Mag.* 93: 190–193.
- Tryjanowski, P. (1999). Clutch size in relation to nest size in the Red-backed Shrike *Lanius collurio*. *Vogelwarte* 40: 149–150.
- Tryjanowski, P. (2002). A long-term comparison of laying date and clutch size in the Red-backed Shrike *Lanius collurio* in Silesia, southern Poland. *Acta Zool. Acad. Sci. Hung.* 48: 101–106.
- Tryjanowski, P. & Golawski, A. (2004). Sex differences in nest defense by the Red-backed Shrike: effect of offspring age, brood size and stage of the breeding season. *J. Ethol.* 22: 13–16.
- Tryjanowski, P. & Hromada, M. (2005). Do males of the Great Grey Shrike, *Lanius excubitor*, trade food for extrapair copulations? *Anim. Behav.* 69: 529–533.
- Tryjanowski, P. & Kuzniak, S. (1999). Effect of research activity on the success of Red-backed Shrike nests. *Ornis Fenn.* 76: 41–43.
- Tryjanowski, P. & Reino, L.M. (2004). Post-breeding habitat selection of the Grey-backed Shrike (*Lanius tephronotus*) in Sichuan, China. *Biol. Letters (Poznan)* 41: 195–197.
- Tryjanowski, P. & Sparks, T. (2001). Is the detection of the first arrival date of migrating birds influenced by population size? A case study of the Red-backed Shrike *Lanius collurio*. *Int. J. Biometeorology* 45: 217–219.
- Tryjanowski, P. & Yosef, R. (2002). Differences between the spring and autumn migration of the Red-backed Shrike *Lanius collurio*: record from the Eilat stopover (Israel). *Acta Orn. (Warszawa)* 37: 85–90.
- Tryjanowski, P., Hromada, M. & Antczak, M. (1999). Breeding habitat selection in the Great Grey Shrike *Lanius excubitor* – the importance of meadows & spring crops. *Acta Orn. (Warszawa)* 34: 59–63.
- Tryjanowski, P., Hromada, M., Antczak, M., Grzybek, J., Kuniak, S. & Lorek, G. (2003). Which method is most suitable for censusing breeding populations of Red-backed (*Lanius collurio*) and Great Grey (*L. excubitor*) Shrikes? *Ornis Hungarica* 12/13: 223–228.
- Tryjanowski, P., Karg, M.K. & Karg, J. (2003a). Assessing shrike diet: comparing collars, pellets and prey remains in the Red-backed Shrike. *Acta Orn. (Warszawa)* 37: 67–72.
- Tryjanowski, P., Karg, M.K. & Karg, J. (2003b). Diet composition and prey choice by the Red-backed Shrike *Lanius collurio* in western Poland. *Belg. J. Zool.* 133: 157–162.
- Tryjanowski, P., Kuzniak, S. & Diehl, B. (2000). Breeding success of the Red-backed Shrike in relation to nest site. *Ornis Fenn.* 77: 137–141.
- Tryjanowski, P., Sparks, T.H. & Crick, H.Q.P. (2006). Red-backed Shrike (*Lanius collurio*) nest performance in a declining British population: a comparison with a stable population in Poland. *Ornis Fenn.* 83: 181–186.
- Tubb, J.A. (1945). Field notes on some New Guinea birds. *Emu* 44: 249–273.
- Tucker, G.M. & Heath, M.F. eds. (1994). *Birds in Europe – Their Conservation Status*. BirdLife Conservation Series 3. BirdLife International, Cambridge, UK.
- Tullis, K.J. & Wooller, R.D. (1981). Interspecific feeding hierarchies in captive honeyeaters. *Bird Behaviour* 3: 93–95.
- Tullis, K.J., Calver, M.C. & Wooller, R.D. (1982). The invertebrate diets of small birds in Banksia woodland near Perth, W.A., during winter. *Austr. Wildl. Res.* 9(2): 303–309.
- Turbott, E.G. (1967). *Buller's Birds of New Zealand*. Whitcombe & Tombs, Christchurch.
- Turbott, E.G. & Buddle, G.A. (1948). Birds of the Three Kings Islands. *Records Auckland Inst. Mus.* 3: 319–336.
- Turnbull, M., Carey G.J., Lewthwaite, R.W. & Yu Yattung (2007). Systematic list 2001–02. Pp. 20–154 in: Turnbull, M., Carey G.J. & Lockey, H. eds. (2007). *The Hong Kong Bird Report 2001–02*. The Hong Kong Bird Watching Society, Hong Kong.
- Turner, D. (1995). Colonial nesting of figbirds. *Austr. Birds* 28(3): 71–75.
- Turner, D.A. & Forbes-Watson, A. (1979). *Nectarinia adelberti* au Cameroun. *Oiseau et RFO (Nouv. Sér.)* 49: 158. In French.
- Turner, R.J. (1992). Effect of wildfire on birds at Weddin Mountain, New South Wales. *Corella* 16(3): 65–74.
- Tweeddale, Marquis of (1877a). Description of some new species of birds. *Ann. Mag. Nat. Hist. Ser.* 4, no. 20: 533–538.
- Tweeddale, Marquis of (1877b). Reports on the collections of birds made during the voyage of HMS Challenger. Part 2. On the Birds of the Philippine islands. *Proc. Zool. Soc. London* 1877(3): 534–551.
- Tye, A. (1984). Attacks by shrikes *Lanius* spp. on wheatears *Oenanthe* spp.: competition, kleptoparasitism or predation? *Ibis* 126: 95–102.
- Tye, A. & MacAulay, L.R. (1993). The races of Olive Sunbird *Nectarinia olivacea* on the Gulf of Guinea islands. *Malimbus* 14(2): 65–66.
- Tyler, D. (1992). Black Sunbird at Dassies Hoek. *Promerops* 206: 15.
- Tyler, J.D. (1991). Vertebrate prey of the Loggerhead Shrike in Oklahoma. *Proc. Okla. Acad. Sci.* 71: 17–20.
- Tyler, J.D. (1992). Nesting ecology of the Loggerhead Shrike in southwestern Oklahoma. *Wilson Bull.* 104: 95–104.
- Tyler, S.J., Randall, R.D. & Brewster, C.A. (2008). New bird records for Botswana and additional information on some rarities. *Bull. Afr. Bird Club* 15(1): 36–52.
- van Tyne, J. & Berger, A.J. (1959). *Fundamentals of Ornithology*. John Wiley, New York.
- Tzaroos, C.L. (1992). Bell Miners *Manorina melanophrys* at Bendigo, Victoria. *Austr. Bird Watcher* 14(7): 258–259.
- Tzaroos, C.L. (1996). Observations on the ecology and breeding biology of the Speckled Warbler *Chthonicola sagittata* near Bendigo, Victoria. *Austr. Bird Watcher* 16(6): 221–235.
- Uchida, S. (1914). [*The Birds of Japan*]. Keiseisha, Tokyo. In Japanese.
- Ueno, Y. & Sato, H. (2001). Pair- and flock-formation of Long-tailed Tits *Aegithalos caudatus* in a coastal area of Hiroshima Prefecture. *Jap. J. Orn.* 50(2): 71–84. In Japanese with English summary.
- Uhlenhaut, K. (1999). Brutbiologische Beobachtungen und Untersuchungen am Pirol *Oriolus oriolus* L. 1758. *Orn. Jber. Mus. Heineanum* 17: 1–91. In German with English summary.
- Uhlig, R. (1983). Eine Gebäudebrut des Mauerläufers (*Tichodroma muraria*) im Rilagebirge. *Beitr. Vogelkd.* 29: 322–324. In German.
- Ulrich, B. (1971). Untersuchungen zur Ethologie und Ökologie des Rotkopfwürgers (*Lanius senator*) in Südwestdeutschland im Vergleich zu Raubwürger (*L. excubitor*), Schwarzstirnwürger (*Lanius minor*) und Neuntöter (*Lanius collurio*). *Vogelwarte* 26: 1–77.
- Ulrich, B. (1987a). Über die postnuptiale Mauser des Rotkopfwürgers (*Lanius senator*). *J. Orn.* 115: 79–85. In German with English summary.
- Ulrich, B. (1987b). Beringungsergebnisse aus einer Brutpopulation des Rotkopfwürgers (*Lanius senator*) im mittleren Altvorland, Kreis Göppingen und Esslingen. *Orn. Jahresh. Baden-Württemb.* 3: 107–112. In German.
- Ulrich, B. (1993). Verhaltensweisen des Rotkopfwürgers *Lanius senator* zur Verringerung von Feindverlusten. *Vogelwelt* 114: 98–113. In German.
- Ulrich, B. (2002). Verhaltensökologische Beobachtungen am Maskenwürger, *Lanius nubicus*, im Vergleich mit anderen Vögelarten der Gattung *Lanius* unter Berücksichtigung ökomorphologischer Besonderheiten. *Ökol. Vögel* 24: 523–558. In German with English summary.
- Underhill, L.G. & Fraser, M.W. (1989). Bayesian estimate of the number of Malachite Sunbirds feeding at an isolated and transient nectar source. *J. Field Orn.* 60: 382–387.
- Unnithan, S. (1996). Variations in Olivebacked Sunbirds *Nectarinia jugularis* (Linnaeus) of Andaman, Car, Central and Great Nicobar Island. *J. Bombay Nat. Hist. Soc.* 93(2): 297–298.
- Urban, E.K. & Brown, L.H. (1971). *A Checklist of the Birds of Ethiopia*. Department of Biology, Haile Sellassie i University Press, Addis Ababa.
- Uys, C.J. (1981a). Lesser Double-collared Sunbird (760) nesting in suburban garden, Newlands. *Promerops* 146: 6–7.
- Uys, C.J. (1981b). Malachite Sunbird nesting in unusual site. *Promerops* 147: 6.
- Vahnsberg, D. & Evans, A. (2002). Habitat associations of the Red-backed Shrike in Carinthia, Austria. *J. Orn.* 143: 405–415.
- Valera, F., Hoi, H. & Kristin, A. (2006). Parasite pressure and its effects on blood parameters in a stable and dense population of the endangered Lesser Grey Shrike. *Biodiversity & Conservation* 15: 2187–2195.
- Valera, F., Hoi, H. & Schleicher, B. (1997). Egg burial in Penduline Tits, *Remiz pendulinus*: its role in mate desertion and female polyandry. *Behav. Ecol.* 8(1): 20–27.
- Valera, F., Kristin, A. & Hoi, H. (2001). Why does the Lesser Grey Shrike (*Lanius minor*) seldom store food? Determinants of impaling in an uncommon storing species. *Behaviour* 138: 1421–1436.
- Valera, F., Rey, P., Sanchez-Lafuente, A.M. & Muñoz-Cobo, J. (1990). The situation of Penduline Tit (*Remiz pendulinus*) in Southern Europe: a new stage of its expansion. *J. Orn.* 131(4): 413–420.
- Vali, U. (2005). Habitat use of the Red-backed Shrike in Estonia. *Hirundo (Tartu)* 18: 10–17.
- Vallianatos, M., Loughheed, S.C. & Boag, P.T. (2001). Phylogeography and genetic characteristics of a putative secondary-contact zone of the Loggerhead Shrike in central and eastern North America. *Can. J. Zool.* 79(12): 2221–2227.
- Vallianatos, M., Loughheed, S.C. & Boag, P.T. (2002). Conservation genetics of the Loggerhead Shrike (*Lanius ludovicianus*) in central and eastern North America. *Conserv. Genetics* 3(1): 1–13.
- Vatev, I.T., Simeonov, P.S., Michev, T.M. & Ivanov, B.E. (1980). The Masked Shrike (*Lanius nubicus* Lichtenstein) – a breeding species in Bulgaria. *Acta Zool. Bulg.* 15: 115–118. In Bulgarian with English summary.
- Vaucher, C. (1945). Calendrier ornithologique: Tichodrome *Tichodroma muraria* (L.). [Part 2]. *Nos Oiseaux* 18: 75. In French.

- Vaughan, J.H. (1930). On the birds of Zanzibar and Pemba. *Ibis Ser.* **12**, no. 6: 1–48.
- Vaughton, G. (1990). Seasonal variation in honeyeater foraging behaviour, inflorescence abundance and fruit set in *Banksia spinulosa* (Proteaceae). *Austr. J. Ecol.* **15**(1): 109–116.
- Vaurie, C. (1950a). Notes on some Asiatic titmice. *Amer. Mus. Novit.* **1459**: 1–66.
- Vaurie, C. (1950b). Notes on some Asiatic nuthatches and creepers. *Amer. Mus. Novit.* **1472**: 1–39.
- Vaurie, C. (1952). Additional systematic notes on the titmice of the *Remiz pendulinus* group (Aves). *Amer. Mus. Novit.* **1549**: 1–5.
- Vaurie, C. (1955). Systematic notes on Palearctic birds. No. 17. Laniidae. *Amer. Mus. Novit.* **1752**: 1–19.
- Vaurie, C. (1957a). Systematic notes on Palearctic birds. No. 28. The families Remizidae and Aegithalidae. *Amer. Mus. Novit.* **1853**: 1–21.
- Vaurie, C. (1957b). Systematic notes on Palearctic birds. No. 29. The subfamilies Tichodromadinae and Sittinae. *Amer. Mus. Novit.* **1854**: 1–26.
- Vaurie, C. (1957c). Systematic notes on Palearctic birds. No. 30. The Certhiidae. *Amer. Mus. Novit.* **1855**: 1–14.
- Vaurie, C. (1957d). Systematic notes on Palearctic birds. No. 31. Sylviinae: the genus *Leptopoecile*. *Amer. Mus. Novit.* **1856**: 1–7.
- Vaurie, C. (1958). Systematic notes on Palearctic birds. No. 32. Oriolidae, Dicruridae, Bombycillidae, Pycnonotidae, Nectariniidae, and Zosteropidae. *Amer. Mus. Novit.* **1869**: 1–28.
- Vaurie, C. (1959). *The Birds of the Palearctic Fauna: a Systematic Reference. Order Passeriformes*. H.F.&G. Witherby, London.
- Vaurie, C. (1972). *Tibet and its Birds*. H.F.&G. Witherby, London.
- Veerman, P.A. (1992). Vocal mimicry of larger honeyeaters by the Regent Honeyeater *Xanthomyza phrygia*. *Austr. Bird Watcher* **14**(5): 180–189.
- Veerman, P.A. (1994). Batesian acoustic mimicry by the Regent Honeyeater *Xanthomyza phrygia*. *Austr. Bird Watcher* **15**(6): 250–259.
- Veitch, C.R. (2003). Counts of forest birds on Raoul Island, Kermadec group. *Notornis* **50**(2): 116–117.
- Veitch, C.R., Miskelly, C.M., Harper, G.A., Taylor, G.A., & Tennyson, A.J.D. (2004). Birds of the Kermadec Islands, South-west Pacific. *Notornis* **51**(2): 61–90.
- Velevski, M. (2001). New data on distribution of the Masked Shrike *Lanius nubicus* in Macedonia: further evidence for the expansion of its range on the Balkan Peninsula. *Acrocephalus* **22**: 159–161.
- Veltman, C.J., Nee, S., & Crawley, M.J. (1996). Correlates of introduction success in exotic New Zealand birds. *Amer. Naturalist* **147**: 542–557.
- Verbeek, N.A.M., Braithwaite, R.W., & Boasson, R. (1993). The importance of *Pandanus spiralis* to birds. *Emu* **93**(1): 53–58.
- Verbelen, F. (1996). Birding in Seram, Kai and Tanimbar. Report available from Oriental Bird Club. Unpubl.
- Verheijen, J.A.J. (1961). Some notes on the birds of the island of Paluë, Flores, observed from 13th April to 5th May 1960. *Ardea* **49**: 183–187.
- Verheijen, J.A.J. (1964). Breeding season on the island of Flores, Indonesia. *Ardea* **52**(3/4): 194–201.
- Verheijen, J.A.J. (1976). Some data on the avifauna of the island of Roti, Lesser Sunda Islands, Indonesia. *Zool. Meded. Leiden* **50**: 1–21.
- Verheught, W.J.M., Skov, H., Danielsen, H., & Danielsen, F. (1993). Notes on the birds of the tidal lowlands and floodplains of South Sumatra province, Indonesia. *Kukila* **6**: 53–84.
- Verheyen, R. (1951). La migration de la Pie-grièche écorcheur. *Gerfaut* **41**: 111–139. In French.
- Verhoeve, J., & Holmes, D.A. (1999). The birds of the islands of Flores – a review. *Kukila* **10** (1998): 3–59.
- Vernon, C.J. (1973). Vocal imitation by Southern African birds. *Ostrich* **44**: 23–30.
- Vernon, C.J. (1985). Bird populations in two woodlands near Lake Kyle, Zimbabwe. *Honeyguide* **31**: 148–161.
- Vernon, C.J. (1988). Notes from the border [No.] **24**. *Bee-eater & BirdLife E Cape News* **39**: 43–47.
- Vernon, C.J., & Dean, W.R.J. (1975). On the systematic position of *Pholidornis rufiae*. *Bull. Brit. Orn. Club* **95**(1): 20.
- Vernon, D.P. (1968). *Birds of Brisbane and Environs*. Queensland Museum, Brisbane.
- Vernon, D.P., & Barry, D.H. (1972). Birds of Fraser Island and adjacent waters. *Mem. Queensland Mus.* **16**(2): 223–232.
- Vernon, D.P., & Martin, J.H.D. (1975). Birds of Stradbroke Island. *Proc. Royal Soc. Queensland* **86**: 61–72.
- Vernon, J.D.R. (1972). Migrations pratinierres au Maroc occidental. *Alauda* **40**(4): 307–320. In French.
- Vesey-Fitzgerald, D. (1940). The birds of Seychelles. 1. The endemic birds. *Ibis Ser.* **14**, no. 4: 480–489.
- Vicent, A.W. (1949). On the breeding habits of some African birds. *Ibis* **91**: 111–139.
- Vielliard, J. (1976). La Sitt[?]lle kabyte. *Alauda* **44**(3) (Suppl.): 351–352. In French.
- Vielliard, J. (1978). Le Djebel Babor et sa Sittelle *Sitta ledanti* Vielliard 1976. *Alauda* **46**(1): 1–42. In French.
- Vielliard, J. (1980). Remarques complémentaires sur la Sittelle kabyte *Sitta ledanti* Vielliard 1976. *Alauda* **48**: 139–150. In French.
- Villarán, A. (2003). Análisis de la invernada del Pájaro Moscón *Remiz pendulinus* en España. *Ardeola* **50**(2): 245–250. In Spanish with English summary.
- Villard, P., & Thibault, J.C. (2001). Données sur les nids, la croissance des poussins et les soins parentaux chez la Sittelle corse *Sitta whiteheadi*. *Alauda* **69**(4): 465–474. In French with English summary.
- Villard, P., Bittelberger, S., Seguin, J.F., & Thibault, J.C. (2003). La quête alimentaire de la Sittelle corse (*Sitta whiteheadi*) dans les Pins laricio (*Pinus nigra laricio*). *Vie & Milieu* **53**: 27–32. In French.
- Vincent, A.W. (1949). On the breeding habits of some African birds. [Part 2]. *Ibis* **91**: 313–345.
- Vincent, J. (1936). The birds of northern Portuguese East Africa. Comprising a list of, and observations on, the collections made during the British Museum Expedition of 1931–32. Part 10. *Ibis Ser.* **13**, no. 6: 48–125.
- Viney, C., & Philipps, K. (1988). *Birds of Hong Kong*. 4th edition. Government Printer, Hong Kong.
- Vinter, S.V. (1986). Biology of the Chinese Great Grey Shrike (*Lanius sphenocercus*) in the area of Middle Amur River. *Ornitologiya* **21**: 58–68. In Russian with English summary.
- Vinter, S.V. (1991). Age related plumages, moult and variation in *Lanius sphenocercus* Cab. *Trudy Zool. Inst. Akad. Nauk SSSR* **239**: 30–67. In Russian with English summary.
- Virtue, R.M. (1947). Birds observed at Torokina, Bougainville island. *Emu* **46**: 324–331.
- Vitali, S.D., Withers, P.C., & Richardson, K.C. (1999). Standard metabolic rates of three nectarivorous meliphagid passerine birds. *Austr. J. Zool.* **47**(4): 385–391.
- Vogel, C.J., Sweet, P.R., Lê Manh Hùng & Hurley, M.M. (2003). Ornithological records from Ha Giang province, north-east Vietnam, during March–June 2000. *Forktail* **19**: 21–30.
- Voisin, C., Voisin, J.F., Causey, D., & Dickinson, E.C. (2002). Systematic notes on Asian Birds. 29. On the types of *Sitta sinensis* J. Verreaux, 1871, and *Sitta montium* La Touche, 1899. *Zool. Verhand. Leiden* **340**: 191–196.
- Voous, K.H. (1960). *Atlas of European Birds*. Thomas Nelson and Sons, London.
- Voous, K.H. (1977). List of recent Holarctic bird species – Passerines (conclusion). *Ibis* **119**(3): 376–406 [85, viii pp. offprint was published by Academic Press for the British Ornithologists' Union, London].
- Voous, K.H. (1979). Capricious taxonomic history of Isabelle Shrike. *British Birds* **72**: 573–578.
- Voous, K.H., & van Marle, J.G. (1953). The distributional history of the Nuthatch, *Sitta europaea* L. *Ardea* **41** (Suppl.): 1–68.
- Vorderman, A.G. (1883). Bataviasche vogels III. *Natuurk. Tijdschr. Ned. Indië* **42**: 129–239. In Dutch.
- Vorderman, A.G. (1886). Bijdrage tot de kennis der Avifauna van den Berg Salak (West Java). *Natuurk. Tijdschr. Ned. Indië* **45**: 304–414. In Dutch.
- Vorobiev, K.A. (1954). *Ptitsy Ussuriiskogo kraja*. [Birds of Ussuriiland]. The Academy of Sciences of the USSR, Moscow. In Russian.
- Votpyka, J., Simek, J., & Tryjanowski, P. (2003). Bloodparasites, reproduction and sexual selection in the Red-backed Shrike (*Lanius collurio*). *Ann. Zool. Fennici* **40**: 431–439.
- Vuilleumier, F. (1993). Notes on birds observed in beech (*Fagus*) forests in the Maershan Natural Reserve, Guangxi Autonomous Region, China. *Bull. Brit. Orn. Club* **113**(3): 152–166.
- Vuilleumier, F., & Gochfeld, M. (1976). Notes sur l'avifaune de Nouvelle-Calédonie. *Alauda* **44**: 237–273. In French.
- Vyas, S. (2002). Sight records of Crimson Sunbird *Aethopyga siparaja* in Islamabad, Pakistan. *J. Bombay Nat. Hist. Soc.* **99**: 316–318.
- Wahlberg, N. (1988). Observations from Simbai. *Muruk* **3**(2): 41–47.
- Wahlberg, N. (1992). Observations of birds feeding in a fruiting fig *Ficus* sp. in Varirata National Park. *Muruk* **5**(3): 109–110.
- Wahlberg, N. (1993). Courtship display of the Long-billed Honeyeater *Melilestes megarhynchus*. *Muruk* **6**(1): 22.
- Wait, W.E. (1931). *Manual of the Birds of Ceylon*. 2nd edition. Dulau & Co., London.
- Waite, T.A. (1976). Sighting of the Yellow-faced Honeyeater, *Meliphaga chrysops*, in Tasmania. *Austr. Bird Watcher* **6**(7): 245.
- Wakefield, N.A. (1958). The Yellow-tufted Honeyeater with a description of a new subspecies. *Emu* **58**(3): 163–194.
- Wall, L.E. (1982). Historical notes on the Forty-spotted Pardalote. *Austr. Bird Watcher* **9**(5): 165–168.
- Wallace, A.R. (1863). List of birds collected in the island of Bouru (one of the Moluccas), with descriptions of the new species. *Proc. Zool. Soc. London* **1863**(1): 18–36, pls. 4–6.
- Walsh, J.F. (1966). A nest of the Violet-backed Sunbird. *Bull. Nigerian Orn. Soc.* **3**: 70–71.
- Walsh, J.F. (1967). Inland records of the Mouse-brown Sunbird. *Bull. Nigerian Orn. Soc.* **3**: 74–75.
- Walsh, J.F., Cheke, R.A., & Sowah, S.A. (1990). Additional species and breeding records of birds in the Republic of Togo. *Malimbus* **12**: 2–18.
- Walter, D. (2005). Mauerläufer *Tichodroma muraria*. Pp. 354–355 in: Bezzel, E., Geiersberger, I., Lossow, G. von & Peifer, R. (2005). *Brutvögel in Bayern – Verbreitung 1996 bis 1999*. Verlag Eugen Ulmer, Stuttgart, Germany. In German.
- Walter, H. (1968). Zur Abhängigkeit des Eleonorenfalken (*Falco eleonora*) vom mediterranen Vogelzug. *J. Orn.* **109**: 323–365. In German.
- Walters, I.N. (1985). Birds of a railway yard at Corinda, Queensland. *Austr. Bird Watcher* **11**(1): 17–27.
- Waltert, M., & Faber, K. (2000). Olive-bellied Sunbird *Nectarinia chloropygia* host to Cassin's Honeyguide *Prodotiscus insignis*. *Malimbus* **22**(2): 86.
- Walther, B.A. (2004). Why canopy access is essential to understand canopy birds: four examples from the Surumoni Crane Project. *Orn. Neotropical* **15**: 41–52.
- Ward, D., & Pinshow, B. (1995a). Temperature regulation of the Great Grey Shrike (*Lanius excubitor*) in the Negev Desert. 1. Laboratory measurements of metabolic rate and evaporative water loss. *J. Therm. Biol.* **20**: 263–269.
- Ward, D., & Pinshow, B. (1995b). Temperature regulation of the Great Grey Shrike (*Lanius excubitor*) in the Negev Desert. 2. Field measurements of standard operative temperatures and behaviour. *J. Therm. Biol.* **20**: 271–279.
- Ward, M.J., & Paton, D.C. (2007). Predicting mistletoe seed shadow and patterns of seed rain from movements of the Mistletoebird, *Dicaeum hirundinaceum*. *Austr. Ecol.* **32**(2): 113–121.
- Ward, P. (1968). Origin of the avifauna of urban and suburban Singapore. *Ibis* **110**: 239–254.
- Ward, P. (1971). The migration patterns of *Quelea quelea* in Africa. *Ibis* **113**: 275–297.
- Ward, V., & Underhill, L. (2006). Previous sightings of leucistic Malachite Sunbird on Robben Island. *Promerops* **266**: 13.
- Ward, W.V. (1969). Kermadec Islands expedition reports. Bio-acoustics on the expedition. *Notornis* **16**(3): 163–171.
- Wardell-Johnson, G. (1984). The effectiveness of a variable circular-plot census procedure for estimating bird density in the karri *Eucalyptus diversicolor* F.V. Muell. forest of south-western Australia. Pp. 25–33 in: Davies, S.J.J.F. ed. (1984). *Methods of Censusing Birds in Australia*. RAOU Report 7. Department of Conservation and Environment Bulletin 153. Royal Australasian Ornithologists Union & Department of Conservation and Environment (Western Australia), Melbourne & Perth.
- Wardell-Johnson, G., & Lynch, A.J.J. (2005). Landscape processes and eucalypt dieback associated with Bell Miner habitat in south-eastern Australia. *Austr. Forestry* **68**(4): 237–241.
- Wardell-Johnson, G., Stone, C., Recher, H., & Lynch, A.J.J. (2005). A review of eucalypt dieback associated with Bell Miner habitat in south-eastern Australia. *Austr. Forestry* **68**(4): 231–236.
- Wardell-Johnson, G., Stone, C., Recher, H., & Lynch, A.J.J. (2006). *Bell Miner Associated Dieback (BMAD) Independent Scientific Literature Review: a Review of Eucalypt Dieback Associated with Bell Miner Habitat in North-Eastern New South Wales, Australia*. Occasional Paper 2006/116. Department of Environment and Conservation (New South Wales), Sydney.
- Wardill, J.C. (2003). New distributional records and notes on the Pale-bellied White-eye *Zosterops consobrinorum*. *Kukila* **12**: 12–16.
- Wardill, J.C., & Hunow, I. (1998). First observations of the endemic subspecies of Black-fronted White-eye on Sangihe, North Sulawesi. *Bull. Oriental Bird Club* **27**: 48–49.
- Wardill, J.C., Fox, P.S., Hoare, D.J., Marthy, W., & Anggraini, K. (1999). Birds of the Rawa Aopa Watumohai National Park, South-east Sulawesi. *Kukila* **10**: 91–114.
- Warham, J. (1957). Cockatoo Island birds. *Emu* **57**(4): 225–231.
- Warham, J. (1967). Snakes island birds. *Notornis* **14**(3): 122–139.
- Warneke, E. (1958). Zur Brutbiologie des Schwarzstirnwürgers *Lanius minor*. *Vogelwelt* **79**: 177–181. In German.
- Warner, D.W. (1947). *The Ornithology of New Caledonia and the Loyalty Islands*. PhD thesis, Cornell University, Ithaca, New York.
- Warren, B.H., Bermingham, E., Bowie, R.C.K., Prys-Jones, R.P., & Thébaud, C. (2003). Molecular phylogeography reveals island colonisation history and diversification of western Indian Ocean sunbirds (*Nectarinia*: Nectariniidae). *Mol. Phylog. Evol.* **29**: 67–85.
- Warren, B.H., Bermingham, E., Prys-Jones, R.P., Thébaud, C. (2006). Immigration, species radiation and extinction in a highly diverse songbird lineage: white-eyes on Indian Ocean islands. *Mol. Ecol.* **15**: 3769–3786.
- Wassink, A., & Oreeel, G.J. (2007). *The Birds of Kazakhstan*. Published privately, De Cocksdorp, Texel, The Netherlands.
- Wassmann, R. (1986a). Ungewöhnlicher Nestbau vom Pirol (*Oriolus oriolus*). *Orn. Mitt.* **38**(7): 173. In German.
- Wassmann, R. (1986b). Zur Nahrung des Pirols (*Oriolus oriolus*). *Vogelwelt* **107**: 156. In German.
- Wassmann, R. (1990a). Kleptoparasitismus beim Pirol (*Oriolus oriolus* L.). *Egretta* **33**(1): 51–53. In German.
- Wassmann, R. (1990b). Saugtrinken beim Pirol (*Oriolus oriolus*). *J. Orn.* **131**(3): 339–340. In German with English summary.
- Wassmann, R. (1990c). Zur "Pfahlstellung" beim Pirol (*Oriolus oriolus*). *Ökol. Vögel* **12**(2): 215–218. In German with English summary.
- Wassmann, R. (1993). *Oriolus oriolus* (Linnaeus 1758) – Pirol. Pp. 1071–1121 in: Glutz von Blotzheim & Bauer (1993).
- Wassmann, R. (1997a). Ökologische und ethologische Untersuchungen am Pirol (*Oriolus oriolus* L. 1758). *Beitr. Naturkd. Niedersachsens* **50**: 1–164. In German.
- Wassmann, R. (1997b). Pirole (*Oriolus oriolus*) benutzten vorjährige Nester. *Egretta* **40**(1): 58–60. In German.
- Wassmann, R. (1997c). Pirole *Oriolus oriolus* im Schnee. *Monticola* **8**(81): 16–17. In German.
- Wassmann, R. (1998). Von Vögeln und Früchten – Kirschen als Basisart. *Orn. Mitt.* **50**: 383. In German.
- Wassmann, R. (2004). *Der Pirol: ein Tropenwaldvogel in Europa?* Aula-Verlag, Wiebelsheim, Germany. In German.
- Wassmann, R., & Böhm, W. (1995a). Ungewöhnliche Nester des Pirols (*Oriolus oriolus*). *Orn. Mitt.* **47**: 312–315. In German.

- Wassmann, R. & Böhm, W. (1995b). Wie häufig sind Nester des Pirols (*Oriolus oriolus*) über dem Wasser? *Orn. Mitt.* 47: 316. In German.
- Waterhouse, J.D. (1941). The Black Honeyeater. *Emu* 40(5): 385–387.
- Waterhouse, R.D. (1995). Observations on the diet of the Lewin's Honeyeater *Meliphaga lewinii* in the Illawarra rainforest, New South Wales. *Corella* 19(3): 102–105.
- Watling, D. (1982a). *Birds of Fiji, Tonga and Samoa*. Millwood Press, Wellington, New Zealand.
- Watling, D. (1982b). Notes on the birds of Makogai island, Fiji Islands. *Bull. Brit. Orn. Club* 102(4): 123–127.
- Watling, D. (1983). Ornithological notes from Sulawesi. *Emu* 83: 247–261.
- Watling, D. (1985). Notes on the birds of Gau island, Fiji. *Bull. Brit. Orn. Club* 105: 96–102.
- Watling, D. (2001). *A Guide to the Birds of Fiji and Western Polynesia: Including American Samoa, Niue, Samoa, Tokelau, Tonga, Tuvalu and Wallis-Futuna*. Environment Consultants, Suva, Fiji.
- Watson, D.M. (1994). *The Dynamics of Bird Communities in Remnant Buloke Allocasuarina luehmanni Woodlands*. BSc thesis, Monash University, Melbourne, Victoria.
- Watson, D.M. (1995). Black Honeyeaters in the Wimmera. *Austr. Bird Watcher* 16(4): 166–167.
- Watson, D.M. (1997). The importance of mistletoe to the White-fronted Honeyeater *Phylidonyris albigrons* in western Victoria. *Emu* 97(2): 174–177.
- Watson, D.M., Mac Nally, R. & Bennett, A.F. (2000). The avifauna of severely fragmented buloke *Allocasuarina luehmanni* woodland in western Victoria, Australia. *Pacific Conserv. Biol.* 6(1): 46–60.
- Watson, G.E. (1986). Family Sylviidae – Old World warblers (Holarctic and Oriental). Pp. 3–294 in: Mayr, E. & Cottrell, G.W. eds. (1986). *Check-list of Birds of the World. A Continuation of the Work of James L. Peters*. Vol. 11. Museum of Comparative Zoology, Cambridge, Massachusetts.
- Watson, I. (1955). Migratory flight of honeyeaters. *Emu* 55(4): 312–313.
- Watson, J. (1984). Land birds: endangered species of the granitic Seychelles. Pp. 513–528 in: Stoddart (1984).
- Watson, J.D., Wheeler, W.R. & Whitbourn, E. (1962). With the R.A.O.U. in Papua-New Guinea, October 1960 (concluded). *Emu* 62(2): 67–98.
- Weathers, W.W., Buttemer, W.A., Hayworth, A.M. & Nagy, K.A. (1984). An evaluation of time-budget estimates of daily energy expenditure in birds. *Auk* 101: 459–472.
- Weathers, W.W., Paton, D.C. & Seymour, R.S. (1996). Field metabolic rate and water flux of nectarivorous honeyeaters. *Aust. J. Zool.* 44(5): 445–460.
- Webb, E.L., Stanfield, B.J. & Jensen, M.L. (1999). Effects of topography on rainforest tree community structure and diversity in American Samoa, and implications for frugivore and nectarivore populations. *J. Biogeogr.* 26(4): 887–897.
- Webb, H.P. (1992). Field observations of the birds of Santa Isabel, Solomon Islands. *Emu* 92: 52–57.
- Webb, H.P. (1997). Nesting and other observations of Solomon Island birds. *Austr. Bird Watcher* 17: 34–41.
- Webster, J.D. (1986a). *Certhia americana* Bonaparte. Pp. 197–201 in: Phillips, A.R. ed. (1986). *The Known Birds of North and Middle America*. Part 1. Hirundinidae to Mimidae; Certhiidae. Denver Museum of Natural History, Denver, Colorado.
- Webster, J.D. (1986b). Summary of geographic variation in *Certhia americana*. Pp. 203–212 in: Phillips, A.R. ed. (1986). *The Known Birds of North and Middle America*. Part 1. Hirundinidae to Mimidae; Certhiidae. Denver Museum of Natural History, Denver, Colorado.
- Webster, J.D. (2000). Systematic relationships of the Verdin: skeletal evidence (Aves: Passeriformes). *Proc. Biol. Soc. Washington* 113(3): 828–835.
- Webster, M.D. (1999). Verdin *Auriparus flaviceps*. No. 470 in: Poole, A. & Gill, F. eds. (1999). *The Birds of North America*. Vol. 12. The Birds of North America Inc., Philadelphia, Pennsylvania.
- Webster, M.D. & Weathers, W.W. (2000). Seasonal changes in energy and water use by Verdins, *Auriparus flaviceps*. *J. Exper. Biol.* 203(21): 3333–3344.
- Webster, R. & Menkhurst, P.W. (1991). The Regent Honeyeater (*Xanthomyza phrygia*): population status and ecology in Victoria and New South Wales. Report to Australian National Parks and Wildlife Service, Canberra. Unpubl.
- Webster, R. & Menkhurst, P.W. (1992). *The Regent Honeyeater* (*Xanthomyza phrygia*): Population Status and Ecology in Victoria and New South Wales. Arthur Rylah Institute for Environmental Research Technical Report 126. Department of Conservation and Natural Resources (Victoria), Melbourne, Victoria.
- van Weerd, M. & Hutchinson, R. (2004). Observations of Isabela Oriole *Oriolus isabellae* in the Sierra Madre, Luzon, Philippines, with descriptions of the call. *Forktail* 20: 133–136.
- Weindler, P., Wiltshchko, R. & Wiltshchko, W. (1996). Magnetic information affects the stellar orientation of young bird migrants. *Nature (London)* 383: 158–160.
- Welch, G. & Welch, H. (1984). Birds seen on an expedition to Djibouti. *Sandgrouse* 6: 1–23.
- Welch, G. & Welch, H. (1998). Mystery birds from Djibouti. *Bull. Afr. Bird Club* 5: 46–50.
- Wells, A.G. & Wells, B.A. (1977). Breeding records of the Grey Honeyeater. *West. Austr. Nat.* 13(8): 209–210.
- Wells, D.R. (1966). The Violet-backed Sunbird nesting in Nigeria. *Bull. Nigerian Orn. Soc.* 3: 72–74.
- Wells, D.R. (1968). Zonation of bird communities on Fernando Poo. *Bull. Nigerian Orn. Soc.* 5: 71–87.
- Wells, D.R. (1984). Bird report: 1978 and 1979. *Malay. Nat. J.* 38: 113–150.
- Wells, D.R. (1990). Malayan bird report: 1984 and 1985. *Malay. Nat. J.* 43: 148–171.
- Wells, D.R. (2007). *The Birds of the Thai-Malay Peninsula*. Vol. 2. Passerines. Christopher Helm & A&C Black, London.
- Wells, D.R., Hails, C.J. & Hails, A.J. (1978). A study of the birds of the Gunung Mulu National Park, Sarawak, with emphasis on those of the lowland forest. Report to the Royal Geographical Society, London. Unpubl.
- Wertz, F.A.A. (1994). Rotbrust-Glanköpfchen *Chalcomitra (Baptothorax) senegalensis*. *Gefiederte Welt* 118(3): 83–85. In German.
- Wesley, H.D. (2004). A glimpse of the breeding biology of the Purple-rumped Sunbird *Nectarinia zeylonica* (Linnaeus, 1766). *Newsl. Orn.* 1(1/2): 9–10.
- Wesolowski, T. & Stawarczyk, T. (1991). Survival and population dynamics of Nuthatches *Sitta europaea* breeding in natural cavities in a primeval temperate forest. *Ornis Scand.* 22(2): 143–154.
- Western, R. (1992). Quail killed by shrike. *Emirates Bird Rep.* 16: 8–9.
- Weston, I.L. (1976a). Wau Easter excursion – a report of the N.G.B.S. Easter excursion to Wau, April 1976. *Papua New Guinea Bird Soc. Newsl.* 125: 5–11.
- Weston, I.L. (1976b). Excursion report – Ower's Corner 10 October 1976. *Papua New Guinea Bird Soc. Newsl.* 126: 7–9.
- Weston, I.L. (1976c). Description of the nest of *Zosterops fuscicapillus*. *Papua New Guinea Bird Soc. Newsl.* 126: 13.
- Weston, I.L. (1977). High mountain birds in the Enga province. *Papua New Guinea Bird Soc. Newsl.* 128: 16–21.
- Weston, I.L. (1983). A report on four species of the genus *Meliphaga* in Papua New Guinea. *Sunbird* 13(3): 45–53.
- Wetmore, A. (1956). *A Check-list of the Fossil and Prehistoric Birds of North America and the West Indies*. Smithsonian Miscellaneous Collections 131(5). Smithsonian Institution, Washington, D.C. 105 pp.
- Wheat, M. (1996). Movement patterns of honeyeaters foraging alone and in flocks for nectar of *Astroloma conostephioides* in Hale Conservation Park, South Australia. *Emu* 96(1): 55–61.
- Wheeler, A.G. & Calver, M.C. (1996). Resource partitioning in an island community of insectivorous birds during winter. *Emu* 96(1): 23–31.
- Wheeler, W.R. (1959). The R.A.O.U. camp-out at Noosa Heads, Queensland, 1958. *Emu* 59(4): 229–249.
- Wheeler, W.R. (1966). Field outing 1965 at Mt. Beauty, north-east Victoria. *Emu* 66: 163–185.
- Wheeler, W.R. (1967a). *A Handlist of the Birds of Victoria*. Victorian Ornithological Research Group, Melbourne, Victoria.
- Wheeler, W.R. (1967b). The birds of Cairns, Cooktown and the Atherton Tablelands. *Austr. Bird Watcher* 3(2): 55–76.
- Wheeler, W.R. (1967c). The Helmeted Honeyeater. *Victorian Orn. Res. Group Notes* 5(3): 2–4.
- Whistler, H. (1944). Material for the ornithology of Afghanistan. *J. Bombay Nat. Hist. Soc.* 44: 505–519.
- Whistler, H. (& Kinneer, N.B. ed.) (1949). *Popular Handbook of Indian Birds*. 4th edition. Gurney and Jackson, London & Edinburgh.
- Whitaker, L.M. (1943). Roosting habits of the Verdin. *Wilson Bull.* 55: 55–56.
- White, C.M.N. (1962). *A Revised Check List of African Shrikes, Orioles, Drongos, Starlings, Crows, Waxwings, Cuckoo-shrikes, Bulbuls, Accentors, Thrushes and Babbblers*. Government Printers, Lusaka, Zambia.
- White, C.M.N. (1963). *A Revised Check-list of African Flycatchers, Tits, Tree-creepers, Sunbirds, White-eyes, Honeyeaters, Buntings, Finches, Weavers and Waxbills*. Government Printer, Lusaka, Zambia.
- White, C.M.N. & Bruce, M.D. (1986). *The Birds of Wallacea (Sulawesi, the Moluccas & Lesser Sunda Islands, Indonesia). An Annotated Check-list*. British Ornithologists' Union Check-list 7. British Ornithologists' Union, London.
- White, G. (1985). *Birds and other Vertebrates of South West Tasmania*. Published privately, Sydney.
- White, H.L. (1911). Description of new eggs. *Emu* 10: 339–340.
- White, H.L. (1912). [Description of eggs of Lesser Yellow-faced Honey-eater (*Ptilotis subchrysops*)]. *Emu* 12(1): 45–46.
- White, H.L. (1917a). North Australian birds. *Emu* 16(3): 117–158.
- White, H.L. (1917b). Description of new honey-eater of the genus *Ptilotis*, from north Australia. *Emu* 16(3): 165.
- White, H.L. (1917c). North Australian birds. Observed by William M'Lennan. *Emu* 16(4): 205–231.
- White, H.L. (1922). A collecting trip to Cape York Peninsula. *Emu* 22: 99–116.
- White, S.A. (1916). A trip to the northern end of the Flinders Ranges. *Emu* 15(3): 152–162.
- White, S.A. (1918). A trip on the Coorong and amongst the bristle-birds on Younghusband Peninsula. *South Austr. Orn.* 3(6): 164–173.
- White, S.R. (1940). Note on the Western Spinebill. *Emu* 40(2): 169–170.
- White, S.R. (1946). Notes on the bird life of Australia's heaviest rainfall region. *Emu* 46(2): 81–122.
- Whitehead, J. (1893). *Exploration of Mount Kinabalu, North Borneo, with an Appendix, Giving Full Descriptions of the Various Species of Mammals, Birds, Reptiles, Insects, etc.. Collected by the Author in Borneo, Palawan, and Eastern Java*. Gurney and Jackson, London.
- Whitehead, J. (1899). Field-notes on birds collected in the Philippine islands in 1893–6. Part 2. *Ibis Ser.* 7, no. 5: 210–246.
- Whitelaw, D.A. (1985). Musings on the Cape White-eye in the southwestern Cape. *Safring News* 14: 19–24.
- Whitley, G.P. (1971). Field notes on birds by Thomas Carter. *West. Austr. Nat.* 12(2): 41–44.
- Whitlock, F.L. (1909). Notes on birds observed on the Pilbara Goldfield, north-western Australia. *Emu* 8(4): 173–194.
- Whitlock, F.L. (1910). On the east Murchison. Four months' collecting trip. *Emu* 9(4): 181–219.
- Whitlock, F.L. (1911). In the Stirling Ranges, Western Australia. *Emu* 10(5): 305–317.
- Whitlock, F.L. (1924). Journey to central Australia in search of the Night Parrot. *Emu* 23: 248–281.
- Whitlock, F.L. (1925). Ten months on the Fitzroy River, north-western Australia (with introduction by A.J. Campbell, C.M.B.O.U., etc.). *Emu* 25: 69–89.
- Whitmee, S.J. (1875). List of Samoan birds, with notes on their habits. *Ibis Ser.* 3, no. 5: 436–447.
- Whitmore, M.J. (1984). *The Breeding Biology and Communal Reproductive Behaviour of Noisy Miners*, *Manorina melanoccephala*. PhD thesis, University of Queensland, Brisbane.
- Whitmore, M.J. (1986). Infanticide of nestling Noisy Miners, communally breeding honeyeaters. *Anim. Behav.* 34(3): 933–935.
- Whitmore, M.J. & Dow, D.D. (1982). Noisy Miners – the girls have it made. *Austr. Nat. Hist.* 20(9): 290–294.
- Whitmore, M.J. & Eller, C.M. (1983). Observations at a nest of Painted Honeyeaters. *Emu* 83(3): 199–202.
- Whitmore, M.J., Dow, D.D., Fisk, P. & Moffatt, J.D. (1983). An annotated list of the birds of Meandarra, Queensland. *Emu* 83(1): 19–27.
- Whitmore, T.C. (1986). *Tropical Rain Forests of the Far East*. 2nd edition. English Language Book Society & Oxford University Press, Oxford, UK.
- Whitney, B. (2007). Notes on the Obscure Berrypecker *Melanocharis arfakiana*. Unpubl. 1 page.
- Whittell, H.M. (1938). The birds of the Bridgetown district, south-western Australia. Part 2. *Emu* 38: 54–59.
- Whittell, H.M. (1951). A review of the work of John Gilbert in Western Australia. Part 4. *Emu* 51(1): 17–29.
- Wickham, P.F. (1929). Notes on the birds of the Upper Burma hills. Part 1. *J. Bombay Nat. Hist. Soc.* 33(4): 800–827, pls. 1–3.
- Wiegant, W.M. & Steinhaus, G.H. eds. (1997). Rare birds in the Netherlands in 1995. *Dutch Birding* 19: 97–115.
- Wieneke, J. (1988). The birds of Magnetic Island, North Queensland. *Sunbird* 18(1): 1–22.
- Wieneke, J. (1992). *Where to Find Birds in North East Queensland*. Published privately, Townsville, Queensland.
- Wieneke, J. (1996). *Birds of Magnetic Island*. Published privately, Townsville, Queensland.
- Wiggins, D. (2005). Loggerhead Shrike (*Lanius ludovicianus*): a technical conservation assessment (version 10 Feb 2005). USDA Forest Service, Rocky Mountain Region. URL: <http://www.fs.fed.us/r2/projects/scp/assessments/loggerheadshrike.pdf> (download 12 March 2008).
- Wildor, G.D. & Hubbard, H.W. (1938). *Birds of Northeastern China: a Practical Guide Based on Studies Made Chiefly in Hopei Province*. Peking Society of Natural History Handbook 6. Peking Society of Natural History, Beijing.
- Wiles, G.J. (2003). A checklist of birds recorded in Guam's marine habitats. *Micronesica* 35/36: 661–675.
- Wiles, G.J. (2005). A checklist of the birds and mammals of Micronesia. *Micronesica* 38: 141–189.
- Wiles, G.J. & Conry, P.J. (1990). Terrestrial vertebrates of the Ngerukewid Islands Wildlife Preserve, Palau Islands. *Micronesica* 23(1): 41–66.
- Wiles, G.J., Bart, J., Beck, R.E. & Agnon, C.F. (2003). Impacts of the brown tree snake: patterns of decline and species persistence in Guam's avifauna. *Conserv. Biol.* 17(5): 1350–1360.
- van Wilgen, B.W., Everson, C.S. & Trollope, W.S.W. (1990). Fire management in South Africa: some examples of current objectives, practices and problems. Pp. 179–215 in: Goldammer, J.G. ed. (1990). *Fire in the Tropical Biota: Ecosystem Processes and Global Changes*. Springer-Verlag, Berlin & London.
- Wilhelm, K., Comtesse, H. & Pflumm, W. (1980). Zur Abhängigkeit des Gesangs vom Nahrungsangebot beim Gelbbauchnektarvogel (*Nectarinia venusta*). *Zeitschr. Tierpsychol.* 54(2): 185–202. In German with English summary.
- Wilhelm, K., Comtesse, H. & Pflumm, W. (1982). Einfluß der Konzentration der Zuckerlösung auf den Gesang und das Balzverhalten des Gelbbauchnektarvogels (*Nectarinia venusta*). *Zeitschr. Tierpsychol.* 60(1): 27–40. In German with English summary.
- Wilkinson, A.S. & Wilkinson, A. (1952). *Kapiti Bird Sanctuary*. Masterton Printing Company, Masterton, New Zealand.
- Wilkinson, G.S. & English-Loeb, G.M. (1982). Predation and coloniality in Cliff Swallows. *Auk* 99: 459–467.
- Wilkinson, R.J., Dutson, G.C.L., Sheldon, B., Darjono & Yus Rusila Noor (1991). The avifauna of the Barito Ulu region, Central Kalimantan. *Kukila* 5(2): 99–116.
- Wille, H. (1964). *Nectarinia bocagei* Shelley, een nieuwe soort voor Kongo. *Gerfaut* 54(1/2): 77–83. In Flemish with French summary.
- Williams, A.A.E. (1978). Accidental parasitization of an Eastern Double-collared Sunbird by a Variable Sunbird. *Scopus* 2: 25–26.
- Williams, A.J., Braine, S.G. & Bridgeford, P. (1986). The biology of the Dusky Sunbird in S.W.A./Namibia: a review. *Lanioturdus* 22: 4–9.

- Williams, J.B. (1993a). Energetics of incubation in free-living Orange-breasted Sunbirds in South Africa. *Condor* 95: 115–126.
- Williams, J.B. (1993b). Nest orientation of Orange-breasted Sunbirds in Southern Africa. *Ostrich* 64: 40–42.
- Williams, J.G. (1950a). A new race of *Cinnyris regius* from Tanganyika. *Ibis* 92: 644–645.
- Williams, J.G. (1950b). On the status of *Cinnyris mediocris moreaui*. *Ibis* 92: 645–647.
- Williams, J.G. (1950c). Further notes on *Cinnyris moreaui*. *Ibis* 92: 647.
- Williams, J.G. (1951a). Notes on *Scepomycter winifredae* and *Cinnyris loveridgei*. *Ibis* 93: 469–470.
- Williams, J.G. (1951b). *Nectarinia johnstoni*: a revision of the species, together with data on plumages, moults and habits. *Ibis* 93: 579–595.
- Williams, J.G. (1951c). Notes on *Anthreptes reichenowi yokanae*. *Bull. Brit. Orn. Club* 71: 48–50.
- Williams, J.G. (1952). Notes on the African Sunbird *Cinnyris afra graueri* Neumann. *J. East Afr. Nat. Hist. Soc.* 20: 440–442.
- Williams, J.G. (1953a). On the status of the Seychelles Sunbirds, *Cyanomitra dussumieri* and *Cyanomitra maheii*. *Ibis* 95: 545–546.
- Williams, J.G. (1953b). Revision of *Cinnyris sovimgana*: with description of a new race. *Ibis* 95: 501–504.
- Williams, J.G. (1953c). *Cinnyris mediocris*: a revision of the species and description of a new race. *Bull. Brit. Orn. Club* 73(1): 8–11.
- Williams, J.G. (1953d). On the nest and eggs of *Anthreptes reichenowi yokanae*. *Bull. Brit. Orn. Club* 73: 33.
- Williams, J.G. (1954). A systematic revision and natural history of the Shining Sunbird of Africa. *Condor* 57: 249–262.
- Williams, J.G. (1955). *Cinnyris oustaleti*: notes on plumages and habits. *Ibis* 97: 150–153.
- Williams, J.G. (1956). A new Golden-winged Sunbird from Kenya. *Bull. Brit. Orn. Club* 76: 136–139.
- Williams, J.G. (1958). *Cyanomitra batesi* in Northern Rhodesia. *Bull. Brit. Orn. Club* 78(2): 30–31.
- Williams, J.G. (1959). On the status of the Northern Rhodesian population of *Cyanomitra batesi*. *Bull. Brit. Orn. Club* 79(6): 101.
- Williams, J.G. & Arlott, N. (1980). *A Field Guide to the Birds of East Africa*. William Collins Sons, London & Glasgow.
- Williams, M.D., Carey, G.J., Duff, D.G. & Xu Weishu (1992). Autumn bird migration at Beidaihe, China, 1986–1990. *Forktail* 7: 3–55.
- Willis, E.O. (1983). Wrens, gnatwrens, rockfowl, babblers and shrikes as ant followers. *Gerfaut* 73: 393–404.
- Wilson, C. & Hamilton, N. (1986). Breeding the Western Spinebill *Acanthorhynchus superciliosus*. *Avicult. Mag.* 92(3): 166–171.
- Wilson, H. (1950). The R.A.O.U. campout at Lake St. Clair, November, 1949. *Emu* 50(1): 41–51.
- Wilson, J.M. (1994). Variation in initiator strategy in fighting by Silverweys. *Anim. Behav.* 47: 153–162.
- Wilson, K. & Recher, H.F. (2001). Foraging ecology and habitat selection of the Yellow-plumed Honeyeater, *Lichenostomus ornatus*, in a Western Australian woodland: implications for conservation. *Emu* 101(1): 89–94.
- Wilson, M.D. & Watts, B.D. (1999). Response of Brown-headed Nuthatches to thinning of pine-plantations. *Wilson Bull.* 111(1): 56–60.
- Wilson, P.R., Taylor, R.H. & Thomas, B.W. (1988). Effect of topography on seasonal distribution of forest birds in the Ohikanui, lower Buller and Inangahua valleys, north Westland. *Notornis* 35(3): 217–243.
- Wilson, R.I. (1981). The woodchip industry and Tasmanian birds. *Tasmanian Bird Rep.* 11: 11–14.
- Wilson, S.J. (1963). Mist netting migrating Yellow-faced Honeyeaters. *Austr. Bird Bander* 1: 53–59.
- Wilson, S.M. & Kikkawa, J. (1988). Post-fledging parental investment in the Capricorn Silverwey. *Emu* 88: 81–87.
- Wiltshcko, R. & Wiltshcko, W. (1975a). The interaction of stars and magnetic field in the orientation system of night-migrating birds. 1. Autumn experiments with European warblers (Gen. *Sylvia*). *Z. Tierpsychol.* 37: 337–355.
- Wiltshcko, R. & Wiltshcko, W. (1975b). The interaction of stars and magnetic field in the orientation system of night-migrating birds. 2. Spring experiments with European Robins (*Erithacus rubecula*). *Z. Tierpsychol.* 37: 265–282.
- Wiltshcko, R. & Wiltshcko, W. (1995). *Magnetic Orientation in Animals*. Springer, Berlin.
- Wiltshcko, R., Munro, U., Ford, H. & Wiltshcko, W. (1999). After-effects of exposure to conflicting celestial and magnetic cues at sunset in migratory Silverweys *Zosterops l. lateralis*. *J. Avian Biol.* 30: 56–62.
- Wiltshcko, W. (1968). Über den Einfluss statischer Magnetfelder auf die Zugorientierung der Rotkehlchen (*Erithacus rubecula*). *Z. Tierpsychol.* 25: 537–558. In German.
- Wiltshcko, W. & Wiltshcko, R. (1972). Magnetic compass of European Robins. *Science (Washington, D.C.)* 176: 62–64.
- Wiltshcko, W. & Wiltshcko, R. (2000). Light-dependent magnetoreception in birds: does directional information change with light intensity? *Naturwissenschaften* 87: 36–40.
- Wiltshcko, W. & Wiltshcko, R. (2003). Mechanisms of orientation and navigation in migratory birds. Pp. 433–456 in: Berthold et al. (2003).
- Wiltshcko, W., Daum, P., Fergenbauer-Kimmel, A. & Wiltshcko, R. (1987). The development of the star compass in Garden Warblers *Sylvia borin*. *Ornithology* 74: 285–292.
- Wiltshcko, W., Ford, H., Munro, U., Winkhofer, M. & Wiltshcko, R. (2007). Magnetite-based magnetoreception: the effect of repeated pulsing on the orientation of migratory birds. *J. Comp. Physiol.* 193: 515–522.
- Wiltshcko, W., Munro, U., Ford, H. & Wiltshcko, R. (1998). Effect of a magnetic pulse on the orientation of Silverweys, *Zosterops l. lateralis*, during spring migration. *J. Exper. Biol.* 201: 3257–3261.
- Wiltshcko, W., Munro, U., Ford, H. & Wiltshcko, R. (2003). Magnetic orientation in birds: non-compass responses under monochromatic light of increased intensity. *Proc. Royal Soc. London (Ser. B Biol. Sci.)* 270: 2133–2140.
- Wiltshcko, W., Weindler, P. & Wiltshcko, R. (1998). Interaction of magnetic and celestial cues in the migratory orientation of passerines. *J. Avian Biol.* 29: 606–617.
- Wiltshcko, W., Wiltshcko, R. & Munro, U. (2000). Light-dependent magnetoreception in birds: the effect of intensity of 565-nm green light. *Naturwissenschaften* 87: 366–369.
- Wiltshcko, W., Wiltshcko, R., Munro, U. & Ford, H. (1998). Magnetic versus celestial cues: cue-conflict experiments with migrating Silverweys at dusk. *J. Comp. Physiol.* 182: 521–529.
- van der Winden, J. (2002). The odyssey of the Black Tern *Chlidonias niger* migration ecology in Europe and Africa. *Ardea* 90: 421–435.
- Wingfield, J.C. (2005). Flexibility in annual cycles of birds: implications for endocrine control mechanisms. *J. Orn.* 146: 291–304.
- Winslet, J. & Winslet, B. (1987). Birds of the Le Fevre Peninsula, Adelaide, 1972–1985. *South Austr. Orn.* 30(4): 103–110.
- Winter, S.W. (1987). Die Ernährung des Keilschwanzwürgers, *Lanius sphenocercus* Cabanis, im Mittleren Amurland. *Mitt. Zool. Mus. Berlin* 63 (Suppl. Ann. Orn. 11): 13–34. In German with English summary.
- Winterbottom, J.M. (1943). On woodland bird parties in Northern Rhodesia. *Ibis* 85: 437–442.
- Winterbottom, J.M. (1955). Notes on the breeding of the Pale White-eye, *Z. pallida*, in the south-west Cape. *Wilson Bull.* 67: 135.
- Winterbottom, J.M. (1962). Breeding season of Long-tailed Sugarbird *Promerops cafer* (L.). *Ostrich* 33: 77.
- Winterbottom, J.M. (1964). Notes on the comparative ecology of the Long-tailed Sugarbird and the Orange-breasted Sunbird. *Ostrich* 35: 239–240.
- Wirthmüller, R. (1993). Beobachtung von Schwanzmeisen (*Aegithalos caudatus*) am Gemeinschaftsschlafplatz im Winter. *Charadrius* 29(1): 22–28. In German with English summary.
- Wirtitsch, M., Hoi, H., Valera, F. & Kristin, A. (2001). Habitat composition and use in the Lesser Grey Shrike (*Lanius minor*). *Folia Zool. (Brno)* 50: 137–150.
- Witherby, H.F., Jourdain, F.C.R., Ticehurst, N.F. & Tucker, B.W. (1938). *The Handbook of British Birds*. Vol. 1. Crows to flycatchers. H.F. & G. Witherby, London.
- Withgott, J.H. & Smith, K.G. (1998). Brown-headed Nuthatch *Sitta pusilla*. No. 349 in: Poole, A. & Gill, F. eds. (1998). *The Birds of North America*. Vol. 9. The Birds of North America Inc., Philadelphia, Pennsylvania.
- Woinarski, J.C.Z. (1974). A comparison of the ground-nesting of two species of pardalotes. *Emu* 74(4): 219–222.
- Woinarski, J.C.Z. (1984a). Interbreeding of the Spotted and Yellow-rumped Pardalotes, *Pardalotus punctatus* and *P. xanthopygus*. *Emu* 84(2): 80–86.
- Woinarski, J.C.Z. (1984b). Small birds, lerp-feeding and the problem of honeyeaters. *Emu* 84(3): 137–141.
- Woinarski, J.C.Z. (1984c). *Ecology of Pardalotes in South-eastern Australia*. PhD thesis, Zoology Department, Monash University, Clayton, Victoria.
- Woinarski, J.C.Z. (1985a). Foliage-gleaners of the treetops, the pardalotes. Pp. 165–175 in: Keast et al. (1985).
- Woinarski, J.C.Z. (1985b). Breeding biology and life history of small insectivorous birds in Australian forests: response to a stable environment? *Proc. Ecol. Soc. Austr.* 14: 159–168.
- Woinarski, J.C.Z. (1988). Foraging behaviour of pardalotes in south-eastern Australia: comparison of the taxa *Pardalotus punctatus*, *P. xanthopygus* [sic] and *P. striatus* 'striatus', 'ornatus' and 'substriatus'. *Emu* 88(3): 129–137.
- Woinarski, J.C.Z. (1989a). Some life history comparisons of small leaf-gleaning bird species in south-eastern Australia. *Corella* 13(3): 73–80.
- Woinarski, J.C.Z. (1989b). The vertebrate fauna of broombush *Melaleuca uncinata* vegetation in north-western Victoria, with reference to effects of broombush harvesting. *Austr. Wildl. Res.* 16(2): 217–238.
- Woinarski, J.C.Z. (1990). Effects of fire on the bird communities of tropical woodlands and open forests in northern Australia. *Austr. J. Ecol.* 15(1): 1–22.
- Woinarski, J.C.Z. (1993). A cut-and-paste community: birds of monsoon rainforests in Kakadu National Park, Northern Territory. *Emu* 93(2): 100–120.
- Woinarski, J.C.Z. (2006). Predictors of nomadism in Australian birds: A reanalysis of Allen and Saunders (2002). *Ecosystems (New York)* 9(5): 689–693.
- Woinarski, J.C.Z. & Ash, A.J. (2002). Responses of vertebrates to pastoralism, military land use and landscape position in an Australian tropical savanna. *Austr. Ecol.* 27(3): 311–323.
- Woinarski, J.C.Z. & Bulman, C.M. (1985). Ecology and breeding biology of the Forty-spotted Pardalote and other pardalotes on North Bruny Island. *Emu* 85(2): 106–120.
- Woinarski, J.C.Z. & Cullen, J.M. (1984). Distribution of invertebrates on foliage in forests of south-eastern Australia. *Austr. J. Ecol.* 9: 207–232.
- Woinarski, J.C.Z. & Fisher, A. (1995a). Wildlife of lancewood (*Acacia shirleyi*) thickets and woodlands in northern Australia. 1. Variation in vertebrate species composition across the environmental range occupied by lancewood vegetation in the Northern Territory. *Wildl. Res.* 22(4): 379–411.
- Woinarski, J.C.Z. & Fisher, A. (1995b). Wildlife of lancewood (*Acacia shirleyi*) thickets and woodlands in northern Australia. 2. Comparisons with other environments of the region (*Acacia* woodlands, *Eucalyptus* savanna woodlands and monsoon rainforests). *Wildl. Res.* 22(4): 413–443.
- Woinarski, J.C.Z. & McEvey, A.R. (1983). Mortality in pardalotes in Melbourne, 1960 to 1980. *Corella* 7(3): 55–59.
- Woinarski, J.C.Z. & Rounsevell, D.E. (1983). Comparative ecology of pardalotes, including the Forty-spotted Pardalote, *Pardalotus quadragintus* (Aves: Pardalotidae) in south-eastern Tasmania. *Austr. Wildl. Res.* 10(2): 351–361.
- Woinarski, J.C.Z. & Tidemann, S.C. (1991). The bird fauna of a deciduous woodland in the wet-dry tropics of northern Australia. *Wildl. Res.* 18(4): 479–500.
- Woinarski, J.C.Z. & Wykes, B.J. (1983). Decline and extinction of the Helmeted Honeyeater at Cardinia Creek. *Biol. Conserv.* 27: 7–21.
- Woinarski, J.C.Z., Brock, C., Armstrong, M., Hempel, C., Cheal, D. & Brennan, K. (2000). Bird distribution in riparian vegetation in the extensive natural landscape of Australia's tropical savanna: a broad-scale survey and analysis of a distributional database. *J. Biogeogr.* 27: 843–868.
- Woinarski, J.C.Z., Connors, G. & Franklin, D.C. (2000). Thinking honeyeater: nectar maps for the Northern Territory, Australia. *Pacific Conserv. Biol.* 6(1): 61–80.
- Woinarski, J.C.Z., Cullen, J.M., Hull, C. & Nayudu, R. (1989). Lerp-feeding in birds: a smorgasbord experiment. *Austr. J. Ecol.* 14(2): 227–234.
- Woinarski, J.C.Z., Dorward, D.F. & Cullen, J.M. (1983). Variation in the *Pardalotus striatus* complex in south-eastern Australia. *Emu* 83(2): 82–93.
- Woinarski, J.C.Z., Fisher, A., Brennan, K., Morris, I. & Chatto, R. (2001). Patterns of bird species richness and composition on islands off Arnhem Land, Northern Territory, Australia. *Austr. Ecol.* 26(1): 1–13.
- Woinarski, J.C.Z., Press, A.J. & Russell-Smith, J. (1989). The bird community of a sandstone plateau monsoon forest at Kakadu National Park, Northern Territory. *Emu* 89(4): 223–231.
- Woinarski, J.C.Z., Recher, H.F. & Majer, J. (1997). Vertebrates of eucalypt formations. Pp. 303–341 in: Williams, J.E. & Woinarski, J.C.Z. eds. (1997). *Eucalypt Ecology: Individuals to Ecosystems*. Cambridge University Press, Cambridge, UK.
- Woinarski, J.C.Z., Risler, J. & Kean, L. (2004). Response of vegetation and vertebrate fauna to 23 years of fire exclusion in a tropical *Eucalyptus* open forest, Northern Territory, Australia. *Austr. Ecol.* 29(2): 156–176.
- Woinarski, J.C.Z., Tidemann, S.C. & Kerin, S. (1988). Birds in a tropical mosaic: the distribution of bird species in relation to vegetation patterns. *Austr. Wildl. Res.* 15(2): 171–196.
- Wolf, L.L. (1975a). Energy intake and expenditure in a nectar-feeding sunbird. *Ecology* 56: 92–104.
- Wolf, L.L. (1975b). Energetics of territoriality: *Nectarinia famosa* at *Aloe graminicola*. *Ecology* 56: 92–104.
- Wolf, L.L. & Wolf, J.S. (1976). Mating system and reproductive biology of Malachite Sunbirds. *Condor* 78: 27–39.
- Wolfe, L.R. (1938). Birds of central Luzon. *Auk* 55: 198–224.
- Wolff, T. (1976). Notes on birds from Rennell and Bellona Islands. Pp. 7–28 in: Wolff, T. ed. (1976). *The Natural History of Rennell Island, British Solomon Islands*. Vol. 7. Danish Science Press, Copenhagen.
- Wolff-Metterich, G.F. & Stresemann, E. (1956). Biologische Notizen über Vögel von Fernando Poo. *J. Orn.* 97: 274–290. In German.
- Wolfson, A. (1954). Production of repeated gonadal, fat and moult cycles within one year in the Junco and White-crowned Sparrow by manipulation of day length. *J. Exper. Zool.* 125: 353–376.
- Wolfson, A. (1959). Ecologic and physiologic factors in the regulation of spring migration and reproductive cycles in birds. Pp. 38–70 in: Gorman, A. ed. (1959). *Comparative Endocrinology*. John Wiley & Sons, New York.
- Wolstenholme, H. (1922). Notes from Wahroonga, Sydney, N.S.W. *Emu* 22: 141–148.
- Wolstenholme, H. (1923). The Crimson Honeyeater, *Myzomela sanguinolenta*. *Emu* 22: 300.
- Wolstenholme, H. (1924). Some Jervis Bay birds. *Emu* 24: 117–119.
- Wolstenholme, H. (1927). The Little Wattle-Bird (*Anthochaera chrysoptera*). *Emu* 26: 302–304.
- Wolstenholme, H. (1929). Nesting notes from a Sydney garden. *Emu* 28: 183–191.
- Wolstenholme, H. (1930). Triple nesting of the Scarlet Honeyeater. *Emu* 29: 264–266.
- Wolters, H.E. (1965). *Nectarinia chalybea pinto* und *Nectarinia seimundi traylori* nomina nova. *J. Orn.* 106(3): 357. In German.
- Wolters, H.E. (1977). Die Gattungen der Nectariniidae (Aves, Passeriformes). *Bonn Zool. Beitr.* 28: 82–101. In German.
- Wolters, H.E. (1979). *Die Vogelarten der Erde. Eine systematische Liste mit Verbreitungangaben sowie deutschen und englischen Namen*. 4th instalement. Paul Parey, Hamburg & Berlin. In German with English index.

Wolters, H.E. & Clancey, P.A. (1969). A new race of Green-headed Oriole from southern Moçambique. *Bull. Brit. Orn. Club* **89**: 108–109.

Wood, D.S. (1992). Color and size variation in eastern White-breasted Nuthatches. *Wilson Bull.* **104**(4): 599–611.

Wood, K.A. (1995). Temporal and spatial variations in density of landbirds at an urban bushland reserve. *Corella* **19**(1): 7–11.

Wood, K.A. (1996). Breeding records of the Spangled Drongo *Dicrurus bracteatus*. *Sunbird* **26**: 25–35.

Wood, K.A. & Ley, A.J. (2005a). Nesting and foraging by a pair of Striped Honeyeaters at Baradine, New South Wales. *Austr. Field Orn.* **22**(2): 88–103.

Wood, K.A. & Ley, A.J. (2005b). Breeding displays and calls of the Striped Honeyeater at Baradine, New South Wales. *Austr. Field Orn.* **22**(3): 153–157.

Woodall, P.F. (1980). Communal breeding in the Figbird. *Sunbird* **3**/4: 73–75.

Woodall, P.F. (1995). Results of the QOS garden bird survey, 1979–80, with particular reference to south-east Queensland. *Sunbird* **25**(1): 1–17.

Woodall, P.F. (1999). The birds of Peel Island, Moreton Bay: eighty-five years on. *Sunbird* **29**(1): 13–23.

Woodcock, K. (1985). Sighting of a Painted Honeyeater in South Australia's Lower North. *South Austr. Orn.* **29**(8): 220.

Woods, C.P. (1993a). Variation in Loggerhead Shrike nest composition between two shrub species in southwest Idaho. *J. Field Orn.* **64**: 352–352.

Woods, C.P. (1993b). Parent Loggerhead Shrikes induce nesting to fledge. *Wilson Bull.* **105**: 532–533.

Woods, C.P. (1995a). Food delivery and food holding during copulation in the Loggerhead Shrike. *Wilson Bull.* **107**: 762–764.

Woods, C.P. (1995b). Status of Loggerhead Shrikes in the sagebrush habitat of southwestern Idaho. *Proc. West. Found. Vert. Zool.* **6**: 150–154.

Woods, C.P. (1995c). Breeding ecology of *Lanius ludovicianus* nesting in sagebrush. *Proc. West. Found. Vert. Zool.* **6**: 244–250.

Woods, C.P. & Cade, T.J. (1996). Nesting habits of the Loggerhead Shrike in sagebrush. *Condor* **98**: 75–81.

Woods, S., Hutchinson, R. & Adcock, A. (2003). Philippines. January–April 2003. Birding trip report. Unpubl.

Woodward, S.A., Vitousek, P.M., Matson, K., Hughes, F., Benvenuto, K. & Matson, P.A. (1990). Use of the exotic tree *Myrica faya* by native and exotic birds in Hawaii Volcanoes National Park (Hawaii, USA). *Pacific Sci.* **44**: 88–93.

Wooldridge, D.B. (1985). Wallcreeper – a new Isle of Wight species. *Isle of Wight Birds* **1985**: 30.

Wooller, R.D. (1981). Seasonal changes in a community of honeyeaters in south-western Australia. *Emu* **81**(1): 50–51.

Wooller, R.D. (1982). Feeding interactions between sunbirds and sugarbirds. *Ostrich* **53**(2): 114–115.

Wooller, R.D. (1984). Bill shape and size in honeyeaters and other small insectivorous birds in Western Australia. *Austr. J. Zool.* **32**(5): 657–661.

Wooller, R.D. & Calver, M.C. (1981a). Diet of three insectivorous birds on Barrow Island, WA. *Emu* **81**(1): 48–50.

Wooller, R.D. & Calver, M.C. (1981b). Feeding segregation within an assemblage of small birds in the karri forest understorey. *Austr. Wildl. Res.* **8**(2): 401–410.

Wooller, R.D. & Calver, M.C. (1988). Changes in an assemblage of small birds in the understorey of dry sclerophyll forest in south-western Australia after fire. *Austr. Wildl. Res.* **15**(3): 331–338.

Wooller, R.D. & Wooller, S.J. (1998). Consistent individuality in the timing and magnitude of flowering by *Adenanthos obovatus* (Proteaceae). *Austral. J. Bot.* **46**: 595–608.

Wooller, R.D., Saunders, D.A., Bradley, J.S. & de Rebeira, C.P. (1985). Geographical variation in size of an Australian honeyeater (Aves: Meliphagidae): an example of Bergmann's rule. *Biol. J. Linn. Soc.* **25**(4): 355–363.

Worcester, D.C. (1898). Contributions to Philippine ornithology. Part 2. Notes on the distribution of Philippine birds. *Proc. US Natl. Mus.* **20**: 567–625.

Worcester, D.C. & Bourns, F.S. (1898). Contributions to Philippine ornithology. Part 1. A list of the birds known to inhabit the Philippine and Palawan Islands, showing their distribution within the limits of the two groups. *Proc. US Natl. Mus.* **20**: 549–566.

Worfolk, T. (2000). Identification of Red-backed, Isabelline and Brown Shrikes. *Dutch Birding* **22**: 323–362.

Work, T.M., Massey, J.G., Johnson, L., Dougill, S. & Banko, S. (1999). Survival and physiologic response of Common Amakihi and Japanese White-eyes during simulated translocation. *Condor* **101**: 21–27.

Wu Zhikang, Lin Qiwei, Yang Jiongli, Liu Jichen & Wu Lu (1986). [The Avifauna of Guizhou]. Guizhou People's Publishing House, Guiyang, Guizhou, China. In Chinese.

Wunderlich, K. (1983a). *Sitta whiteheadi* Sharpe. 11th instalment in: Dathe, H. & Neufeldt, I.A. eds. (1983). *Atlas der Verbreitung paläarktischer Vögel*. Akademie-Verlag, Berlin. In German.

Wunderlich, K. (1983b). *Sitta ledanti* Vieillard. 11th instalment in: Dathe, H. & Neufeldt, I.A. eds. (1983). *Atlas der Verbreitung paläarktischer Vögel*. Akademie-Verlag, Berlin. In German.

Wunderlich, K. (1986). *Sitta neumayer* Michelles. 12th instalment in: Dathe, H. & Neufeldt, I.A. eds. (1986). *Atlas der Verbreitung paläarktischer Vögel*. Akademie-Verlag, Berlin. In German.

Wunderlich, K. (1988a). *Certhia nipalensis* Blyth. 15th instalment in: Dathe, H. & Neufeldt, I.A. eds. (1988). *Atlas der Verbreitung paläarktischer Vögel*. Akademie-Verlag, Berlin. In German.

Wunderlich, K. (1988b). *Sitta leucopsis* Gould. 15th instalment in: Dathe, H. & Neufeldt, I.A. eds. (1988). *Atlas der Verbreitung paläarktischer Vögel*. Akademie-Verlag, Berlin. In German.

Wunderlich, K. (1989a). *Aegithalos niveogularis* (Gould). 16th instalment in: Dathe, H. & Loskot, W.M. eds. (1989). *Atlas der Verbreitung palaearktischer Vögel*. Akademie-Verlag, Berlin. In German.

Wunderlich, K. (1989b). *Aegithalos leucogenys* (Moore). 16th instalment in: Dathe, H. & Loskot, W.M. eds. (1989). *Atlas der Verbreitung palaearktischer Vögel*. Akademie-Verlag, Berlin. In German.

Wunderlich, K. (1991a). *Aegithalos bonvaloti* Oustalet. 17th instalment in: Dathe, H. & Loskot, W.M. eds. (1991). *Atlas der Verbreitung palaearktischer Vögel*. Akademie-Verlag, Berlin. [Sic: map of *Aegithalos iouschistos*!]. In German.

Wunderlich, K. (1991b). *Aegithalos iouschistos* (Hodgson). 17th instalment in: Dathe, H. & Loskot, W.M. eds. (1991). *Atlas der Verbreitung palaearktischer Vögel*. Akademie-Verlag, Berlin. [Sic: map of *Aegithalos bonvaloti*!]. In German.

Wunderlich, K. (1991c). *Cephalopyrus flammeiceps* (Hodgson). 17th instalment in: Dathe, H. & Loskot, W.M. eds. (1991). *Atlas der Verbreitung palaearktischer Vögel*. Akademie-Verlag, Berlin. In German.

Wüst, W. (1986). *Avifauna Bavaricae. Die Vogelwelt Bayerns im Wandel der Zeit*. Vol. 2. Ornithologische Gesellschaft in Bayern, Munich, Germany. In German.

van Wyk, A.M. (1984). Malachite Sunbirds take a shower. *WBC News* **126**: 17.

Wykes, B.J. (1982). Resource Partitioning and the Role of Competition in Structuring Lichenostomus Honeyeater (and Manorina melanophrys) Communities in Southern Victoria. PhD thesis, Monash University, Melbourne, Victoria.

Wykes, B.J. (1985). The Helmeted Honeyeater and related honeyeaters of Victorian woodlands. P. 205–217 in: Keast *et al.* (1985).

Wyndham, E. (1978). Birds of the Milparinka district and Cooper Creek basin. *Emu* **78**(4): 179–187.

Yahya, S.A. (1981). Golden Oriole *Oriolus oriolus* feeding a fledgling cuckoo (*Cuculus* sp.). *J. Bombay Nat. Hist. Soc.* **78**(2): 379–380.

Yamagishi, S. (1982). Age determination in the Bull-headed Shrike *Lanius bucephalus* based on buff-tips of greater primary coverts. *J. Yamashina Inst. Orn.* **14**: 96–102.

Yamagishi, S. (1995). Social organization of Bull-headed Shrikes (*Lanius bucephalus*) in Japan. *Proc. West. Found. Vert. Zool.* **6**: 309.

Yamagishi, S. & Saito, M. (1985). Function of courtship feeding in the Bull-headed Shrike, *Lanius bucephalus*. *J. Ethol.* **3**: 113–121.

Yamagishi, S., Nishiumi, I. & Shimoda, C. (1992). Extra-pair fertilization in monogamous Bull-headed Shrikes revealed by DNA fingerprinting. *Auk* **109**: 711–721.

Yamashina, Y. (1930). Birds of Parry-Group, Bonin Islands. *Tori* **6**(30): 323–382. In Japanese and English.

Yamashina, Y. (1932). On a collection of bird's eggs from Micronesia. *Tori* **7**: 393–413, plate 7. In Japanese and English.

Yamashina, Y. (1934). *A Natural History of Japanese Birds*. Azusa Shobo, Tokyo, Japan.

Yan Chongwei & Xu Weishu (1996). *Zhong Guo ye Niao tu Jian*. [A Field Guide to the Birds of China]. Cuiniaio Cultural Enterprise Company, Taiwan [introduction dated 1995, published 1996]. In Chinese with English bird names and index.

Yan, Z. (1993). Seed dispersal of *Ameyma preissii* and *Lysiana exocarpi* by Mistletoebirds and Spiny-cheeked Honeyeaters. *Emu* **93**(4): 214–219.

Yanushevich, A.I., Tyurin, P.S., Yakovleva, I.D., Kyrdyraliev, A. & Semenova, N.I. (1960). *Pritysi Kirgizii*. [Birds of Kyrgyzia]. Vol. 2. Akademiya nauk Kirgizskoi SSR, Frunze [Bishkek], Kyrgyzstan. In Russian.

Yeatman-Berthelot, D. (1995). *Nouvel Atlas des Oiseaux Nicheurs de France 1985–1989*. Société Ornithologique de France, Paris. In French.

Yen Chungwei (1990). First breeding record of the Red-headed Tit (*Aegithalos concinnus*) in Taiwan. *Bull. Natl. Mus. Nat. Sci. Taichung* **1990**(2): 321–322.

Yom-Tov, Y. (1987). The reproductive rates of Australian passerines. *Austr. Wildl. Res.* **14**(3): 319–330 [+Appendix].

Yom-Tov, Y., McCleery, R. & Oatley, T.B. (1994). The survival rates of some African passerines. *Ostrich* **65**: 329–332.

Yong, W. & Moore, F.R. (1993). Relation between migratory activity and energetic condition among thrushes (Turdinae) following passage across the Gulf of Mexico. *Condor* **95**: 934–943.

Yosef, R. (1992a). From nest building to fledgling of young in the Great Grey Shrike (*Lanius excubitor*) at Sede Boquer, Israel. *J. Orn.* **133**(3): 279–285.

Yosef, R. (1992b). Behavior of polygynous and monogamous Loggerhead Shrikes, and a comparison with Northern Shrikes. *Wilson Bull.* **104**: 747–749.

Yosef, R. (1992c). Loggerhead Shrikes eat crayfish. *Florida Field Nat.* **20**: 75–76.

Yosef, R. (1992d). Male-biased breeding site fidelity in a population of Northern Shrikes. *Condor* **94**: 1025–1027.

Yosef, R. (1993a). Effects of Little Owl predation on Northern Shrike postfledgling success. *Auk* **110**: 396–398.

Yosef, R. (1993b). Influence of observation posts on territory size in Northern Shrikes. *Wilson Bull.* **105**(1): 180–183.

Yosef, R. (1993c). Prey transport by Loggerhead Shrikes. *Condor* **95**: 231–233.

Yosef, R. (1994a). Conservation commentary: an evaluation of the global decline in the true shrikes (Family Laniidae). *Auk* **111**: 228–233.

Yosef, R. (1994b). The effects of fencelines on the reproductive success of Loggerhead Shrikes. *Conserv. Biol.* **8**: 281–285.

Yosef, R. (1996). Loggerhead shrike *Lanius ludovicianus*. No. **231** in: Poole, A. & Gill, F. eds. (1996). *The Birds of North America*. Vol. 6. The Birds of North America Inc., Philadelphia, Pennsylvania.

Yosef, R. (1998). Migration of Red-backed (*Lanius collurio*), Masked (*L. nubicus*), and Woodchat Shrikes (*L. senator*) at Eilat, Israel. Pp. 5–8 in: Yosef & Lohrer (1998).

Yosef, R. (2001). Nesting ecology of resident Loggerhead Shrikes in south-central Florida. *Wilson Bull.* **113**: 279–284.

Yosef, R. (2004). Perch-site use and inter- and intraspecific aggression of migratory Brown Shrikes (*Lanius cristatus*) in southern Taiwan. *Biol. Letters (Poznan)* **41**: 113–118.

Yosef, R. & Deyrup, M.A. (1998). Effects of fertilizer-induced reduction of invertebrates on reproductive success of Loggerhead Shrikes (*Lanius ludovicianus*). *J. Orn.* **139**: 307–312.

Yosef, R. & Grubb, T.C. (1993). Effect of vegetation height on hunting behavior and diet of Loggerhead Shrikes. *Condor* **95**: 127–131.

Yosef, R. & Grubb, T.C. (1994a). Resource dependence and territory size in Loggerhead Shrikes (*Lanius ludovicianus*). *Auk* **111**(2): 465–469.

Yosef, R. & Grubb, T.C. (1994b). Habitat-specific nutritional condition in Loggerhead Shrikes (*Lanius ludovicianus*): evidence from pilochronology. *Auk* **111**(3): 756–759.

Yosef, R. & Lohrer, F.E. (1995). Loggerhead Shrikes, red fire ants and red herrings? *Condor* **97**: 1053–1056.

Yosef, R. & Lohrer, F.E. eds. (1998). *Shrikes of the World – II: Conservation and Implementation*. International Birdwatching Center Technical Publication 7. International Birdwatching Center, Eilat, Israel. 119 pp.

Yosef, R. & Pinshow, B. (1988a). Nestling transfer in the Northern Shrike *Lanius excubitor*. *Auk* **105**: 580–581.

Yosef, R. & Pinshow, B. (1988b). Polygyny in the Northern Shrike *Lanius excubitor* in Israel. *Auk* **105**: 581–582.

Yosef, R. & Pinshow, B. (1989). Cache size in shrikes influences female mate choice and reproductive success. *Auk* **106**: 418–421.

Yosef, R. & Pinshow, B. (2005). Impaling in shrikes: a behavioral and ontogenic perspective. *Behav. Processes* **69**: 363–367.

Yosef, R. & Tryjanowski, P. (2002). Migratory Masked Shrikes *Lanius nubicus* staging at the desert edge: phenology, and sex- and age-related differences in body mass. *Ostrich* **73**: 162–165.

Yosef, R. & Whitman, D.W. (1992). Predator adaptations and defensive adaptations in evolutionary balance: no defense is perfect. *Evol. Ecol.* **6**: 527–536.

Yosef, R. & Zduniak, P. (2004). Within-clutch variation in egg dimensions of Loggerhead Shrike (*Lanius ludovicianus*) in south-central Florida. *Biol. Letters (Poznan)* **41**: 155–162.

Yosef, R., Carrel, J.E. & Eisner, T. (1996). Contrasting reactions of Loggerhead Shrikes to two types of chemically defended insect prey. *J. Chem. Ecol.* **22**: 173–181.

Yosef, R., Layne, J.N. & Lohrer, F.E. (1993). Trends in numbers of Loggerhead Shrikes on roadside censuses in peninsular Florida, 1974–1992. *Florida Science* **56**: 92–97.

Yosef, R., Maritz, C., Maritz, A. & Verdoorn, G. (2000). Physical properties of nests of the Common Fiscal Shrike (*Lanius collaris subcoronatus*) in the Kalahari Desert, South Africa. *Ring* **22**(1): 123–126.

Yosef, R., Mitchell, W.A. & Pinshow, B. (1991). The proximate costs and benefits of polygyny to male Northern Shrikes. *Wilson Bull.* **103**: 146–149.

Yoshii, M., Sato, F., Ozaki, K., Shigeta, Y., Komeda, S., Yoshiyasu, K. & Mitamura, A. (1989). Japanese bird-banding now and past. *J. Yamashina Inst. Orn.* **21**: 309–325.

Young, K.V., Brodie, E.D. Jr. & Brodie, E.D. (2004). How the horned lizard got its horns. *Science (Washington, D.C.)* **304**: 65.

Young, T.P. (1982). Bird visitation, seed-set, and germination rates in two species of *Lobelia* on Mount Kenya. *Ecology* **63**: 1983–1986.

Young, T.P. & Evans, T.P. (1993). Alpine vertebrates of Mount Kenya, with particular notes on the rock hyrax. *J. East Afr. Nat. Hist. Soc. & Natl. Mus.* **82**: 55–79.

Yumoto, T. (2000). Bird-pollination of three *Durio* species (Bombacaceae) in a tropical rainforest in Sarawak, Malaysia. *Amer. J. Bot.* **87**(8): 1181–1188.

Zack, S. & Ligon, J.D. (1985a). Cooperative breeding in *Lanius* shrikes. 1. Habitat and demography of two sympatric species. *Auk* **102**: 754–765.

Zack, S. & Ligon, J.D. (1985b). Cooperative breeding in *Lanius* shrikes. 2. Maintenance of group-living in a nonsaturated habitat. *Auk* **102**: 766–773.

Zack, S. & Ligon, J.D. (1986). Behaviour and breeding biology of the cooperatively breeding Grey-backed Fiscal Shrike *Lanius excubitorius* in Kenya. *Ibis* **128**: 214–233.

Zedlitz, O. Graf von (1910). Einige neue Formen aus Nordost-Afrika. [Part 2]. *Orn. Monatsber.* **18**(4): 57–59. In German.

Zhang Lixun, An Pei, Zhou Tianlin & Liu Naifa (2006). New records of birds in Gansu province. *J. Lanzhou Univ. (Nat. Sci.)* **42**(3): 57–59. In Chinese with English summary.

Zhang Wei, Lei Fumin, Liang Gang, Yin Zuohua, Zhao Hongfeng, Wang Hongjian & Kristin, A. (2007). Taxonomic status of eight Asian shrike species (*Lanius*): phylogenetic analysis based on Cyt b and Col gene sequences. *Acta Orn. (Warszawa)* **42**(2): 173–180.

Zhao Zhengjie, Piao Longguo, Piao Zhengji, Sun Chuanzhou, Liu Qinglin & Guo Wanfu (1984). [On the biology of *Remiz pendulinus consobrinus*]. *Forestry Sci. Techn.* **1984**(1): 15–19. In Chinese.

Zheng Guangmei & Wang Xiangting (1985). On the intraspecific categories of Bull-headed Shrike (*Lanius bucephalus* Temminck & Schlegel). *Beijing Daxue Xuebao (Ziran Kexue Ban)* **3**: 75–79. In Chinese with English summary.

Zheng Zuoxin, Li Dehao, Wang Zuxiang, Wang Ziyu, Jiang Zhihua & Lu Taichun (1983). See Cheng Tsohsin *et al.* (1983).

Zhou Lizhi, Wang Qishan & Song Yujun (2003). Breeding ecology of *Aegithalos concinnus*. *Chinese J. Ecol.* **22**(2): 24–27. In Chinese with English summary.

van Zijl, G. (1999). Nest building in the Lesser Doublecollared Sunbird. *Bird Numbers* **8**: 28.

Zimmer, J.T. (1918). Some notes on the birds of Southern Palawan and adjacent islands. *Philippine J. Sci.* **13**: 327–357.

Zimmer, K. (1943). Der Flug des Nektarvogels (*Cinnyris*). *J. Orn.* **91**(4): 371–387, pls. 13–16. In German.

Zimmerman, D.A., Turner, D.A. & Pearson, D.J. (1996). *Birds of Kenya and Northern Tanzania*. Christopher Helm & A&C Black, London.

Zink, G. (1975). *Der Zug europäischer Singvögel. Ein Atlas der Wiederfunde beringter Vögel*. Vol. 1(2). Vogelwarte Radolfzell am Max-Planck-Institut für Verhaltensphysiologie, Vogelzug-Verlag, Möggingen & Konstanz. In German.

Zink, R.M., Drovetski, S.V. & Rohwer, S. (2006). Selective neutrality of mitochondrial ND2 sequences, phylogeography and species limits in *Sitta europaea*. *Mol. Phylogen. Evol.* **40**: 679–686.

Zink, R.M., Kessen, A.E., Line, T.V. & Blackwell-Rago, R.C. (2001). Comparative phylogeography of some aridland bird species. *Condor* **103**(1): 1–10.

Zippelius, H.M. (1972). Zur Brutbiologie des Pirols (*Oriolus oriolus*). *Bonn. Zool. Beitr.* **23**: 338–346. In German.

Zuccon, D., Cibois, A., Pasquet, E. & Ericson, P.G.P. (2006). Nuclear and mitochondrial sequence data reveal the major lineages of starlings, mynas and related taxa. *Mol. Phylogen. Evol.* **41**(2): 333–344.

Zug, G.R., Springer, V.G., Williams, J.T. & Johnson, G.D. (1988). The vertebrates of Rotuma and surrounding waters. *Atoll Res. Bull.* **316**: 1–25.

INDEX

INDEX

Numbers in *italics* refer to the page numbers of individual photographs.

A

abbotti, *Cinnyris sovimanga* 301
ablutum, *Dicaeum sanguinolentum* 388
 Abyssinian Oriole 728
 Abyssinian Sunbird 289
 Abyssinian White-eye 405, 469
 Abyssinian Yellow White-eye 469
abyssinicus, *Zosterops* 405, 469
acaciurum, *Auriparus flaviceps* 74
Acanthagenys 618
Acanthorhynchus 582
acik, *Chalcomitra senegalensis* 264
acrophila, *Ptiloprora mayri* 658
aculeata, *Sitta carolinensis* 139
adamauae, *Chalcomitra senegalensis* 264
addendus, *Lichenostomus flavus* 602
additus, *Oriolus larvatus* 728
adelberti, *Chalcomitra* 263
adiabonensis, *Anthodiaeta metallica* 254
adjuncta, *Chalcomitra amethystina* 264
admiralitatis, *Zosterops hypoxanthus* 457
 Admiralty Friarbird 682
 Admiralty Honeyeater 650
 Admiralty Island Friarbird 682
 Admiralty Myzomela 650
Adolphina's Myzomela 650
adolphinae, Myzomela 649
aeger, *Cinnyris pulchellus* 283
 AEGITHALIDAE 76, 95
Aegithalos 95
aeneigularis, *Nectarinia famosa* 272
aeneum, *Dicaeum* 384
aeneus, *Anthreptes rhodolaemus* 248
aequatorialis, *Chalcomitra senegalensis* 264
aequatorialis, *Corvinella melanoleuca* 795
aeruginosum, *Dicaeum agile* 371
Aethopyga 305
afer, *Cinnyris* 205, 278
affine, *Dicaeum agile* 371
affine, *Oedistoma iliolophus* 337
affinis, *Arachnothera* 319
affinis, *Corvinella corvina* 794
affinis, *Melithreptes* 675
affinis, *Oriolus sagittatus* 717
 African Black-headed Oriole 728
 African Golden Oriole 703, 723
 African Montane White-eye 412, 432, 473
 African Mountain White-eye 473
 African Oriole 723
 African Pale White-eye 470
 African Penduline-tit 72, 73
 African Violet-backed Sunbird 251
 African Yellow White-eye 426, 433, 434, 470
agile, *Dicaeum* 370
aicora, *Meliphaga montana* 593
aignani, *Zosterops griseotinctus* 462
alani, *Zosterops japonicus* 445
alaris, *Rhabdornis inornatus* 195
alascensis, *Certhia americana* 182
albescens, *Certhia americana* 182
albicauda, *Melanocharis striativentris* 336
albifrons, *Purnella* 503, 609
albifrons, *Sitta europaea* 127
albigula, Myzomela 637
albilateralis, *Cinnyris chalybeus* 275
albilineata, *Meliphaga* 594
albiloris, *Oriolus steerii* 721
albipennis, *Entomyzon cyanotis* 676
albitorques, *Philemon* 682
albiventr, *Cinnyris venustus* 292
albiventr, *Zosterops citrinella* 454

alboauricularis, *Lichmera* 662
albugularis, *Conopophila* 563, 628
albugularis, *Melithreptes* 567, 674
albugularis, *Zosterops* 468
albonotata, *Meliphaga* 591
albopunctatum, *Dicaeum geelvinkianum* 384
aldabrensis, *Cinnyris sovimanga* 301
aldabrensis, *Zosterops maderaspatanus* 474
alexandrae, *Sitta carolinensis* 140
alexis, *Philemon argenteiceps* 682
 Alfred Honeyeater 629
alfredi, *Cyanomitra olivacea* 260
 Algerian Nuthatch 134
algeriensis, *Lanius meridionalis* 787
alinae, *Cyanomitra* 260
alinderi, *Drepanorhynchus reichenowi* 273
alisteri, *Melithreptes affinis* 675
alleni, *Oriolus nigripennis* 729
 Allied Honeyeater 591
alligator, *Manorina flavigula* 618
almorae, *Sitta cinnamoventris* 130
alopekion, *Zosterops borbonicus* 473
 Alor White-eye 454
alpina, *Paramythia montium* 348
 Alpine Tit 95
alpinus, *Aegithalos caudatus* 95
 Altai Shrike 786
altaicus, *Remiz macronyx* 69
altaicus, *Remiz pendulinus* 69
alter, *Cinnyris habessinicus* 289
alticola, *Certhia americana* 182
amabilis, *Zosterops palpebrosus* 446
amadoni, *Anthreptes rectirostris* 252
amadoni, *Cinnyris minullus* 274
 Amani Sunbird 243, 254
amani, *Oriolus chlorocephalus* 727
 Amboina Honeyeater 637
 Amboina Myzomela 637
 Amboina White-eye 461
 Ambon Honeyeater 637
 Ambon Myzomela 637
 Ambon White-eye 461
 Ambon Yellow White-eye 461
 American Bushtit 99
 American Creeper 182
 American Treecreeper 171, 175, 182
americana, *Certhia* 171, 175, 182
 Amethyst Sunbird 214, 264
 Amethyst-throated Sunbird 264
amethystina, *Chalcomitra* 214, 264
amicorum, *Cinnyris manoensis* 274
ammitophilus, *Philemon buceroides* 680
Amoromyza 670, 671
amphochlora, *Meliphaga lewinii* 589
amputakae, *Zosterops maderaspatanus* 474
amurensis, *Sitta europaea* 127
Anabathmis 257
analoga, *Meliphaga* 591
analogus, *Lophozosterops squameiceps* 482
analogus, *Zosterops maderaspatanus* 474
anambae, *Anthreptes malacensis* 247
 Anchietta's Sunbird 246
anchietae, *Anthreptes* 246
 Andaman Black-naped Oriole 724
 Andaman Flowerpecker 380
andamanensis, *Oriolus chinensis* 724
andamanensis, *Oriolus xanthornus* 729
andamanicus, *Cinnyris jugularis* 297
anderseni, *Cinnyris regius* 279
andersoni, *Aethopyga siparaja* 313
anderssoni, *Cinnyris talatala* 291
anderssoni, *Zosterops senegalensis* 471

angkanensis, *Aethopyga nipalensis* 309
 Angola Sunbird 291
 Angola White-bellied Sunbird 291
angolensis, *Anthreptes longuemarei* 251
angolensis, *Corvinella melanoleuca* 795
angolensis, *Oriolus larvatus* 728
anguitimens, *Eurocephalus* 766, 795
angustipluma, *Chaetoptila* 499
 Anjouan Sunbird 301
anjuanensis, *Zosterops maderaspatanus* 474
 Anna's Flowerpecker 370
annabellae, Myzomela 601
annae, *Dicaeum* 370
annamensis, *Aegithalos concinnus* 97
annamensis, *Aethopyga gouldiae* 309
annamensis, *Cinnyris jugularis* 297
 Annobon White-eye 474
anomala, *Aethopyga saturata* 310
anomalous, *Zosterops* 404, 455
ansorgei, *Anthoscopus caroli* 72
antelia, *Arachnothera longirostra* 317
Anthobaphes 258
Anthochaera 620
Anthodiaeta 253
 Anthony's Flowerpecker 374
anthonyi, *Dicaeum* 367, 374
anthonyi, *Lanius ludovicianus* 785
Anthornis 587
Anthoscopus 71
Anthreptes 246
anticostiensis, *Certhia americana* 182
antioproctum, *Dicaeum trigonostigma* 379
Apalopteron 480
apicalis, *Moho* 499
 Apo Sunbird 242, 305
 Apo White-eye 481
apo, *Dicaeum ignipectus* 387
apo, *Sitta oenochlamys* 143
apolis, *Cinnyris sovimanga* 301
 Apricot-breasted Sunbird 239, 297
apsleyi, *Entomyzon cyanotis* 676
apsleyi, *Ramsayornis fasciatus* 627
arabs, *Zosterops abyssinicus* 469
Arachnothera 317
aralensis, *Remiz macronyx* 69
arctica, *Sitta europaea* 127
ardens, *Oriolus traillii* 730
ardens, *Promerops gurneyi* 497
aremericus, *Aegithalos caudatus* 95
arenarius, *Lanius isabellinus* 777
areustus, *Cinnyris talatala* 291
 Arfak Berrypecker 335, 348
 Arfak Black-fronted White-eye 457
 Arfak Flowerpecker 348
 Arfak Honeyeater 632
 Arfak Melidectes 612
 Arfak Melipotes 632
 Arfak White-eye 457
 Arfak White-fronted Honeyeater 613
 Arfak Yellow-throated White-eye 457
arfaki, *Oreocharis* 343, 348
arfakiana, *Melanocharis* 335
argentaureis, *Lichmera* 660
argenteiceps, *Philemon* 515, 682
aridicolus, *Lanius collaris* 792
ariel, *Aethopyga saturata* 310
armata, *Arachnothera robusta* 318
arolasi, *Aethopyga bella* 307
arturi, *Nectarinia kilimensis* 272
aruensis, *Meliphaga* 590
aruensis, Myzomela 638
aruensis, *Philemon buceroides* 680

aruensis, *Zosterops novaeguineae* 461
ashantiensis, *Cinnyris superbus* 290
ashbyi, *Sphecotheres vieilloti* 715
 Ashy Flowerpecker 383
 Ashy Honeyeater 638
 Ashy Myzomela 638
 Ashy-bellied White-eye 454
 Ashy-fronted Flowerpecker 383
 Asian Black-headed Oriole 729
asiatica, *Sitta europaea* 127
asiaticus, *Cinnyris* 226, 296
aspasia, *Nectarinia* 268
aspasioides, *Leptocoma sericea* 268
assamensis, *Aethopyga saturata* 310
assamensis, *Chalcoparia singalensis* 245
assimile, *Dicaeum trigonostigma* 379
assimilis, *Oriolus steerii* 721
astilpna, *Arachnothera chrysogenys* 318
asuncionis, Myzomela 644
ater, *Melipotes* 509, 632
atita, *Arachnothera longirostra* 317
atjehense, *Dicaeum agile* 371
atkinsi, *Sitta carolinensis* 139
atmorii, *Zosterops pallidus* 470
atrata, Myzomela 651
atricapilla, *Zosterops* 418, 449
atriceps, *Zosterops* 417, 455
atrifrons, *Zosterops* 455
aubryana, *Gymnomyza* 671
aucheri, *Lanius meridionalis* 787
auga, *Meliphaga albonotata* 591
augustus, *Melithreptes brevirostris* 673
aurantius, *Anthreptes* 252
aurata, *Arachnothera magna* 319
auratus, *Oriolus* 703, 723
aurea, *Chalcomitra fuliginosa* 263
aurelloris, *Zosterops nigrorum* 450
aureolimbatus, *Dicaeum* 373
aureus, *Anthoscopus parvulus* 71
auricapilla, *Leptocoma sericea* 268
auriceps, *Leptocoma sericea* 268
Auriparus 74
auriventer, *Zosterops palpebrosus* 446
aurora, *Cinnyris jugularis* 297
austera, *Xanthotis flaviventer* 689
 Austral Flowerpecker 375
 Australasian Figbird 693, 697, 699, 707, 708, 715
australe, *Dicaeum* 375
 Australian Brown Honeyeater 661
 Australian Flower Swallow 388
 Australian Flowerpecker 388
 Australian Oriole 717
 Australian Pale White-eye 454
 Australian Silvereye 454
 Australian White-eared Honeyeater 602
 Australian Yellow Oriole 718
 Australian Yellow White-eye 413, 462
australis, *Aethopyga nipalensis* 309
australis, *Cinnyris jugularis* 297
axantha, *Leptocoma sperata* 267
axillaris, *Deleornis* 245
axillaris, *Melanocharis striativentris* 336
 Azure Nuthatch 144
azurea, *Sitta* 111, 144

B

Babbler Honeyeater 629
babelo, *Zosterops everetti* 449
 Bacan Black-fronted White-eye 455

- badius*, *Lanius senator* 793
baicalensis, *Sitta europaea* 127
 Bald Friarbird 682
balfouri, *Chalcomitra* 240, 265
balstoni, *Zosterops luteus* 462
baltistanicus, *Oriolus kundoo* 722
 Banana-bird 715
 Banda Honeyeater 641, 649
 Banda Myzomela 641, 649
 Banda Sea Honeyeater 662
 Banda White-eye 453
 Banded Green Sunbird 252, 253
 Banded Honeyeater 526, 659
 Banded Myzomela 660
 Banded Sunbird 252, 253, 257
 Banded White-eye 463
bangsi, *Aethopyga gouldiae* 309
bangsi, *Sitta villosa* 135
 Bannerman's Blue-headed Sunbird 259
 Bannerman's Sunbird 259
bannermani, *Cyanomitra* 259
bansoensis, *Cyanomitra oritis* 260
bantenensis, *Chaloparia singalensis* 245
barabensis, *Remiz pendulinus* 69
barboursi, *Anthreptes orientalis* 251
 Bar-breasted Honeyeater 557, 627
 Bar-tailed Treecreeper 167, 184
 Bare-eyed Honeyeater 632
 Bare-eyed White-eye 479
 Bare-faced Spiderhunter 318
 Barred Honeyeater 508, 631
barroni, *Lichenostomus chrysops* 597
barroni, *Pardalotus striatus* 401
basilanicus, *Anthreptes malacensis* 247
basilanicus, *Oriolus steerii* 721
basilanicus, *Zosterops everetti* 449
bassetti, *Zosterops citrinella* 454
bastille, *Meliphaga mimikae* 592
batanis, *Zosterops meyeri* 446
 Bates's Olive Sunbird 295
 Bates's Sunbird 295
batesi, *Cinnyris* 295
batesi, *Melidectes ochromelas* 612
 Batjan Black-fronted White-eye 455
batjanensis, *Myzomela chloroptera* 641
batuense, *Dicaeum cruentatum* 389
baweans, *Anthreptes malacensis* 247
 Bay-backed Shrike 748, 780
 Bearded Honeyeater 667
 Bearded Melidectes 611
 Beautiful Flowerpecker 384
 Beautiful Long-tailed Sunbird 283
 Beautiful Nuthatch 125, 145
 Beautiful Sunbird 217, 283
beccarii, *Aethopyga siparaja* 313
beccarii, *Dicaeum ignipectus* 387
becki, *Dicaeum aeneum* 384
becki, *Meliphaga orientalis* 590
bedfordi, *Pholidornis rushiae* 75
bedfordi, *Sitta europaea* 127
 Bee-eater
 Embroidered 622
 Belford's Black-bill 613
 Belford's Honeyeater 528, 613
 Belford's Melidectes 613
belfordii, *Melidectes* 528, 613
 Bell
 New Zealand 587
 Bell Minah 615
 Bell Miner 505, 615
 Bell Mynah 615
bella, *Aethopyga* 307
 Bellbird 615
 Chatham 587
 Chatham Island 587
 New Zealand 530, 587
 Three Kings 587
 The Bellbird 587
bensoni, *Cinnyris mediocris* 279
benti, *Lanius schach* 781
bergmanni, *Leptocoma sericea* 268
 Berrypecker 322, 335
 Arfak 335, 348
 Black 323, 329, 335
 Crested 341, 345, 347, 348
 Fan-tailed 325, 330, 332, 333, 336
 Green 336
 Lemon-breasted 335
 Long-tailed 335
 Long-tailed Black 335
 Mid-mountain 323, 335
 Mountain 348
 New Guinea 348
 Obscure 335
 Olivaceous 348
 Painted 340, 348
 Spotted 326, 336
 Streaked 324, 336
 Striated 336
 Thick-billed 336
 Tit 343, 348
 Verster's 336
 Yellow-bellied 335
besti, *Dicaeum trigonostigma* 379
beverleyae, *Anthodieta collaris* 253
 Biak White-eye 439, 458
bianchii, *Certhia familiaris* 181
bianchii, *Lanius excubitor* 786
bicolor, *Dicaeum* 374
 Bicolored Dark-eye 480
 Bicoloured Flowerpecker 374
 Bicoloured White-eye 480
 Bifasciated Sunbird 285
bifasciatus, *Cinnyris* 234, 285
bineschensis, *Cinnyris chloropygius* 273
 Bioko Speirops 484
 Bird
 Cedar 717
 Charcoal 636
 Macgregor's 633
 Rainbow 271
 Bird-of-paradise
 MacGregor's 633
 McGregor's 633
 Orange-wattled 633
birgitae, *Anthreptes griseigularis* 247
 Bishop's O'o 499
bishopi, *Moho* 499
 Bismarck Black Honeyeater 650
 Bismarck Black Myzomela 650
 Bismarck Black-fronted White-eye 457
 Bismarck Flowerpecker 384
 Bismarck Friarbird 681
 Bismarck Friarbird 681
 Bismarck Honeyeater 611, 638, 650
 Bismarck Island Honeyeater 650
 Bismarck Melidectes 611
 Bismarck Myzomela 638, 650
 Bismarck White-eye 457
 Bismarck Yellow-bellied White-eye 457
 Black Berrypecker 323, 329, 335
 Black Honeyeater 565, 632, 636, 639, 650
 Black Myzomela 639, 650
 Black Oriole 730
 Black Sunbird 202, 264, 268
 Black White-eye 458
 Black-and-crimson Oriole 730
 Black-and-red Honeyeater 653
 Black-and-red Myzomela 653
 Black-and-white Honeyeater 585
 Black-backed Honeyeater 658
 Black-backed Streaked Honeyeater 658
 Black-banded Flowerpecker 385
 Black-bellied Honeyeater 646
 Black-bellied Honeyeater 645
 Black-bellied Myzomela 646
 Black-bellied Sunbird 284
 Black-bellied Flowerpecker 375
 Black-bill
 Belford's 613
 Black-breasted Honeyeater 653, 670
 Black-breasted Myzomela 653
 Black-breasted Sunbird 296, 310
 Black-browed Tit 76, 98
 Black-capped Honeyeater 673, 675
 Black-capped Shrike 781
 Black-capped Speirops 409, 485
 Black-capped White-eye 418, 449
 Black-chested Honeyeater 653, 664
 Black-chinned Honeyeater 672
 Black-cowled Honeyeater 651
 Black-crowned White-eye 455
 Black-eared Bushtit 99
 Black-eared Miner 571, 580, 617
 Black-eared Oriole 712, 716
 Black-eye 483
 Grey-throated 482
 Mountain 407, 483
 Olive 483
 Black-faced Friarbird 679
 Black-faced Honeyeater 598, 604
 Black-faced Oriole 716
 Black-fronted Flowerpecker 364, 385
 Black-fronted Honeyeater 593, 595
 Black-fronted White-eye 455, 456, 457
 Black-headed Forest Oriole 728
 Black-headed Honeyeater 651, 675
 Black-headed Myzomela 651
 Black-headed Nuthatch 135
 Black-headed Oriole 721, 729
 Black-headed Pardalote 401
 Black-headed Penduline-tit 69, 70
 Black-headed Shrike 781
 Black-headed Tit 97, 98
 Black-headed White-eye 457
 Black-hooded Oriole 729
 Black-masked Nuthatch 136
 Black-masked White-eye 438, 481
 Black-naped Oriole 699, 711, 724
 Black-necked Honeyeater 663
 Black-ringed White-eye 404, 455
 Black-sided Flowerpecker 351, 358, 363, 363, 387
 Black-tailed Oriole 728
 Black-throated Bushtit 96
 Black-throated Honeyeater 595, 672
 Black-throated Oriole 721
 Black-throated Sunbird 235, 296, 310
 Black-throated Tit 77, 82, 88, 92, 96
 Black-winged Oriole 729
 Blackened Honeyeater 639
 Blackish Myzomela 639
blanci, *Aethopyga nipalensis* 309
blanfordi, *Cinnyris jugularis* 297
blasii, *Myzomela* 637
blicki, *Cinnyris venustus* 292
 Blood Honeyeater 642
 Blood-breasted Flowerpecker 388
 Blood-red Honeyeater 642
bloodi, *Oreocharis arfaki* 348
 Blue Nuthatch 171, 144
 Blue Sunbird 251
 Blue-cheeked Flowerpecker 385
 Blue-faced Honeyeater 540, 570, 676
 Blue-headed Brown Sunbird 259
 Blue-headed Sunbird 259, 260
 Blue-naped Sunbird 257
 Blue-throated Brown Sunbird 259
 Blue-throated Little Sunbird 246
 Blue-throated Sunbird 246, 259, 309
 Blyth's Long-tailed Tit 97
 Blyth's Tit 97
 Bocache's Montane Double-collared Sunbird 277
 Bocache's Sunbird 271
bocagii, *Nectarinia* 271
boehmi, *Eurocephalus ruppelli* 796
boehmi, *Lanius excubitorius* 788
bohndorffi, *Cyanomitra verticalis* 259
boholensis, *Zosterops everetti* 449
 Boie's Honeyeater 641
boiei, *Myzomela* 641
boltoni, *Aethopyga* 242, 305
 Bonaparte's Friarbird 685
boneratis, *Oriolus chinensis* 724
bonga, *Dicaeum ignipectus* 387
 Bonin White-eye 442, 480
boninsimae, *Zosterops japonicus* 445
bonita, *Aethopyga bella* 307
 Bonvalot's Tit 98
bonvaloti, *Aegithalos* 76, 98
borbonicus, *Zosterops* 437, 473
borealis, *Lanius excubitor* 786
 Bornean Fire-breasted Flowerpecker 387
 Bornean Flowerpecker 370, 387
 Bornean Spiderhunter 319
borneana, *Chaloparia singalensis* 245
borneamum, *Dicaeum concolor* 380
bornensis, *Anthreptes malacensis* 247
 Borneo Flowerpecker 370
 Borneo Yellow-rumped Flowerpecker 370
bostanjogli, *Remiz macronyx* 69
bostanjogli, *Remiz pendulinus* 69
 Bougainville Honeyeater 630, 651
 Bougainville Myzomela 651
bougainvillei, *Stresemannia* 630
 Bourbon White-eye 473
bouroensis, *Oriolus* 712, 716
 Bouvier's Orange-tufted Sunbird 289
 Bouvier's Sunbird 289
bouvieri, *Cinnyris* 289
 Bowbill
 Canary 338
 Grey-winged 338
bowensis, *Pardalotus striatus* 401
braba, *Gliciphila melanops* 659
braccatus, *Moho* 499
brachydactyla, *Certhia* 169, 171, 173, 176, 177, 183
brachyrhynchus, *Oriolus* 727
bractiatus, *Cinnyris manoensis* 274
brasiliiana, *Leptocoma sperata* 267
 Brass' Friarbird 684
 Brass's Friarbird 684
brassi, *Melidectes belfordii* 613
brassi, *Philemon* 684
breda, *Philemon citreogularis* 684
brevicauda, *Paramythia montium* 349
brevicauda, *Zosterops flavifrons* 465
brevipennis, *Philemon buceroides* 680
brevirostris, *Cinnyris asiaticus* 296
brevirostris, *Melithreptus* 551, 561, 673
 Bridled Honeyeater 596
 Bridled White-eye 447
britannica, *Certhia familiaris* 181
 Broad-ringed White-eye 473
 Broadbent's Honeyeater 596, 602
broderipi, *Oriolus chinensis* 724
 Bronze Sunbird 233, 272
 Bronze-backed Flowerpecker 387
 Bronzed Pygmy Sunbird 254
 Bronzy Sunbird 272
 Brooks's Nuthatch 129
broomei, *Ramsayornis fasciatus* 627
 Brown Creeper 182
 Brown Honeyeater 523, 538, 552, 583, 631, 661, 689
 Brown Honeyeater 631
 Brown Oriole 694, 716
 Brown Shrike 759, 777
 Brown Sunbird 245, 248
 Brown Xanthotis 689
 Brown-backed Flowerpecker 371
 Brown-backed Honeyeater 506, 627
 Brown-backed Streaked Honeyeater 658
 Brown-breasted White-eye 481
 Brown-headed Honeyeater 551, 561, 673
 Brown-headed Nuthatch 109, 132
 Brown-throated Sunbird 198, 247
 Brown-throated Treecreeper 185, 186
brunneirostris, *Gymnomyza viridis* 670
brunnesens, *Sitta pygmaea* 132
brunneus, *Melilestes megarhynchus* 630
brunneus, *Speirops* 484
 Brush Mockbird 620, 621
 Brush Mockingbird 621
 Brush Wattledbird 620, 621
 Brush-throated Honeyeater 669
bucephalus, *Lanius* 760, 775
buceroideis, *Philemon* 529, 680
buchenorum, *Cinnyris sovimga* 301
buettikoferi, *Arachnothera longirostra* 317
buettikoferi, *Cinnyris* 239, 297
 Buff-bellied Flowerpecker 387
 Buff-bellied Penduline-tit 72
 Buff-breasted Honeyeater 689
 Buff-breasted Sunbird 292
 Buff-chested Sunbird 292
 Buff-striped Honeyeater 689
 Buff-throated Sunbird 263
 Bukida White-eye 461
 Bull-headed Shrike 760, 775
bungurens, *Dicaeum everetti* 371
burigi, *Lanius souzae* 779
 Burmese Nuthatch 130
 Burmese Shrike 778
 Burmese Tit 98
 Buru Flowerpecker 383
 Buru Friarbird 679
 Buru Friarbird 679
 Buru Honeyeater 663
 Buru Island White-eye 458
 Buru Mountain White-eye 481
 Buru Oriole 716
 Buru White-eye 458
 Buru Yellow White-eye 458
buruensis, *Cinnyris jugularis* 297
buruensis, *Zosterops* 458
buryi, *Lanius meridionalis* 787
 Bushtit 79, 82, 87, 88, 89, 99
 American 99
 Black-eared 99
 Black-throated 96
 Common 99
 Grinda's 99
 Jouy's 99
 Lead-coloured 99
 Long-tailed 95
 Plain 99
 Plumbeous 99
 Puget Sound 99
 Pygmy 100
 Rufous-fronted 97
 Sacramento 99
 Silver-throated 96
 White-cheeked 96

- White-throated 97
Butcherbird 785
butleri, *Cinnyris osea* 289
buvuma, *Cinnyris superbus* 290
buxtoni, *Zosterops palpebrosus* 446
Buzzing Flowerpecker 354, 379
- C**
cabanisi, *Lanius* 734, 789
Caconda White-bellied Sunbird 291
caena, *Arachnothera modesta* 319
caeruleogula, *Leptocoma sericea* 268
caesia, *Sitta europaea* 127
cafer, *Promerops* 487, 491, 493, 494, 495, 496
cagayanense, *Dicaeum hypoleucum* 379
cagayanensis, *Anthreptes malacensis* 247
cahni, *Melidectes torquatus* 614
cairnensis, *Acanthorhynchus temirostris* 582
calconi, *Lichenostomus penicillatus* 608
calcostetha, *Leptocoma* 269
caledonica, *Myzomela* 642
Californian Nuthatch 131
californicus, *Psaltiriparus minimus* 99
Caliginosa 595, 596, 597
caliginosa, *Corvinella corvina* 794
Callisitta 145
Cambodian Flowerpecker 387
cambodiana, *Aethopyga saturata* 310
cambodianum, *Dicaeum ignipectus* 387
Cameroon Blue-headed Sunbird 260
Cameroon Speirops 485
Cameroon Sunbird 236, 259
Cameroon White-eye 485
cameroonensis, *Deleornis fraseri* 245
campbelli, *Phylidonyris novaehollandiae* 667
canadensis, *Sitta* 110, 136
Canary Bowbill 338
Canary False-sunbird 338
Canary Longbill 338
candidior, *Xanthotis polygrammus* 688
canescens, *Phylidonyris novaehollandiae* 667
canescens, *Sitta pygmaea* 131
caniceps, *Lanius schach* 781
caniviridis, *Zosterops pallidus* 470
cantans, *Myzomela cruentata* 639
Cape Long-tailed Sugarbird 496
Cape Penduline-tit 57, 60, 73
Cape Red-browed Pardalote 401
Cape Sugarbird 487, 491, 493, 494, 495, 496
Cape White-eye 424, 428, 470
Cape York Friarbird 680
Cape-and-Green White-eye 470
capelli, *Lanius collaris* 792
capensis, *Zosterops pallidus* 470
Capped White-eye 458
Cappoc Tit 71
Capricorn Silvereye 467
capricornensis, *Cinnyris chalybeus* 275
captata, *Melanocharis longicauda* 335
cara, *Aethopyga siparaja* 313
Carbon Honeyeater 639
Carbon Myzomela 639
Cardinal Honeyeater 645
Cardinal Myzomela 645
cardinalis, *Myzomela* 645
Carmelite Sunbird 263
carolae, *Melipotus* 509, 633
caroli, *Anthoscopus* 65, 72
Carolina Nuthatch 139
carolinae, *Macgregoria pulchra* 633
Caroline Islands White-eye 448
Caroline White-eye 448, 469
carolinensis, *Sitta* 106, 116, 121, 139
carpentariae, *Pardalotus rubricatus* 401
carpentariae, *Philemon citreogularis* 684
carpentarianus, *Melithreptus gularis* 672
Carter's Honeyeater 608
carteri, *Lichenostomus penicillatus* 608
carunculata, *Anthochaera* 524, 546, 548, 623
Carunculated Honeyeater 669
carunculatus, *Foulehaio* 539, 669
cashmirensis, *Sitta* 122, 129
caspius, *Remiz pendulinus* 69
cassidix, *Lichenostomus melanops* 604
castanea, *Sitta* 129
castaneus, *Remiz pendulinus* 69
casuarina, *Manorina flavigula* 618
catarmanensis, *Zosterops nigrorum* 450
caucasica, *Certhia familiaris* 181
caucasica, *Sitta europaea* 127
causicus, *Oriolus oriolus* 722
- caudatus*, *Aegithalos* 78, 83, 84, 86, 89, 90, 93, 95
caudatus, *Phylidonyris novaehollandiae* 667
Cebu Flowerpecker 375
Cedar Bird 717
celebensis, *Anthreptes malacensis* 247
celebensis, *Myza* 631
celebensis, *Oriolus chinensis* 724
Celebes Flowerpecker 373, 383
Celebes Grey-throated White-eye 481
Celebes Honeyeater 631, 641
Celebes Mountain White-eye 481
Celebes Myza 631
Celebes Myzomela 641
Celebes White-eye 454, 455
celebicum, *Dicaeum* 387
Central Asian Shrike 777
Central Solomons Honeyeater 651
Central Solomons White-eye 464
centralasiae, *Remiz coronatus* 70
centrale, *Dicaeum geelvinkianum* 384
centralis, *Nectarinia famosa* 272
centralis, *Lichenostomus penicillatus* 608
cephaelis, *Cyanomitra obscura* 261
Cephalopyrus 74
Ceram Flowerpecker 383
Ceram Honeyeater 663
Ceram Mountain Honeyeater 663
Ceram Oriole 716
Ceram White-eye 480
Certhia 181
CERTHIIDAE 166, 181
Certhionyx 585
Ceylon Black-headed Oriole 729
Ceylon Hill White-eye 446, 447
Ceylon Small Flowerpecker 380
Ceylon Small White-eye 446
Ceylon Thick-billed Flowerpecker 370
Ceylon White-eye 446, 447
ceylonense, *Dicaeum erythrorhynchus* 380
ceylonensis, *Oriolus xanthornis* 729
ceylonensis, *Zosterops* 416, 447
Chad Orange-tufted Sunbird 289
Chaetoptila 498
chalcus, *Cinnyris cupreus* 296
chalcomelas, *Cinnyris* 285
Chalcomitra 263
Chalcopygia 245
Chalcostetha 267, 268, 269
chalybeus, *Cinnyris* 207, 274
changamensis, *Cyanomitra olivacea* 260
chapini, *Cinnyris stuhlmanni* 277
chapini, *Corvinella corvina* 794
Charcoal Bird 636
charlottae, *Myzomela chloroptera* 641
Chatham Bellbird 587
Chatham Island Bellbird 587
Chatham Island Tui 587
chathamensis, *Prothemadera novaeseelandiae* 587
chelidonia, *Gliciphila melanops* 659
chermesina, *Myzomela* 640
Chestnut-backed Shrike 778
Chestnut-bellied Nuthatch 129
Chestnut-flanked White-eye 403, 445, 475
Chestnut-headed Sugarbird 497
Chestnut-rumped Shrike 778
Chestnut-sided White-eye 422, 475
Chestnut-vented Nuthatch 112, 128
chienfengensis, *Sitta solangiae* 143
chihuahuae, *Sitta pygmaea* 132
chinensis, *Oriolus* 699, 711, 724
Chinese Great Grey Shrike 788
Chinese Grey Shrike 754, 788
Chinese Nuthatch 127, 135
Chinese Penduline-tit 52, 59, 70
Chinese White-eye 445
chionogenys, *Myza sarasinorum* 632
chlorigaster, *Anthreptes malacensis* 247
chloris, *Lichmera argentauris* 660
chloris, *Melanocharis longicauda* 335
chloris, *Zosterops* 453
chlorocephala, *Leptocoma sericea* 268
chlorocephalus, *Oriolus* 727
chlorocephalus, *Zosterops lateralis* 467
Chlorocharis 483
chlorolaema, *Leptocoma sericea* 268
chloronothos, *Zosterops* 476
chloronotus, *Zosterops lateralis* 467
chloropsis, *Melithreptus lunatus* 675
chloroptera, *Melanocharis nigra* 335
chloroptera, *Myzomela* 641
chloropygius, *Cinnyris* 222, 273
chobiensis, *Anthodiaeta collaris* 253
- christianae*, *Leptocoma sericea* 268
christinae, *Aethopyga* 221, 310
Christmas Island White-eye 462
Christmas White-eye 440, 462
chrysoclore, *Dicaeum chrysorrheum* 373
chrysocome, *Melanocharis striativentris* 336
chrysogenys, *Arachnothera* 213, 318
chrysogenys, *Oreornis* 588
chrysolaemus, *Zosterops minor* 457
chrysops, *Lichenostomus* 558, 597
chrysoptera, *Anthochaera* 522, 553, 620
chrysorrheum, *Dicaeum* 356, 373
chrysotis, *Xanthotis* 689
Chuuk White-eye 479
chyulu, *Cyanomitra olivacea* 260
cineracea, *Myzomela* 638
cinerascens, *Oedistoma iliophus* 337
cinereicollis, *Arachnothera longirostra* 317
cinereifrons, *Meliphaga* 501, 592
cinereifrons, *Pycnopygius ixoides* 583
cinereigulare, *Dicaeum trigonostigma* 379
cinereogenys, *Oriolus steerii* 721
Cinereous Honeyeater 638
cinereus, *Pycnopygius* 499, 584
cinereus, *Zosterops* 469
cinreicollis, *Arachnothera longirostra* 317
cinnamomeus, *Hypocryptadius* 410, 485
Cinnamon Ibon 410, 485
Cinnamon Rufous-eye 485
Cinnamon White-eye 485
Cinnamon-bellied Nuthatch 129
Cinnamon-breasted Honeyeater 614
Cinnamon-breasted Melidectes 614
Cinnamon-breasted Wattlebird 614
Cinnamon-browed Honeyeater 612
Cinnamon-browed Melidectes 612
cinnamoventr, *Sitta* 129
Cinnyris 273
cisalpin, *Sitta europaea* 127
Cissomela 659
citreogularis, *Philemon* 542, 684
citreola, *Meliphaga orientalis* 590
Citrine White-eye 448
citrinella, *Zosterops* 454
citrimus, *Anthoscopus parvulus* 71
citrinus, *Anthreptes malacensis* 247
clamans, *Philemon corniculatus* 682
clara, *Sitta europaea* 127
clarae, *Arachnothera* 318
claudi, *Glycichaera fallax* 654
clelandi, *Anthochaera carunculata* 623
clelandi, *Manorina flavigula* 618
clementiae, *Cinnyris jugularis* 297
Cleptornis 480
Cleptornis 480
Cloncurry Honeyeater 608
cneocolaemum, *Dicaeum trigonostigma* 379
coccinea, *Dicaeum cruentatum* 389
coccinea, *Myzomela cruentata* 639
coccinigastrus, *Cinnyris* 290
cochrani, *Leptocoma sericea* 268
Cockerell's Honeyeater 669
cockerelli, *Philemon* 681
cockerelli, *Trichodere* 669
Cogno Double-collared Sunbird 277
Collared Sunbird 225, 231, 253
collaris, *Anthodiaeta* 225, 231, 253
collaris, *Lanius* 736, 742, 747, 753, 764, 792
collurio, *Lanius* 756, 761, 767, 776
collurioides, *Lanius* 778
Common Bushtit 99
Common Fiscal 736, 742, 747, 753, 764, 792
Common Fiscal Shrike 792
Common Honeyeater 632
Common Malachite Sunbird 272
Common Melipote 632
Common Melipotus 632
Common Nuthatch 127, 139
Common Penduline-tit 69
Common Purple-banded Sunbird 234, 285
Common Smoky Honeyeater 632
Common Treecreeper 181
Common Wattlebird 623
comorensis, *Cinnyris* 301
comorensis, *Zosterops maderaspatanus* 474
Comoro White-eye 476
concinus, *Aegithalos* 77, 82, 88, 92, 96
concolor, *Aethopyga vigorsii* 313
concolor, *Arachnothera modesta* 319
concolor, *Dicaeum* 352, 380
confusus, *Lanius cristatus* 777
confusus, *Philemon buceroides* 680
congensis, *Cinnyris* 284
Congo Black-bellied Sunbird 284
- Congo Sunbird 284
connectens, *Meliphaga analoga* 591
Conopophila 628
consanguineus, *Oriolus cruentus* 730
consobrinorum, *Zosterops* 454
consobrinus, *Oriolus xanthonotus* 721
consobrinus, *Remiz* 52, 59, 70
conspicillatus, *Zosterops* 447
convergens, *Anthreptes malacensis* 247
cookei, *Sitta carolinensis* 139
cooperi, *Lichenostomus virens* 598
copha, *Arachnothera chrysogenys* 318
Copper Sunbird 295
Copper-coloured Sunbird 295
Copper-throated Sunbird 269
Coppery Sunbird 295
coquerellii, *Cinnyris* 241, 302
corallipes, *Sitta frontalis* 142
corea, *Sitta villosa* 135
corinna, *Leptocoma sericea* 268
cornelia, *Leptocoma sericea* 268
corniculatus, *Philemon* 519, 541, 562, 682
cornwalli, *Zosterops lateralis* 467
coronatus, *Remiz* 64, 70
cora, *Certhia familiaris* 181
Corsican Nuthatch 122, 133
corvina, *Corvinella* 740, 752, 794
Corvinella 794
crassirostris, *Arachnothera* 317
crassirostris, *Gliciphila melanops* 659
crassirostris, *Heleia* 407, 483
crassirostris, *Oriolus* 713, 727
crassirostris, *Rhamphocharis* 326, 336
cratitus, *Lichenostomus* 605
Creamy-throated White-eye 417, 455
Creeper
American 182
Brown 182
Long-billed 194
Plain-headed 195
Spotted 169, 172, 178, 186
Spotted Grey 186
Stripe-breasted 195
Stripe-headed 194
Crescent Honeyeater 666
Crested Bertypecker 341, 345, 347, 348
Crested Dark-eye 482
Crested Honeyeater 666
Crested Tit-warbler 80, 85, 100
Crested White-eye 439, 482
cretum, *Dicaeum igniferum* 385
Crimson Honeyeater 642
Crimson Sunbird 208, 313
Crimson-backed Sunbird 239, 267
Crimson-breasted Flowerpecker 355, 369
Crimson-breasted Oriole 730
Crimson-crested Flowerpecker 383
Crimson-crowned Flowerpecker 383
Crimson-fronted Myzomela 640
Crimson-hooded Honeyeater 649
Crimson-hooded Myzomela 649
Crimson-rumped Myzomela 651
crissalis, *Zosterops novaeguineae* 461
cristatus, *Lanius* 759, 777
croceivent, *Dicaeum trigonostigma* 379
crockettorum, *Meliphaga flavivictus* 593
Crookshank's White-eye 458
crookshanki, *Zosterops fuscicapilla* 458
crossensis, *Chalcomitra rubescens* 263
Crow Honeyeater 671
Crowned Penduline-tit 70
cruentata, *Myzomela* 639
cruentatum, *Dicaeum* 359, 388
cruentus, *Oriolus* 730
cucullatus, *Sphecotheres vieilloti* 715
culionensis, *Prionochilus plateni* 370
cupreonitens, *Nectarinia famosa* 272
cupreus, *Cinnyris* 295
cyaneus, *Cinnyris* 295
cyanocephala, *Cyanomitra verticalis* 259
cyanocephala, *Cyanomitra* 259
Cyanomitra 258
cyanotum, *Dicaeum ignipectus* 387
cyanotis, *Entomozon* 540, 570, 676
- D**
dabryii, *Aethopyga gouldiae* 309
daitoensis, *Zosterops japonicus* 445
damarensis, *Anthoscopus minutus* 73
dammermani, *Myzomela* 649
dammermani, *Ptiloprora erythropleura* 657
daphoenonota, *Aethopyga flagrans* 306

Dark Green White-eye / Flowerpecker

Dark Green White-eye 445
 Dark Oriole 717
 Dark-brown Honeyeater 543, 662
 Dark-crowned White-eye 482
 Dark-eared Honeyeater 631
 Dark-eared Myza 631
 Dark-eared Oriole 716
 Dark-eye
 Bicolored 480
 Crested 482
 Grey-hooded 481
 Grey-throated 482
 Rufescent 480
 Rufous-throated 481
 Spot-breasted 483
 Dark-headed Oriole 728
 Dark-mantled Honeyeater 612
 Dark-mantled Melidectes 612
 Dark-throated Oriole 713, 721
 Darkeye
 Streak-headed 481
 Streaky-headed 481
 Yellow-browed 482
dartmouthi, *Nectarinia johnstoni* 273
 Daurian Shrike 777
daurica, *Certhia familiaris* 181
davao, *Dicaeum pygmaeum* 381
davaensis, *Leptocoma sperata* 267
daviesi, *Cyanomitra olivacea* 260
dawsoni, *Lichenostomus fuscus* 607
dayakanum, *Dicaeum trigonostigma* 379
decipiens, *Oriolus bouroensis* 717
deckenii, *Eurocephalus ruppelli* 796
decolor, *Aethopyga flagrans* 306
decorosa, *Aethopyga pulcherrima* 306
decorsei, *Cinnyris osea* 289
degener, *Cinnyris solaris* 298
dehaani, *Zosterops atriceps* 455
deignani, *Dicaeum agile* 371
Deleornis 245
delicatulus, *Zosterops minor* 457
demeryi, *Zosterops senegalensis* 470
deminuta, *Chalcomitra amethystina* 264
deningeri, *Lichmera* 663
denti, *Pholidornis rustiae* 75
derooi, *Cyanomitra alinae* 260
deserticola, *Lichenostomus flavescens* 608
 Diamond Honeyeater 591
 Diamond-bird 400, 401
 Fawn-eyed 401
 Forty-spotted 400
 Many-spotted 400
 Red-browed 401
 Striated 401
 Tasmanian 400
dibapha, *Myzomela* 642
 DICAEDIDAE 350, 369
Dicaeum 370
dichromata, *Myzomela rubra* 644
diemenensis, *Philemon* 578, 683
difficilis, *Zosterops montanus* 450
diffusus, *Oriolus chinensis* 724
dilatator, *Arachnothera longirostra* 317
dimorphicus, *Psaltiriparus minimus* 99
dinagatensis, *Cinnyris jugularis* 297
discolor, *Certhia* 167, 185
dissentiens, *Cinnyris jugularis* 297
diuatae, *Aethopyga primigenia* 305
diuatae, *Dicaeum nigrilore* 374
diuatae, *Zosterops montanus* 450
diversum, *Dicaeum geelvinkianum* 384
djamdjamensis, *Anthodiaeta collaris* 253
doggetti, *Chalcomitra amethystina* 264
 Doherty's White-eye 482
dohertyi, *Lophozosterops* 439, 482
dolichorhynchum, *Dicaeum ignipectus* 387
dominator, *Lanius collaris* 792
dorotheae, *Certhia brachydactyla* 183
dorsale, *Dicaeum trigonostigma* 379
dorsalis, *Lanius* 791
dorsalis, *Pycnopygius cinereus* 584
 Double-collared Sunbird 274
 Drab Honeyeater 637
 Drab Myzomela 637
Drepanorhynchus 273
Dreptes 258
dresseri, *Sitta tephronota* 141
hubia, *Aethopyga pulcherrima* 306
hubius, *Acanthorhynchus tenuirostris* 582
 Dull-colored White-eye 462
dumerilii, *Anthornis melanura* 587
 Dusky Friarbird 679
 Dusky Honeyeater 638
 Dusky Miner 617, 618

Dusky Minor 617
 Dusky Myzomela 535, 638
 Dusky Oriole 716
 Dusky São Tomé Sunbird 258
 Dusky Shrike 781
 Dusky Sunbird 204, 295
 Dusky White-eye 430, 469
 Dusky-brown Oriole 712, 716
dussumieri, *Cinnyris* 240, 302
 Duyvenbode's Sunbird 306
duyvenbodei, *Aethopyga* 306
 Dwarf Friarbird 685
 Dwarf Honeyeater 337
 Dwarf Longbill 327, 337

E

Eared Honeyeater 662
 East African Black-headed Oriole 728
 Eastern Black-headed Oriole 700, 701, 703, 704, 706, 728
 Eastern Black-naped Oriole 724
 Eastern Crimson Sunbird 313
 Eastern Double-collared Sunbird 205, 279
 Eastern Graceful Honeyeater 592
 Eastern Long-tailed Shrike 795
 Eastern Melipote 632
 Eastern Melipotes 632
 Eastern Olive Sunbird 235, 260
 Eastern Pardalote 401
 Eastern Pygmy Sunbird 254
 Eastern Rock Nuthatch 104, 121, 141
 Eastern Smoky Honeyeater 632
 Eastern Spinebill 532, 559, 582
 Eastern Striated Pardalote 401
 Eastern Violet-backed Sunbird 251
 Eastern Woodchat Shrike 793
eboensis, *Chalcomitra adelberti* 263
 Ebony Honeyeater 650
 Ebony Myzomela 650
efatensis, *Zosterops flavifrons* 465
egregius, *Zosterops palpebrosus* 446
 Egypt Honeyeater 666
 Eichhorn's Friarbird 681
 Eichhorn's Honeyeater 651
 Eichhorn's Myzomela 651
eichhorni, *Leptocoma sericea* 268
eichhorni, *Myzomela* 651
eichhorni, *Philemon* 577, 681
eichhorni, *Zosterops griseotinctus* 462
elachior, *Anthodiaeta collaris* 253
elegans, *Lanius meridionalis* 787
elegans, *Leptopoeile* 80, 85, 100
 Elegant Honeyeater 501, 592
 Elegant Sunbird 306
 Elfin Myzomela 650
elii, *Sitta pygmaea* 132
elisabethae, *Myzomela wakoloensis* 641
elliotti, *Philemon corniculatus* 682
elongatus, *Lophozosterops javanicus* 482
 Embroidered Bee-eater 622
 Embroidered Honeyeater 622
 Embroidered Merops 622
emiliae, *Chlorocharis* 407, 483
emilii, *Melidectes torquatus* 614
 Emin's Red-backed Shrike 779
 Emin's Shrike 772, 779
emini, *Salpornis spilonotus* 186
emmae, *Leptocoma sperata* 267
 Enggano White-eye 449
Entomyzon 676
equus, *Myzomela* 637
 Erect-tailed Honeyeater 601
erixanthus, *Anthreptes malacensis* 247
erlangeri, *Cinnyris nectarinioides* 284
erlangeri, *Eurocephalus ruppelli* 796
erlangeri, *Salpornis spilonotus* 186
ernstmayri, *Myzomela pammelaena* 650
erythrina, *Myzomela cruentata* 639
erythrinae, *Chalcomitra senegalensis* 264
erythrocephala, *Myzomela* 648
erythrocerus, *Cinnyris* 213, 284
erythromelas, *Myzomela* 646
erythronotum, *Dicaeum cruentatum* 389
erythronotus, *Lanius schach* 781
erythropleura, *Psittoprora* 657
erythropleurus, *Zosterops* 403, 445
erythrorhynchus, *Dicaeum* 360, 380
erythrorhynchus, *Dicaeum* 383
ethelae, *Lichenostomus plumulus* 606
 Ethiopian Black-headed Oriole 693, 728
eumecis, *Leptocoma sperata* 267
 Eungella Honeyeater 597

Eurasian Golden Oriole 695, 698, 707, 709, 722
 Eurasian Long-tailed Tit 95
 Eurasian Nuthatch 105, 106, 107, 110, 113, 115, 116, 117, 119, 120, 127
 Eurasian Penduline-tit 53, 56, 63, 67, 69
 Eurasian Treecreeper 168, 170, 174, 178, 181
Eurocephalus 795
europaea, *Sitta* 105, 106, 107, 110, 113, 115, 116, 117, 119, 120, 127
europaeus, *Aegialos caudatus* 95
 European Golden Oriole 722
 European Nuthatch 127
 European Penduline-tit 69
 European Treecreeper 181
eurycricotus, *Zosterops polioastrus* 473
euthapsinus, *Anthreptes simplex* 246
eva, *Myzomela chloroptera* 641
 Everett's Flowerpecker 371
 Everett's Spiderhunter 319
 Everett's White-eye 449
everetti, *Arachnothera affinis* 319
everetti, *Dicaeum* 371
everetti, *Zosterops* 449
excellens, *Aethopyga flagrans* 305
excubitor, *Lanius* 735, 749, 755, 786
excubitorides, *Lanius ludovicianus* 785
excubitorius, *Lanius* 743, 788
exiguus, *Zosterops metcalfii* 461
exilis, *Psaltirya* 79, 100
eximia, *Aethopyga* 309
eximium, *Dicaeum* 384
exochra, *Arachnothera longirostra* 317
expectata, *Sitta azurea* 144
explorator, *Zosterops* 465
expressa, *Corvinella melanoleuca* 795
exquisitus, *Cinnyris solaris* 298
extima, *Certhia americana* 182
extremus, *Anthreptes malacensis* 247
exultans, *Aethopyga ignicauda* 314
 Eye-browed White-eye 482
 Eyebrowed White-eye 479
ezrai, *Aethopyga nipalensis* 309

F

facialis, *Meliphaga orientalis* 590
 Faichuk White-eye 479
 Fairy Flowerpecker 370
falkensteini, *Cinnyris venustus* 292
fallax, *Glycichaera* 654
 False-sunbird
 Canary 338
 Grey-winged 338
 Long-plumed 337
familiale, *Apalopteron* 442, 480
familiaris, *Certhia* 168, 170, 174, 178, 181
familiaris, *Zosterops lateralis* 467
famosa, *Nectarinia* 230, 233, 272
 Fan-tailed Berrypecker 325, 330, 332, 333, 336
 Farfak Honeyeater 633
 Fasciated Honeyeater 601, 627
fasciatus, *Cinnyris johannae* 290
fasciatus, *Ramsayornis* 557, 627
fasciocularis, *Lichenostomus* 601
 Fawn-eyed Diamond-bird 401
fazoqlensis, *Cinnyris venustus* 292
feae, *Zosterops ficedulinus* 474
fergussoni, *Oedistoma iliolophus* 337
 Fernando Po Mouse-coloured Sunbird 295
 Fernando Po Speirops 484
 Fernando Po Sunbird 295
ficedulinus, *Zosterops* 474
 Figbird 715
 Australasian 693, 697, 699, 707, 708, 715
 Green 715
 Grey-breasted 715
 Northern 715
 Southern 715
 Timor 692, 715
 Wetar 715
 Yellow 715
 Fiji White-eye 465
filiger, *Xanthotis flaviventer* 689
finitimus, *Zosterops montanus* 450
 Finsch's Honeyeater 664
 Finsch's White-eye 469
finschi, *Dicaeum agile* 371
finschi, *Oriolus melanotis* 717
finschi, *Pycnopygius ixoides* 583
finschii, *Zosterops* 430, 469
 Fire-breasted Flowerpecker 353, 387, 388
 Fire-capped Tit 55, 74
 Fire-capped Tit-warbler 74

Fire-tailed Flowerpecker 385
 Fire-tailed Sunbird 314
 Fire-throated Flowerpecker 387
 Fiscal
 Common 736, 742, 747, 753, 764, 792
 Grey-backed 743, 788
 Latakoo African 792
 Long-tailed 734, 789
 Mackinnon's 791
 Newton's 792
 São Tomé 792
 Somali 791
 South-west African 792
 Taita 791
 Teita 791
 Uhehe 793
 Fiscal Shrike 792
fischeri, *Cyanomitra veraxii* 261
fischeri, *Eurocephalus ruppelli* 796
flagrans, *Aethopyga* 305
 Flame-breasted Flowerpecker 383
 Flame-breasted Sunbird 298
 Flame-chested Flowerpecker 383
 Flame-crowned Flowerpecker 367, 374
 Flame-eared Honeyeater 663
 Flaming Sunbird 305
flammaxillaris, *Cinnyris jugularis* 297
flammiceps, *Cephalopyrus* 55, 74
flammifera, *Arachnothera longirostra* 317
flavescens, *Aethopyga ignicauda* 314
flavescens, *Lichenostomus* 534, 554, 608
flavicans, *Lichmera* 577, 663
flaviceps, *Auriparus* 54, 58, 61, 64, 66, 74
flaviceps, *Zosterops lateralis* 467
flaviclunis, *Dicaeum trigonostigma* 379
flavicollis, *Lichenostomus* 603
flavida, *Meliphaga analoga* 591
flavifrons, *Anthoscopus* 73
flavifrons, *Zosterops* 465
flavigaster, *Arachnothera* 232, 318
flavigastra, *Cinnyris jugularis* 297
flavigula, *Manorina* 518, 525, 617
flavilateralis, *Zosterops abyssinicus* 469
flavinucha, *Sitta pygmaea* 132
flaviopectus, *Aethopyga bella* 307
flaviopectus, *Oedistoma pygmaeum* 337
flavirictus, *Meliphaga* 593
flavissimus, *Zosterops chloris* 453
flaviventer, *Dicaeum australe* 375
flaviventer, *Xanthotis* 564, 689
flaviventris, *Leptocoma zeylonica* 267
flaviventris, *Sphecotheres vieilloti* 715
flaviventris, *Toxorhamphus novaeguineae* 338
flavocinctus, *Oriolus* 704, 718
flavostriata, *Aethopyga siparaja* 313
flavotincta, *Lichmera incana* 662
flavotinctus, *Oriolus flavocinctus* 718
flavum, *Dicaeum* 446
flavum, *Oedistoma iliolophus* 337
flavus, *Lichenostomus* 602
flavus, *Zosterops* 453
florensis, *Zosterops montanus* 450
 Flores Flowerpecker 370
 Flores White-eye 483
 Florida Nuthatch 139
floridamus, *Zosterops metcalfii* 461
 Flowerpecker 350, 369
 Andaman 380
 Anna's 370
 Anthony's 374
 Arafak 348
 Ashy 383
 Ashy-fronted 383
 Austral 375
 Australian 388
 Beautiful 384
 Bicoloured 374
 Bismarck 384
 Black-banded 385
 Black-bellied 375
 Black-fronted 364, 385
 Black-sided 351, 358, 363, 367, 387
 Blood-breasted 388
 Blue-cheeked 385
 Bornean 370, 387
 Bornean Fire-breasted 387
 Borneo 370
 Borneo Yellow-rumped 370
 Bronze-backed 387
 Brown-backed 371
 Buff-bellied 387
 Buru 383
 Buzzing 354, 379
 Cambodian 387

White-throated 366, 373, 383
Yellow-bellied 352, 373
Yellow-breasted 357, 361, 369
Yellow-crowned 374
Yellow-rumped 350, 370
Yellow-sided 373
Yellow-throated 369
Yellow-vented 356, 373
Foerster's Honeyeater 614
Foerster's Melidectes 614
foersteri, *Melidectes* 614
foghaensis, *Zosterops montanus* 450
forbesi, *Myzomela nigrata* 639
forbesi, *Zosterops everetti* 449
fjordiana, *Meliphaga* 595
Forest Double-collared Sunbird 279
Forest Honeyeater 593
Forest Oriole 728
Forest Penduline-tit 73
Forest White-eared Honeyeater 593
Forest White-eared Meliphaga 593
Fork-tailed Sunbird 221, 310
formosa, *Sitta* 125, 145
formosae, *Lanius schach* 781
formosana, *Sitta europaea* 127
formosum, *Dicaeum ignipictus* 387
formosus, *Oriolus chinensis* 724
Forrest's Honeyeater 598
forresti, *Lichenostomus virescens* 598
Forsten's Oriole 716
forsteni, *Oriolus* 716
fortior, *Sitta solangiae* 143
Forty-spotted Diamond-bird 400
Forty-spotted Pardalote 399, 400
Foulehaio 669
Four-coloured Flowerpecker 375
Fraser's Sunbird 245
fraseri, *Deleornis* 245
fraterculus, *Auriparus flaviceps* 74
Freckled Honeyeater 662
frenatus, *Cinnyris jugularis* 297
frenatus, *Lichenostomus* 596
fretensis, *Philemon buceroides* 680
Friarbird
 Bismarck 681
 Brass' 684
 Brass's 684
 Buru 679
 Grey-necked 679
 Moluccan 679
 Moluccas 679
 New Britain 681
Friarbird 680, 682
 Admiralty 682
 Admiralty Island 682
 Bald 682
 Bismarck 681
 Black-faced 679
 Bonaparte's 685
 Brass's 684
 Buru 679
 Cape York 680
 Dusky 679
 Dwarf 685
 Eichhorn's 681
 Gilolo 685
 Grey 685
 Grey-necked 679
 Helmeted 529, 680, 681
 Little 542, 680, 684
 Mangrove 680
 Manus 682
 Melville 680
 Melville Island 680
 Meyer's 685
 Moluccan 679
 Moluccas 679
 Monsoon 680
 Morotai 679
 New Britain 681
 New Caledonian 578, 683
 New Guinea 680
 New Ireland 577, 681
 Noisy 519, 541, 562, 682
 Plain 684
 Sandstone 680
 Seram 679
 Silver-crowned 515, 682
 Striated 685
 Tanimbar 679
 Timor 680, 684
 Timor Helmeted 680
 White-naped 682
 White-streaked 685

G

gabonicus, *Anthreptes* 248
Gadow's Sunbird 272
gadowi, *Nectarinia kilimensis* 272
galenae, *Aethopyga saturata* 310
gambeli, *Lanius ludovicianus* 785
ganongae, *Myzomela eichhorni* 651
Ganongga White-eye 463
garguensis, *Anthodiaeta collaris* 253
gauensis, *Zosterops flavifrons* 465
Geelvink Flowerpecker 383
geelvinkianum, *Dicaeum* 383
genderuensis, *Cinnyris reichenowi* 278
geraldtonensis, *Lichenostomus penicillatus* 608
gerhardi, *Zosterops senegalensis* 470
germanorum, *Meliphaga montana* 593
germanus, *Lichenostomus flavescens* 608
gertrudis, *Cinnyris manoensis* 274
Giant Forest Honeyeater 670
Giant Green Honeyeater 670
Giant Honeyeater 670
Giant Nuthatch 111, 124, 144
Giant Sunbird 258
Giant White-eye 408, 484
giganteus, *Lanius sphenocercus* 788
gigi, *Anthoscopus minutus* 73
gilli, *Zosterops montanus* 446
Gilliard's Honeyeater 611
Gilliard's Melidectes 611
gilliardi, *Melidectes fuscus* 611
gilliardi, *Melidectes rufocrissalis* 613
gilolensis, *Melitograis* 685
Gilolo Friarbird 685
Gippsland Yellow-buffed Honeyeater 604
gippslandicus, *Lichenostomus melanopus* 604
gizuanietiti, *Xanthotis flaviventris* 689
Gizo White-eye 463
glaucoocularis, *Aegithalos* 96
Gliciphila 659
Glycichaera 654
Glyciphobia 631
Glyciphila 659
Golden Honeyeater 480
Golden Oriole 722
Golden White-eye 462, 480
Golden-backed Honeyeater 672
Golden-bellied White-eye 455
Golden-edged Flowerpecker 373
Golden-flanked Flowerpecker 373
Golden-green White-eye 404, 450
Golden-rumped Flowerpecker 370
Golden-tufted Honeyeater 604
Golden-winged Honeyeater 667
Golden-winged Sunbird 202, 273
Golden-yellow White-eye 450
goliathi, *Melipotes fumigatus* 633
Goodfellow's White-eye 481
goodfellowi, *Lophozosterops* 438, 481
gordoni, *Philemon buceroides* 680
Gould's Sunbird 309
gouldi, *Zosterops lateralis* 467
gouldiae, *Aethopyga* 309

Grey-necked Honeyeater / Honeyeater

- Grey-necked Honeyeater 679
 Grey-necked Oriole 716
 Grey-sided Flowerpecker 387
 Grey-streaked Honeyeater 658
 Grey-throated Black-eye 482
 Grey-throated Dark-eye 482
 Grey-throated Oriole 721
 Grey-throated Straight-billed Honeyeater 629
 Grey-throated Straightbill 629
 Grey-throated Sunbird 247
 Grey-throated Tufted-eye 482
 Grey-throated White-eye 464, 482
 Grey-winged Bowbill 338
 Grey-winged False-sunbird 338
 Grey-winged Longbill 338
 Greyish-brown Honeyeater 584
 Grinda's Bushtit 99
grindae, *Psaltiriparus minimus* 99
grinnelli, *Lanius ludovicianus* 785
griseiceps, *Aethopyga nipalensis* 309
griseigula, *Timeliopsis* 507, 629
griseigularis, *Anthreptes* 247
griseigularis, *Entomozon cyanotis* 676
griseirostris, *Melidectes belfordi* 613
griseiventris, *Zosterops citrinella* 454
griseonota, *Zosterops lateralis* 467
griseotinctus, *Zosterops* 436, 462
griseovirens, *Zosterops* 474
griseoviridis, *Lichmera incana* 662
griscens, *Oriolus sagittatus* 717
grisiventris, *Sitta nagaensis* 128
 Guadalcanal Honeyeater 588, 651
 Guadalcanal Myzomela 651
Guadalcanaria 588
 Guam Cardinal Honeyeater 644
guasso, *Anthoscopus musculus* 72
gubernator, *Lanius* 772, 779
guerrensis, *Certhia americana* 182
 Guimaras Flowerpecker 375
guimarasensis, *Aethopyga flagrans* 306
 Guinea Olive Sunbird 261
 Guinean Olive Sunbird 261
guineensis, *Cyanomitra obscura* 261
 Guise's Honeyeater 658
guisei, *Prilopora* 556, 658
gularis, *Melithreptes* 672
 Gunning's Sunbird 246
 Gurney's Sugarbird 489, 492, 497
gurneyi, *Promerops* 489, 492, 497
gutturialis, *Chalcomitra senegalensis* 264
Gymnomyza 670
gymnops, *Melipotres* 632
- H**
habessinicus, *Cinnyris* 289
hachisuka, *Cinnyris jugularis* 297
hachisuka, *Lanius validirostris* 782
Hachisuka's Sunbird 305
hades, *Myzomela pammelaena* 650
haematostictum, *Dicaeum* 375
hahasima, *Apalopteron familiare* 480
hainanum, *Dicaeum cruentatum* 389
hainanus, *Lanius schach* 781
hainanus, *Zosterops japonicus* 445
halconensis, *Zosterops montanus* 450
 Halmahera Black-fronted White-eye 455
 Halmahera Oriole 716
 Halmahera White-eye 455
halmaturina, *Anthochaera chrysoptera* 620
halmaturinus, *Acanthorhynchus tenuirostris* 582
halmaturinus, *Lichenostomus cratitius* 605
halmaturinus, *Phylidonyris pyrrhopterus* 666
halmaturinus, *Zosterops lateralis* 467
hamlini, *Zosterops rendovae* 464
hanadori, *Dicaeum trigonostigma* 379
 Handsome Sunbird 307
hanieli, *Dicaeum sanguinolentum* 388
harrietae, *Aethopyga gouldiae* 309
harrissoni, *Arachnothera chrysogenys* 318
 Hartert's White-eye 463
harterti, *Certhia brachydactyla* 183
harterti, *Entomozon cyanotis* 676
harterti, *Myzomela obscura* 638
harterti, *Zosterops citrinella* 454
hartertianus, *Lophozosterops supercilialis* 482
 Hartlaub's Sunbird 257
hartlaubii, *Anabathmis* 257
 Hasselt's Sunbird 267
 van Hasselt's Sunbird 267
hasseltii, *Leptocoma sperata* 267
haussarum, *Anthreptes longuemare* 251
 Hawaii O'o 499
hawkeri, *Cinnyris mariquensis* 283
Hedydipna 253, 254
heinrichi, *Lophozosterops squamiceps* 481
heinrichi, *Zosterops senegalensis* 470
Heleia 483
heliobletus, *Cinnyris jugularis* 297
heliocalus, *Anthreptes malacensis* 247
heliocrita, *Arachnothera longirostra* 317
heliogona, *Aethopyga siparaja* 313
heliolusius, *Anthreptes malacensis* 247
heliomanis, *Cinnyris jugularis* 297
heliophilica, *Aethopyga siparaja* 313
heliophilus, *Arachnothera modesta* 319
heliotis, *Aethopyga siparaja* 313
heliotzetus, *Cinnyris jugularis* 297
hellmayri, *Anthoscopus caroli* 72
hellmayri, *Cinnyris habessinicus* 289
 Helmeted Friarbird 529, 680, 681
 Helmeted Honeyeater 604
 Helmeted Leatherhead 680
 Henke's Sunbird 267
henkei, *Leptocoma sperata* 267
hensii, *Lanius senator* 793
 Herberton Honeyeater 668
 Hermit White-eye 464
 Heuglin's White-eye 473
hidalgensis, *Auriparus flaviceps* 74
 Highland Shrike 775
 Highland White-eye 473
 Hill-forest Honeyeater 590
 Hill-forest Meliphaga 590
 Himalayan Nuthatch 130
 Himalayan Tit 97
 Himalayan Treecreeper 184
himalayana, *Certhia* 167, 184
himalayensis, *Sitta* 130
hindustanicus, *Cinnyris lotenius* 303
hindwoodi, *Lichenostomus* 597
hirundinaceum, *Dicaeum* 357, 362, 388
hispaniensis, *Sitta europaea* 127
 Hodgson's Sunbird 310
 Hodgson's Treecreeper 182
hodgsoni, *Certhia* 182
 Hofmann's Sunbird 284
hofmanni, *Cinnyris shelleyi* 284
homeyeri, *Lanius excubitor* 786
 Hondo Nuthatch 127
hondoensis, *Sitta europaea* 127
 Honey-breasted Honeyeater 689
 Honeyeater 498, 582
 Admiralty 650
 Alfred 629
 Allied 591
 Amboina 637
 Ambon 637
 Arfak 632
 Arfak White-fronted 613
 Ashy 638
 Australian Brown 661
 Australian White-eared 602
 Babbler 629
 Banda 641, 649
 Banda Sea 662
 Banded 526, 659
 Bar-breasted 557, 627
 Bare-eyed 632
 Barred 508, 631
 Bearded 667
 Belford's 528, 613
 Bismarck 611, 638, 650
 Bismarck Black 650
 Bismarck Island 650
 Black 565, 632, 636, 639, 650
 Black-and-red 653
 Black-and-white 585
 Black-backed 658
 Black-backed Streaked 658
 Black-bellied 646
 Black-breasted 653, 670
 Black-capped 673, 675
 Black-chested 653, 664
 Black-chinned 672
 Black-cowled 651
 Black-faced 598, 604
 Black-fronted 593, 595
 Black-headed 651, 675
 Black-necklaced 663
 Black-throated 595, 672
 Blackened 639
 Blood 642
 Blood-red 642
 Blue-faced 540, 570, 676
 Boie's 641
 Bougainville 630, 651
 Bridled 596
 Broadbent's 596, 602
 Brown 523, 538, 552, 583, 631, 661, 689
 Brown-backed 506, 627
 Brown-backed Streaked 658
 Brown-headed 551, 561, 673
 Brush-throated 669
 Buff-breasted 689
 Buff-striped 689
 Buru 663
 Carbon 639
 Cardinal 645
 Carter's 608
 Carunculated 669
 Celebes 631, 641
 Central Solomons 651
 Ceram 663
 Ceram Mountain 663
 Cinereous 638
 Cinnamon-breasted 614
 Cinnamon-browed 612
 Cloncurry 608
 Cockrell's 669
 Common 632
 Common Smoky 632
 Crescent 666
 Crested 666
 Crimson 642
 Crimson-hooded 649
 Crow 671
 Dark-brown 543, 662
 Dark-eared 631
 Dark-mantled 612
 Diamond 591
 Drab 637
 Dusky 638
 Dwarf 337
 Eared 662
 Eastern Graceful 592
 Eastern Smoky 632
 Ebony 650
 Egypt 666
 Eichhorn's 651
 Elegant 501, 592
 Embroidered 622
 Erect-tailed 601
 Eungella 597
 Farfak 633
 Fasciated 601, 627
 Finsch's 664
 Flame-eared 663
 Foerster's 614
 Forest 593
 Forest White-eared 593
 Forrest's 598
 Freckled 662
 Fulvous-breasted 659
 Fulvous-fronted 659
 Fuscous 521, 607
 Giant 670
 Giant Forest 670
 Giant Green 670
 Gilliard's 611
 Gippsland Yellow-buffed 604
 Golden 480
 Golden-backed 672
 Golden-tufted 604
 Golden-winged 667
 Graceful 555, 592, 606
 Graceless 615
 Gray's 636, 688
 Great-wattled 624
 Greater Spot-breasted 592
 Greater Streaked 632
 Greater Sulawesi 632
 Greater Yellow-eared 589
 Green-backed 654
 Green-eyed 658
 Grey 506, 584, 629, 674
 Grey-bellied 337
 Grey-breasted 592
 Grey-eared 662
 Grey-fronted 502, 584, 606
 Grey-headed 605, 654
 Grey-necked 679
 Grey-streaked 658
 Grey-throated Straight-billed 629
 Greyish-brown 584
 Guadalcanal 588, 651
 Guam Cardinal 644
 Guise's 658
 Helmeted 604
 Herberton 668
 Hill-forest 590
 Honey-breasted 689
 Horseshoe 666
 Huon 614, 632
 Huon Wattled 614
 Inconspicuous 629
 Indonesian 512, 660
 Island 601
 Kadavu 516, 690
 Keartland 605
 Keartland's 605
 Kimberley 595
 King Island 675
 Kulambangara 651
 Kulambangra 651
 Lanceolated 690
 Large 632
 Large Spot-breasted 592
 Large-billed 673
 Large-striped 598
 Large-tufted 590
 Laden 657
 Laden Streaked 657
 Least 661, 673
 Lemon-cheeked 596
 Lesser Crescent 666
 Lesser Lewin 589
 Lesser Spot-breasted 590
 Lesser Streaked 631
 Lesser Sulawesi 631
 Lesser Yellow-spotted 592
 Lewin's 566, 589
 Lilac-wattled 605
 Little Lewin 589
 Little Yellow-spotted 592
 Lombok 660
 Long-bearded 579, 612
 Long-billed 507, 630, 667, 673
 Louisianese 591
 Lowland Straight-billed 629
 Loyalty 662
 Loyalty Islands 662
 Lunulated 675
 MacGregor's 510, 633
 Macleay's 539, 689
 Malaita 652
 Mallee 606
 Mangrove 601
 Mangrove Red-headed 648
 Many-spotted 688
 Many-streaked 658
 Mao 670
 Marbled 499, 584
 Mayr's 658
 Mayr's Streaked 658
 Meek's 657
 Meek's Streaked 657
 Melanic 652
 Mengkokka 632
 Meyer's 632
 Micronesian 644
 Micronesian Cardinal 644
 Mid-mountain 612
 Mimetic 591
 Mimic 591
 Mock-Regent 622
 Modest 627
 Moluccan 638, 663
 Mottle-breasted 592, 662
 Mottle-plumaged 689
 Mottled 689
 Mountain 590, 593, 596, 597, 650
 Mountain Purple-gaped 605
 Mountain Red-headed 650
 Mountain Straight-billed 629
 Mountain Yellow-eared 590
 Moustached 668
 Mukojima 480
 New Britain 611, 646
 New Britain Red-headed 646
 New Caledonian 631, 642
 New Georgia 651
 New Guinea 583
 New Guinea Brown 583
 New Hebrides 631
 New Holland 513, 667
 New Ireland 640
 New Norcia 602
 Nondescript 583
 Obscure 596
 Ochre-winged 633
 Olive 660
 Olive Straight-billed 629
 Olive-brown 583
 Olive-streaked 657

- Olive-yellow 640
 Orange-breasted 652
 Orange-cheeked 588
 Ornate 614
 Painted 578, 691
 Pale-eyed 654
 Pale-yellow 608
 Pallid 608
 Papuan Black 639
 Pied 531, 585
 Plain 583
 Plain Olive 660
 Plumed 606
 Provocator 690
 Puff-backed 590, 654
 Purple-gaped 605
 Pygmy 337
 Red 639
 Red-backed 658
 Red-bellied 652
 Red-bibbed 650
 Red-breasted 628
 Red-brown 638
 Red-caped 653
 Red-collared 653
 Red-crowned 651
 Red-faced 671
 Red-headed 648
 Red-headed Mountain 650
 Red-naped 651
 Red-rumped 653
 Red-sided 657
 Red-sided Streaked 657
 Red-spot 637
 Red-throated 628, 637
 Red-tinted 639
 Regent 581, 622
 Reticulated 595
 River 601
 Rosenberg's 653
 Rotuma 640
 Ruby-throated 637
 Rufous-backed 556, 658
 Rufous-banded 563, 628
 Rufous-breasted 628, 689
 Rufous-sided 657
 Rufous-sided Streaked 657
 Rufous-throated 628
 Safford's Cardinal 644
 Samoan Wattled 669
 San Cristobal 615
 Sanguineous 642
 Santa Ana 652
 Scaled 662
 Scaly 662
 Scaly-breasted 662
 Scaly-crowned 660
 Scaly-throated 601
 Scarlet 642
 Scarlet-bibbed 650
 Scarlet-naped 651
 Scarlet-throated 650
 Sclater's 650
 Scrub 591
 Scrub White-eared 591
 Scrub White-eyed 591
 Scrub White-marked 591
 Seram 663
 Short-bearded 611
 Short-billed 673
 Silver 660
 Silver-eared 662
 Silver-spangled 660
 Singing 598
 Slender-billed 582, 592
 Small Bougainville 651
 Small Mountain 588
 Small Spot-breasted 590
 Small Spotted 590
 Smoky 632
 Smoky Bare-eyed 632
 Sooty 611, 652
 Southern 591
 Southern White-eared 591
 Spangle-crowned 584
 Spangled 509, 632
 Spectacled 604, 663
 Spine-billed 582
 Spinebill 582
 Spiny-cheeked 549, 568, 618
 Spot-bellied 632
 Spot-breasted 592
 Spot-headed 632
 Spotted 688
 Spring-cheeked 618
 Stevens's 592
 Streak-breasted 595
 Streak-capped 584
 Streak-headed 584
 Streak-naped 689
 Streaked 689
 Striped 517, 690
 Strong-billed 673
 Sub-bridled 595
 Subcrested 604
 Sudest 591
 Sulawesi 641
 Sumba 649
 Sunda 653, 660
 Tagula 591
 Tanimbar 662
 Tasmanian 582, 666
 Tawny Straight-billed 629
 Tawny-breasted 564, 689
 Tawny-crowned 659
 Temminck's 595
 Timor 595, 653, 663
 Tristram's 652
 Unadorned 627
 Uniform-coloured 601
 Vanuatu 631
 Vanuatu Mountain 631
 Varied 550, 601
 Victorian Wattle-cheeked 605
 Vitu Levu Wattled 669
 Vogelkop 612
 Vogelkop Wattled 612
 Von Rosenberg's 653
 Wakolo 641
 Wallacean 641
 Warbling 661
 Warty-faced 622
 Wattle-cheeked 605
 Wattled 539, 623, 669
 Wattled Smoky 509, 633
 Western Lunulated 675
 Western Pied 585
 Western Smoky 632
 Western Spinebilled 583
 Western White-naped 675
 Wetar 649, 664
 White gaped 601
 White's 629
 White-bearded 667
 White-bellied 631, 664
 White-breasted 627, 631
 White-capped 612
 White-cheeked 668
 White-chinned 637, 674
 White-eared 545, 591, 593, 602, 632, 662
 White-eared Mountain 593
 White-eyed 480, 654, 667
 White-fronted 503, 609, 612
 White-gaped 533, 601
 White-lined 594
 White-marked 591
 White-marked Scrub 593
 White-naped 514, 675
 White-plumed 520, 547, 608
 White-quilled 676
 White-spangled 662
 White-streaked 669, 685
 White-striped 594, 595
 White-throated 567, 628, 637, 674
 White-tufted 662
 Yellow 602
 Yellow-browed 504, 613
 Yellow-eared 577, 589, 663
 Yellow-faced 558, 597, 632, 690
 Yellow-fronted 606
 Yellow-gaped 593, 597
 Yellow-plumed 606
 Yellow-spotted 544, 589, 591
 Yellow-streaked 601, 689
 Yellow-throated 603, 604
 Yellow-tinted 534, 554, 608
 Yellow-tufted 572, 604
 Yellow-vented 651
 Yellow-winged 667
 Yellowish 608, 657
 Yellowish-streaked 657
 Honeyeater
 Black-bellied 645
 Brown 631
 Spot-headed 632
 Horseshoe Honeyeater 666
 horsfieldi, *Aethopyga nipalensis* 309
 hosei, *Oriolus* 730
 hosii, *Dicaeum cruentatum* 389
 hosii, *Oriolus* 730
 Hova Grey-backed White-eye 474
 Hova White-eye 474
 hovarum, *Zosterops maderaspatanus* 474
 Humblot's Sunbird 301
 humbloti, *Cinnyris* 301
 Hume's White-eye 446
 humeralis, *Lanius collaris* 792
 Hunter's Sunbird 201, 265
 hunteri, *Chalcomitra* 201, 265
 Huon Honeyeater 614, 632
 Huon Melidectes 614
 Huon Melipotes 632
 Huon Wattled Honeyeater 614
 Huon Wattled Melidectes 614
 huonensis, *Meliphaga montana* 593
 hypochlous, *Dicaeum trigonostigma* 379
 hypochra, *Arachnothera longirostra* 317
 Hypocryptadius 485
 hypodila, *Anthodiaeta collaris* 253
 Hypogramma 257
 hypogrammicum, *Hypogramma* 199, 257
 hypolais, *Zosterops* 448
 hypolampis, *Leptocoma sperata* 267
 hypoleucum, *Dicaeum* 354, 379
 hypoleucus, *Sphecotheres* 715
 hypoxanthus, *Zosterops* 457
 I
 Ibon
 Cinnamon 410, 485
 idenburgi, *Cinnyris jugularis* 297
 idia, *Nectarinia johnstoni* 272
 idius, *Deleornis fraseri* 245
 igneiventris, *Cinnyris venustus* 292
 ignicapilla, *Prionochilus percussus* 369
 ignicauda, *Aethopyga* 314
 ignicolle, *Dicaeum hirundinaceum* 388
 igniferum, *Dicaeum* 364, 385
 ignipectus, *Dicaeum* 353, 387
 ignitum, *Dicaeum cruentatum* 389
 ignotum, *Dicaeum pectorale* 383
 iliophilus, *Oedistoma* 327, 337
 imitatrix, *Meliphaga gracilis* 592
 inaestimata, *Chalcomitra senegalensis* 264
 incana, *Lichmera* 543, 662
 incerta, *Ptiloprora erythropleura* 657
 incerta, *Ptiloprora perstriata* 658
 inclusus, *Cinnyris fuscus* 295
 Inconspicuous Honeyeater 629
 incoronata, *Anthornis melanura* 587
 Indian Black-headed Oriole 729
 Indian Golden Oriole 701, 722
 Indian Grey Shrike 787
 Indian Nuthatch 129
 Indian Purple-rumped Sunbird 267
 Indian White-eye 446
 indicus, *Oriolus chinensis* 724
 indistincta, *Lichmera* 523, 538, 552, 661
 indistinctus, *Phylidonyris pyrrhopterus* 666
 Indonesian Flowerpecker 383
 Indonesian Honeyeater 512, 660
 inexpectata, *Guadalcánaria* 588
 inexpectatum, *Dicaeum bicolor* 374
 infrenatus, *Cinnyris jugularis* 297
 infusca, *Myzomela erythrocephala* 648
 innominatus, *Zosterops nigrorum* 450
 inopinatus, *Melithreptus albobularis* 674
 inornatum, *Dicaeum concolor* 380
 inornatus, *Philemon* 684
 inornatus, *Phylidonyris pyrrhopterus* 666
 inornatus, *Rhabdornis* 190, 195
 inornatus, *Zosterops* 469
 insularis, *Aethopyga siparaja* 313
 insularis, *Cinnyris chloropygius* 273
 insularis, *Lichenostomus virescens* 598
 insularis, *Oriolus chinensis* 724
 insularis, *Sitta pusilla* 132
 insularis, *Zosterops japonicus* 445
 intensiflava, *Arachnothera chrysogenys* 318
 intensum, *Dicaeum chrysorrheum* 373
 intercalans, *Cyanomitra olivacea* 260
 intercalatus, *Zosterops citrinella* 454
 intercedens, *Lanius excubitorius* 788
 interioris, *Lichenostomus penicillatus* 608
 intermedium, *Dicaeum trigonostigma* 379
 intermedium, *Cinnyris asiaticus* 296
 intermedium, *Cinnyris manensis* 274
 intermedium, *Lichenostomus versicolor* 601
 intermedium, *Zosterops chloris* 453
 internota, *Chalcomitra singalensis* 245
 interposita, *Chalcomitra singalensis* 245
 invictus, *Lanius excubitor* 786
 invisus, *Oriolus tenuirostris* 723
 Inyo Nuthatch 139
 touschistos, *Aegithalos* 97
 iranica, *Sitta tephronota* 141
 irbii, *Aegithalos caudatus* 95
 iredalei, *Aegithalos concinnus* 97
 iriomotensis, *Zosterops japonicus* 445
 iris, *Anthreptes malacensis* 247
 Isabela Oriole 721
 Isabella Oriole 721
 isabellae, *Oriolus* 721
 Isabelline Shrike 733, 751, 777
 isabellinus, *Lanius* 733, 751, 777
 isarog, *Sitta oenochlamys* 143
 isidroi, *Dicaeum trigonostigma* 379
 Island Honeyeater 601
 Island White-eye 462
 Islet Myzomela 650, 651
 Islet White-eye 462
 isolata, *Aethopyga gouldiae* 309
 isopega, *Arachnothera chrysogenys* 318
 italiae, *Aegithalos caudatus* 95
 itombwensis, *Nectarinia johnstoni* 273
 iulus, *Psaltiriparus minimus* 99
 ixoides, *Pycnopygius* 583
 J
 Jackson's White-eye 470
 jacksoni, *Nectarinia tacaze* 271
 jacksoni, *Zosterops senegalensis* 470
 jaliscensis, *Certhia americana* 182
 Japanese Shrike 777
 Japanese White-eye 412, 421, 445
 japonica, *Certhia familiaris* 181
 japonicus, *Aegithalos caudatus* 95
 japonicus, *Zosterops* 412, 421, 445
 Javan Fire-breasted Flowerpecker 388
 Javan Grey-throated White-eye 406, 482
 Javan Sunbird 314
 Javan White-eye 453, 482
 javanicus, *Anthreptes malacensis* 247
 javanicus, *Lophozosterops* 406, 482
 jaxarticus, *Remiz pendulinus* 69
 jebelmarrae, *Lanius meridionalis* 787
 jefferyi, *Aethopyga pulcherrima* 306
 joannae, *Zosterops palpebrosus* 446
 jobiense, *Dicaeum geelvinkianum* 383
 jobiensis, *Leptocoma sericea* 268
 jobiensis, *Philemon buceroides* 680
 Johanna's Sunbird 290
 johannae, *Cinnyris* 290
 johannae, *Prionochilus plateni* 369
 johnsi, *Aethopyga saturata* 310
 johnstoni, *Nectarinia* 218, 272
 johnstoni, *Philemon citreogularis* 684
 joiceyi, *Melidectes belfordi* 613
 Jouy's Bushit 99
 jubaensis, *Anthodiaeta collaris* 253
 jubaensis, *Zosterops abyssinicus* 469
 juga, *Myzomela chloroptera* 641
 jugularis, *Cinnyris* 226, 232, 234, 296
 jugularis, *Myzomela* 575, 652
 juliae, *Arachnothera* 320
 juliae, *Leptocoma sperata* 267
 junior, *Heleia crassirostris* 483
 juxta, *Lanius collurio* 776
 K
 kaboboensis, *Cyanomitra alinae* 260
 Kabylian Nuthatch 134
 Kabylic Nuthatch 134
 Kadavu Honeyeater 516, 690
 kaffensis, *Zosterops polioastrus* 473
 Kai White-eye 454, 455
 kalaotuae, *Zosterops chloris* 453
 kalkkreuthi, *Chalcomitra amethystina* 264
 kampilili, *Dicaeum anthonyi* 374
 kamschaticus, *Aegithalos caudatus* 95
 Kantschatkan Nuthatch 127
 Kapok
 Southern 73
 Kapok Tit 71
 karelini, *Lanius isabellinus* 777
 karenensis, *Aethopyga nipalensis* 309
 karimuiensis, *Myzomela eques* 637
 Karopi White-eye 480
 kasaicus, *Zosterops senegalensis* 470
 Kashmir Nuthatch 122, 129

Kashmir Tit / *malaitae*

Kashmir Tit 96
 Kauai O'o 499
 Keartland Honeyeater 605
 Keartland's Honeyeater 605
keartlandi, *Lichenostomus* 605
kehiensis, *Lichmera squamata* 662
 Kei White-eye 454, 455
keiense, *Dicaeum hirundinaceum* 388
keiensis, *Cinnyris jugularis* 297
kempi, *Cinnyris chloropygius* 273
kempi, *Philemon argenticeps* 682
 Kenya Sunbird 246, 251
 Kenya Violet-backed Sunbird 251
 Kenya Violet-breasted Sunbird 285
 Kenya White-eye 469
 Kenya Yellow White-eye 469
kermadecensis, *Prosthomadera novaezeelandiae* 587
khamensis, *Certhia hodgsoni* 182
kikuyensis, *Oriolus larvatus* 728
 Kikuyu White-eye 473
kikuyuensis, *Nectarinia* 278
kikuyuensis, *Zosterops polioastrus* 473
kilimensis, *Nectarinia* 233, 272
 Kimberley Honeyeater 595
 Kinabalu Spiderhunter 319
 King Island Honeyeater 675
kingi, *Anthochaera paradoxa* 624
kingi, *Melithreptus validirostris* 673
kingi, *Oriolus flavocinctus* 718
kinneari, *Cinnyris habessinicus* 289
kinneari, *Melidectes belfordi* 613
kinneari, *Sitta carolinensis* 140
 Kioea 499
 Kirk's White-eye 474
kirki, *Zosterops maderaspatanus* 474
kirki, *Chalcomitra amethystina* 264
kisserensis, *Philemon* 685
kiusiensis, *Aegithalos caudatus* 95
kiuensis, *Cinnyris regius* 279
klossi, *Cinnyris jugularis* 297
kobayashii, *Myzomela rubratra* 644
kobylini, *Lanius collurio* 776
koelzi, *Aethopyga nipalensis* 309
koelzi, *Sitta cinnamoventris* 130
koenigi, *Lanius meridionalis* 787
 Kolombangara Mountain White-eye 464
koratensis, *Chalcomitra singalensis* 245
korinchi, *Zosterops montanus* 450
 Kosrae White-eye 469
kruensis, *Anthreptes seimundi* 252
krueperi, *Sitta* 119, 134
 Krüper's Nuthatch 119, 134
kuanzae, *Cinnyris venustus* 292
Kubaryum 477
kuelni, *Dicaeum celebicum* 387
kuelni, *Myzomela* 649
kuelni, *Xanthotis polygrammus* 688
kuelni, *Zosterops* 461
 Kuhl's Sunbird 309
 Kühn's *Myzomela* 649
 Kühn's White-eye 461
 Kulal White-eye 473
kulalensis, *Zosterops polioastrus* 473
 Kulambangara Honeyeater 651
 Kulambangara *Myzomela* 651
 Kulambangara Honeyeater 651
 Kulambangara *Myzomela* 651
kulambangrae, *Zosterops* 464
 Kulumbangra White-eye 464
kumawa, *Melipotes fumigatus* 633
kumusii, *Xanthotis flaviventer* 689
kundoo, *Oriolus* 701, 722
kurilensis, *Certhia familiaris* 181
kurodai, *Myzomela rubratra* 644
kwanshiensis, *Certhia hodgsoni* 182

L

labecula, *Aethopyga siparaja* 313
lacertosa, *Woodfordia* 479
Lacustroica 629
ladasi, *Lichenostomus penicillatus* 608
laetior, *Melithreptus gularis* 672
laetior, *Oriolus brachyrhynchus* 727
lafargei, *Myzomela* 574, 651
lagunae, *Dicaeum hypoleucum* 379
lagunae, *Sitta carolinensis* 140
lahiora, *Lanius meridionalis* 787
lahulensis, *Lanius tephronotus* 782
lamperti, *Chalcomitra senegalensis* 264
lamprocephalus, *Auriparus flaviceps* 74
lamprochryseus, *Oriolus chinensis* 724

lanceolata, *Plectorhyncha* 517, 690
 Lanceolated Honeyeater 690
 Laniidae 732, 775
Lanius 775
laotiana, *Certhia manipurensis* 186
 Laoumera White-eye 454
 Lappetface
 Macgregor's 633
 Large Bridled White-eye 453
 Large Chinese Shrike 788
 Large Chuuk White-eye 479
 Large Honeyeater 632
 Large Lifou White-eye 469
 Large Meliphaga 592
 Large Palau White-eye 484
 Large Ponapé White-eye 479
 Large Spiderhunter 318
 Large Spot-breasted Honeyeater 592
 Large Spot-breasted Meliphaga 592
 Large Sri Lanka White-eye 447
 Large Yap White-eye 477
 Large-billed Honeyeater 673
 Large-nosed Shrike 781
 Large-striped Honeyeater 598
 Large-tufted Honeyeater 590
 Large-tufted Meliphaga 590
 Larger Double-collared Sunbird 278
larvatus, *Oriolus* 700, 701, 703, 704, 706, 728
 Latakoo African Fiscal 792
laterale, *Dicaeum aureolimbatum* 374
lateralis, *Zosterops* 414, 417, 419, 423, 425, 431, 435, 467
lathburyi, *Drepanorhynchus reichenowi* 273
latouchii, *Aethopyga christinae* 310
lavongai, *Myzomela cruentata* 639
 Layard's White-eye 465
layardorum, *Dicaeum eximium* 384
leachi, *Manorina melanocephala* 616
 Lead-coloured Bushitit 99
 Leaden Honeyeater 657
 Leaden Streaked Honeyeater 657
 Least Honeyeater 661, 673
 Least Penduline Tit 71
 Leatherhead 680, 684
 Helmeted 680
 Little 684
 New Britain 681
ledanti, *Sitta* 134
 Legge's Flowerpecker 373
leilavalensis, *Lichenostomus penicillatus* 608
 Lemon-bellied White-eye 453
 Lemon-breasted Berrypecker 335
 Lemon-checked Honeyeater 596
 Lemon-throated White-eye 455
lepidota, *Manorina melanocephala* 616
Leptocoma 267
Leptopoecile 100
Leptornis 670, 671
 Lesser Crescent Honeyeater 666
 Lesser Double-collared Sunbird 274
 Lesser Grey Shrike 785
 Lesser Lewin Honeyeater 589
 Lesser Rock Nuthatch 141
 Lesser Spot-breasted Honeyeater 590
 Lesser Spot-breasted Meliphaga 590
 Lesser Streaked Honeyeater 631
 Lesser Sulawesi Honeyeater 631
 Lesser Sulawesi Myza 631
 Lesser Sunda Flowerpecker 385
 Lesser Sunda Lowland White-eye 483
 Lesser Sunda Mountain White-eye 482
 Lesser Sunda Sunbird 247
 Lesser Yellow-eared Spiderhunter 318
 Lesser Yellow-spotted Honeyeater 592
lettienis, *Zosterops citrinella* 454
leucogenys, *Aegithalos* 96
leucogenys, *Melithreptus brevirostris* 673
leuconucha, *Sitta pygmaea* 132
leucophaeus, *Speirops* 484
leucopsis, *Sitta* 139
leucopterus, *Lanius excubitor* 786
leucopygus, *Lanius meridionalis* 787
leucostephes, *Melidectes* 612
leucosticta, *Certhia americana* 182
leucostictus, *Oriolus nigripennis* 729
leucotis, *Lichenostomus* 545, 602
levantina, *Sitta europaea* 127
 Lewin's Honeyeater 566, 589
 Lewin's Meliphaga 589
lewintii, *Meliphaga* 566, 589
leytensis, *Rhabdornis inornatus* 195
Lichenostomus 595
Lichmera 660
 Lifou Cardinal *Myzomela* 645

lifuenensis, *Myzomela cardinalis* 646
ligea, *Sitta magna* 144
 Lilac Nuthatch 143
 Lilac-wattled Honeyeater 605
lilacea, *Sitta oenochlamys* 143
limbata, *Lichmera* 512, 660
 Lina's Sunbird 243, 305
linaraborae, *Aethopyga* 243, 305
lisettae, *Hypogramma hypogrammicum* 257
 Little Bifasciated Sunbird 285
 Little Friarbird 542, 680, 684
 Little Green Sunbird 252
 Little Kai White-eye 455
 Little Kei White-eye 455
 Little Leatherhead 684
 Little Lewin Honeyeater 589
 Little Olive Sunbird 252
 Little Purple-banded Sunbird 285
 Little Spiderhunter 209, 317
 Little Wattlebird 522, 553, 620
 Little Yellow-spotted Honeyeater 592
lloydi, *Psaltiriparus minimus* 99
lofyi, *Acanthorhynchus tenuirostris* 582
 Loggerhead Shrike 750, 758, 785
 Lombok Honeyeater 660
lombokia, *Lichmera* 660
 Long Wattlebird 624
 Long-bearded Honeyeater 579, 612
 Long-bearded Melidectes 612
 Long-billed Creeper 194
 Long-billed Green Sunbird 302
 Long-billed Honeyeater 507, 630, 667, 673
 Long-billed Rhabdornis 194
 Long-billed Spiderhunter 228, 318
 Long-billed Sunbird 303
 Long-billed White-eye 479
 Long-plumed False-sunbird 337
 Long-tailed Berrypecker 335
 Long-tailed Black Berrypecker 335
 Long-tailed Bushitit 95
 Long-tailed Congo Sunbird 284
 Long-tailed Emerald Sunbird 272
 Long-tailed Fiscal 734, 789
 Long-tailed Grey Shrike 788
 Long-tailed Pied Shrike 792
 Long-tailed Shrike 739, 744, 745, 781, 794, 795
 Long-tailed Sugarbird 496
 Long-tailed Sunbird 272
 Long-tailed Tit 76, 95
 Longbill 322, 335
 Canary 338
 Dwarf 327, 337
 Green-crowned 338
 Grey-bellied 337
 Grey-winged 338
 New Guinea 338
 Plumed 337
 Pygmy 337
 Slaty-chinned 328, 331, 338
 Yellow-bellied 327, 338
longicauda, *Melanocharis* 323, 335
longicaudatus, *Lanius schach* 781
longirostra, *Arachnothera* 209, 317
longirostra, *Rukia* 479
longirostra, *Tichodroma muraria* 164
longirostris, *Meliphaga analoga* 591
longirostris, *Myzomela rosenbergii* 653
longirostris, *Phylidonyris novaehollandiae* 667
longirostris, *Rhabdornis* 194
longirostris, *Rhabdornis mystacalis* 194
longirostris, *Zosterops griseotinctus* 462
 Longuemare's Sunbird 251
longuemarei, *Anthreptes* 228, 251
loochooensis, *Zosterops japonicus* 445
lophotis, *Xanthotis polygrammus* 688
Lophozosterops 481
 Lord Howe Island White-eye 467
 Lord Howe White-eye 467
lorentzi, *Ptiloprora perstriata* 658
 Loten's Sunbird 229, 303
lotenius, *Cinnyris* 229, 303
loudoni, *Remiz macronyx* 69
loudoni, *Remiz pendulinus* 69
 Louisiade Black-fronted White-eye 457
 Louisiade Flowerpecker 364, 384
 Louisiade White-eye 436, 462
louisidensis, *Myzomela nigrita* 639
 Louisiades Honeyeater 591
 Louisiades Meliphaga 591
 Lovely Sunbird 306, 307
 Loveridge's Sunbird 280
loveridgei, *Cinnyris* 280
lowei, *Cyanomitra obscura* 261
 Lowland Straight-billed Honeyeater 629

Lowland Straightbill 629
 Lowland White-eye 446
 Loyalty Honeyeater 662
 Loyalty Islands Honeyeater 662
lucens, *Cinnyris marikensis* 283
lucidipectus, *Cinnyris pulchellus* 283
lucifer, *Melidectes ochromelas* 612
lucionensis, *Lanius cristatus* 777
ludovicensis, *Cinnyris* 277
ludovicianus, *Lanius* 750, 758, 785
 Ludwig's Double-collared Sunbird 277
luehderi, *Cinnyris chloropygius* 273
lugubris, *Speirops* 409, 485
lumbo, *Cinnyris talatala* 291
lunatus, *Melithreptus* 514, 675
lunulata, *Anthochaera* 505, 621
 Lunulated Honeyeater 675
 Lunulated Wattlebird 621
lushaiensis, *Sitta himalayensis* 131
lutea, *Manorina flavigula* 618
luteirostris, *Zosterops* 463
luteus, *Zosterops* 413, 462
 Luzon Flowerpecker 387
 Luzon Sunbird 267
 Luzon White-eye 446
luzonensis, *Arachnothera clarae* 318
luzonicus, *Zosterops nigrorum* 450
luzoniense, *Dicaeum ignipectus* 387
lyprum, *Dicaeum trigonostigma* 379

M

mab, *Meliphaga lewintii* 589
macassariensis, *Oriolus chinensis* 724
macedonicus, *Aegithalos caudatus* 95
macgillivrayi, *Cinnyris jugularis* 297
macgillivrayi, *Zosterops flavifrons* 465
 Macgregor's Bird 633
 MacGregor's Bird-of-paradise 633
 MacGregor's Honeyeater 510, 633
 Macgregor's Lappetface 633
Macgregoria 633
 Mackinnon's Fiscal 791
 Mackinnon's Grey Shrike 791
 Mackinnon's Shrike 791
mackinnoni, *Lanius* 791
 Macklot's Sunbird 269
 Macleay's Honeyeater 539, 689
macleayanus, *Xanthotis* 539, 689
macmillani, *Zosterops lateralis* 467
macrodictyla, *Certhia familiaris* 181
macronyx, *Remiz* 69
macrourus, *Oriolus chinensis* 724
maculatus, *Oriolus chinensis* 724
maculatus, *Prionochilus* 357, 361, 369
maculiceps, *Melanocharis versteri* 336
 Madagascan Sunbird 301
 Madagascar Green Sunbird 302
 Madagascar Sunbird 302
 Madagascar White-eye 474
 Madame Verreaux's Sunbird 290
Madanga 481
 Madanga White-eye 481
madaraszi, *Xanthotis flaviventer* 689
maderaspatanus, *Oriolus xanthornus* 729
maderaspatanus, *Zosterops* 433, 474
maforense, *Dicaeum geelvinkianum* 384
maforensis, *Leptocoma sericea* 268
magna, *Arachnothera* 210, 224, 319
magna, *Sitta* 111, 124, 144
magnifica, *Aethopyga siparaja* 313
magnirostrata, *Cyanomitra cyanolaema* 259
magnirostris, *Melithreptus brevirostris* 673
magnirostris, *Oriolus sagittatus* 717
magnirostris, *Zosterops novaeguinaeae* 461
magnus, *Aegithalos caudatus* 95
 Magpie Shrike 740, 745, 763, 768, 795
maheii, *Cinnyris dussumieri* 302
majauensis, *Zosterops chloris* 453
major, *Aegithalos caudatus* 95
major, *Leptopoecile sophiae* 101
major, *Myzomela rubratra* 644
major, *Nectarinia famosa* 272
majusculus, *Zosterops flavifrons* 465
 Makassar White-eye 455
 Makira Melidectes 615
malacensis, *Anthreptes* 198, 247
 Malachite Sunbird 230, 233, 272
 Malagasy White-eye 433, 474
 Malaita Honeyeater 652
 Malaita *Myzomela* 652
 Malaita White-eye 464
malaitae, *Dicaeum aeneum* 384

- malaitae*, *Myzomela* 652
malayanus, *Oriolus cruentus* 730
 Malaysian Oriole 721
malindangensis, *Aethopyga boltoni* 305
malindangensis, *Arachnothera clarae* 318
malindangensis, *Hypocryptadius cinnamomeus* 485
malindangensis, *Lophozosterops goodfellowi* 481
 Mallee Honeyeater 606
mandellii, *Certhia hodgsoni* 182
mandibularis, *Zosterops everetti* 449
mangini, *Aethopyga siparaja* 313
 Mangrove Friarbird 680
 Mangrove Honeyeater 601
 Mangrove Red-headed Honeyeater 648
 Mangrove Red-headed Myzomela 648
 Mangrove Sunbird 248
 Mangrove White-eye 453, 462
 Manipur Treecreeper 186
manipurensis, *Aegithalos concinnus* 97
manipurensis, *Certhia* 186
manoensis, *Cinnyris* 205, 274
Manorina 615
manueli, *Leptocoma sperata* 267
 Manus Friarbird 682
 Many-spotted Diamond-bird 400
 Many-spotted Honeyeater 688
 Many-spotted Pardalote 400
 Many-streaked Honeyeater 658
 Mao 579, 670
 Mao Honeyeater 670
 Marbled Honeyeater 499, 584
marchei, *Cleptornis* 480
mareensis, *Lichmera incana* 662
margaretae, *Meliphaga montana* 593
marginatus, *Cinnyris minullus* 274
mariae, *Dicaeum maugei* 385
mariae, *Hypogramma hypogrammicum* 257
mariae, *Leptocoma sericea* 268
 Marianas Bridled White-eye 447
 Marico Sunbird 283
marinduquensis, *Aethopyga siparaja* 313
marinduquensis, *Leptocoma sperata* 267
 Mariqua Sunbird 203, 223, 283
mariguensis, *Cinnyris* 203, 223, 283
marmoratus, *Pycnopygius cinereus* 584
 Maroon Oriole 694, 696, 702, 730
 Maroon-breasted Sunbird 303
marungensis, *Cyanomitra alinae* 260
 Marungu Sunbird 277
marwitzii, *Lanius* 793
masawan, *Dicaeum anthonyi* 374
 Mascarene Grey White-eye 473
 Mascarene Olive White-eye 476
 Mascarene White-eye 437, 473
 Masked Penduline-tit 69
 Masked Shrike 762, 794
 Mauge's Flowerpecker 385
maugei, *Dicaeum* 354, 385
mauritanica, *Certhia brachydactyla* 183
mauritanicus, *Zosterops borbonicus* 473
 Mauritius Grey White-eye 473
 Mauritius Olive White-eye 476
maxi, *Zosterops chloris* 453
maximus, *Toxorhamphus poliopterus* 338
 Mayotte Buff-breasted Sunbird 302
 Mayotte Sunbird 241, 302
 Mayotte White-eye 475
mayottensis, *Zosterops* 422, 475
 Mayr's Honeyeater 658
 Mayr's Streaked Honeyeater 658
mayri, *Ptiloprora* 658
mbulu White-eye 473
mbuluensis, *Zosterops poliopterus* 473
 McGregor's Bird-of-paradise 633
mearnsi, *Lanius ludovicianus* 785
mecynorhyncha, *Leptocoma sperata* 267
mediocris, *Cinnyris* 205, 279
 Meek's Honeyeater 657
 Meek's Streaked Honeyeater 657
meeki, *Melanocharis versteri* 336
meeki, *Oedistoma pygmaeum* 337
meeki, *Zosterops* 457
meekiana, *Ptiloprora* 657
megarhynchus, *Certhia brachydactyla* 183
megarhynchus, *Melilestes* 507, 630
megastoma, *Dicaeum trigonostigma* 379
Megazosterops 484
meissneri, *Leptopoeile elegans* 100
melanchina, *Arachnothera longirostra* 317
melanetra, *Aethopyga siparaja* 313
 Melanic Honeyeater 652
melanisticus, *Oriolus chinensis* 724
melanocephala, *Anthornis melanura* 587
melanocephala, *Manorina* 527, 545, 616
melanocephala, *Myzomela* 651
melanocephalus, *Pardalotus striatus* 401
melanocephalus, *Spiroops* 441, 485
Melanocharis 335
 MELANOCHARITIDAE 322, 335
melanogastrus, *Cinnyris pulchellus* 283
melanolaemus, *Lichenostomus subfrenatus* 595
melanoleuca, *Corvinella* 740, 745, 763, 768, 795
melanophrys, *Manorina* 505, 615
melanops, *Gliciphila* 659
melanops, *Lichenostomus* 572, 604
melanops, *Zosterops lateralis* 467
melanotis, *Manorina* 571, 580, 617
melanotis, *Oriolus* 712, 717
melanotis, *Psaltiriparus minimus* 99
melanotis, *Sitta pygmaea* 131
melanoxanthum, *Dicaeum* 352, 373
melanthe, *Dicaeum trigonostigma* 379
melanura, *Anthornis* 530, 587
melanurus, *Psaltiriparus minimus* 99
melanurus, *Zosterops palpebrosus* 446
Meliarchus 615
Melidectes 611
 Melidectes
 Arfak 612
 Bearded 611
 Belford's 613
 Bismarck 611
 Cinnamon-breasted 614
 Cinnamon-browed 612
 Dark-mantled 612
 Foerster's 614
 Gilliard's 611
 Huon 614
 Huon Wattled 614
 Long-bearded 612
 Makira 615
 Mid-mountain 612
 Nouhuys's 611
 Ornamental 614
 Ornate 614
 Reichenow's 613
 San Cristobal 615
 Short-bearded 611
 Sooty 611
 Vogelkop 612
 Vose's 611
 White-fronted 612
 Whiteman 611
 Whiteman Mountain 611
 Yellow-browed 613
Melilestes 630
Melionyx 611, 612
Meliornis 609
Meliphacator 690
Meliphaga 589
 Forest White-eared 593
 Graceful 592
 Greater Spot-breasted 592
 Hill-forest 590
 Large 592
 Large Spot-breasted 592
 Large-tufted 590
 Lesser Spot-breasted 590
 Lewin's 589
 Louisades 591
 Mimic 591
 Mottle-breasted 592
 Mountain 590, 593
 Mountain Yellow-eared 590
 Puff-backed 590
 Scrub White-eared 591
 Scrub White-marked 591
 Slender-billed 592
 Small Spot-breasted 590
 Southern White-eared 591
 Spot-breasted 592
 Streak-breasted 595
 Sudest 591
 Tagula 591
 Timor 595
 White-eared 591, 593
 White-eared Mountain 593
 White-marked 591
 Yellow-gaped 593
 Yellow-spotted 589, 591
 MELIPHAGIDAE 498, 582
 Melipote
 Common 632
 Eastern 632
 Melipotes 632
 Melipotes
 Arfak 632
 Common 632
 Eastern 632
 Huon 632
 Western 632
Melithreptus 672
Melitograis 685
melittae, *Aethopyga gouldiae* 309
 Mell's Maroon Oriole 731
 Mell's Oriole 731
mellianus, *Oriolus* 731
mellori, *Lichenostomus penicillatus* 608
meltoni, *Lichenostomus melanops* 604
 Melville Friarbird 680
 Melville Island Friarbird 680
melvillensis, *Lichenostomus flavescens* 608
melvillensis, *Lichmera indistincta* 661
melvillensis, *Manorina flavigula* 618
melvillensis, *Pardalotus striatus* 401
melvillensis, *Philemon argenteiceps* 682
menaiensis, *Zosterops maderaspatanus* 474
meneliki, *Oriolus monacha* 728
 Mengkoka Honeyeater 632
mentawi, *Oriolus xanthonotus* 721
mentoris, *Zosterops chloris* 453
menzbieri, *Remiz pendulinus* 69
meridionalis, *Certhia manipurensis* 186
meridionalis, *Lanius* 757, 769, 787
meridionalis, *Myza celebensis* 631
 Merops
 Embroidered 622
mesoleuca, *Sitta oenochlamys* 143
 Metallic Sunbird 254
 Metallic-winged Sunbird 306
metallica, *Anthodiaeta* 254
 Metcalfe's White-eye 461
metcalfii, *Zosterops* 461
mexicana, *Sitta carolinensis* 140
mexicanus, *Lanius ludovicianus* 785
meyeni, *Zosterops* 446
 Meyer's Friarbird 685
 Meyer's Honeyeater 632
meyeri, *Cinnyris jugularis* 297
meyeri, *Myzomela nigrita* 639
meyeri, *Philemon* 685
meyeri, *Timeliopsis fulvigula* 629
meyeri, *Xanthotis flaviventer* 689
meyleri, *Zosterops nigrorum* 450
miamensis, *Lanius ludovicianus* 785
microleucus, *Cinnyris jugularis* 297
 Micronesian Cardinal Honeyeater 644
 Micronesian Honeyeater 644
 Micronesian Myzomela 576, 644
microrhynchus, *Cinnyris bifasciatus* 285
 Mid-mountain Berrypecker 323, 335
 Mid-mountain Honeyeater 612
 Mid-mountain Melidectes 612
 Midget Flowerpecker 384
 Midget Myzomela 650
migrans, *Lanius ludovicianus* 785
 Migrant Shrike 785
migrator, *Oriolus flavocinctus* 718
miles, *Aethopyga siparaja* 313
militaris, *Pardalotus punctatus* 400
Mimeta 716, 717, 718
 Mimetic Honeyeater 591
 Mimic Honeyeater 591
 Mimic Meliphaga 591
mimikae, *Conopophila albogularis* 628
mimikae, *Meliphaga* 592
 Minah
 Bell 615
 Southern Black-backed 616
 Minahassa Flowerpecker 373
 Mindanao Sunbird 267
 Mindanao White-eye 481
mindanense, *Dicaeum hypoleucum* 379
mindanensis, *Cinnyris jugularis* 297
mindorensis, *Zosterops nigrorum* 450
 Mindoro Flowerpecker 375
 Miner
 Bell 505, 615
 Black-eared 571, 580, 617
 Dusky 617, 618
 Noisy 527, 545, 616
 Sombre 618
 White-rumped 618
 Yellow 618
 Yellow-throated 518, 525, 617
minima, *Leptocoma* 239, 267
minima, *Leptocoma sperata* 267
minimus, *Psaltiriparus* 79, 82, 87, 88, 89, 99
minimus, *Zosterops montanus* 450
 Minor
 Dusky 617
minor, *Anthreptes seimundi* 252
minor, *Lanius* 785
minor, *Rhabdornis mystacalis* 194
minor, *Zosterops* 457
minullum, *Dicaeum concolor* 380
minullus, *Cinnyris* 274
minuta, *Aethopyga bella* 307
minutus, *Anthoscopus* 57, 60, 73
minutus, *Zosterops* 467
miocaemus, *Lanius* 732
 Miombo Double-collared Sunbird 205, 274
 Miombo Sunbird 274
misoriense, *Dicaeum geelvinkianum* 384
 Mistle Flowerpecker 388
 Mistletoe Flowerpecker 388
 Mistletoebird 357, 362, 388
mixta, *Meliphaga notata* 589
mixtus, *Melidectes torquatus* 614
mjobergi, *Anthreptes malacensis* 247
 Mock Regent-bird 622
 Mock Wattlebird 620, 621
 Mock-Regent Honeyeater 622
 Mockbird
 Brush 620, 621
 Mockery 620
 Mockingbird 620
 Brush 621
 Modest Honeyeater 627
modesta, *Arachnothera* 224, 225, 319
modestum, *Dicaeum agile* 371
modestus, *Ramsayornis* 506, 627
modestus, *Zosterops* 443, 475
moebii, *Cinnyris notatus* 302
mohelicus, *Cinnyris humbloti* 301
 Moho 498
molinensis, *Certhia americana* 182
mollis, *Lanius excubitor* 786
 Moluccan Black-fronted White-eye 455
 Moluccan Flowerpecker 383
 Moluccan Friarbird 679
 Moluccan Friarbird 679
 Moluccan Honeyeater 638, 663
 Moluccan Myzomela 638
 Moluccan Oriole 716
 Moluccan White-eye 453, 455
 Moluccas Friarbird 679
 Moluccas Friarbird 679
moluccensis, *Philemon* 679
monacha, *Oriolus* 693, 728
monachus, *Philemon corniculatus* 682
 Monsoon Friarbird 680
montana, *Certhia americana* 182
montana, *Meliphaga* 593
montana, *Timeliopsis fulvigula* 629
 Montane Double-collared Sunbird 277
 Montane Oriole 728
montanus, *Zosterops* 450
monticola, *Lichmera* 663
monticolum, *Dicaeum* 351, 358, 363, 363, 387
montium, *Paramythia* 341, 345, 347, 348
montium, *Sitta nagaensis* 128
 Moreau's Sunbird 280
moreaui, *Cinnyris* 280
 Morotai Friarbird 679
morotensis, *Leptocoma sericea* 268
mortyana, *Myzomela obscura* 638
 Mottle-breasted Honeyeater 592, 662
 Mottle-breasted Meliphaga 592
 Mottle-plumaged Honeyeater 689
 Mottled Flowerpecker 385
 Mottled Honeyeater 689
moultoni, *Chlorocharis emiliae* 484
 Mount Apo Sunbird 305
 Mount Cameroon Spiroops 441, 485
 Mount Karthala White-eye 476
 Mountain Berrypecker 348
 Mountain Black-eye 407, 483
 Mountain Flowerpecker 387
 Mountain Honeyeater 590, 593, 596, 597, 650
 Mountain Meliphaga 590, 593
 Mountain Myzomela 649
 Mountain Nuthatch 128
 Mountain Oriole 728
 Mountain Purple-gaped Honeyeater 605
 Mountain Red-headed Honeyeater 650
 Mountain Red-headed Myzomela 650
 Mountain Shrike 773, 782
 Mountain Straight-billed Honeyeater 629
 Mountain Straightbill 629
 Mountain Sunbird 306
 Mountain White-eye 450, 457, 461, 473
 Mountain Yellow-eared Honeyeater 590

Mountain Yellow-eared Meliphaga / *oblitus*

Mountain Yellow-eared Meliphaga 590

moureniensis, *Zosterops* 476
 Mouse-brown Sunbird 248
 Mouse-coloured Penduline-tit 54, 72
 Mouse-coloured Sunbird 201, 248, 261
 Mouse-coloured Tit 72
 Moustached Honeyeater 668
muelleri, *Heleia* 483
muelleri, *Oriolus flavocinctus* 718
 Mukojima Honeyeater 480
 Mukojima White-eye 480
 Mulberry-bird 715
mundus, *Oriolus chinensis* 724
munna, *Myzomela obscura* 638
muraria, *Tichodroma* 147, 149, 151, 153, 155, 157, 159, 161, 163, 164
 Murphy's White-eye 464
murphyi, *Zosterops* 464
musarum, *Arachnothera magna* 319
musculus, *Anthoscopus* 54, 72
mussooriensis, *Aethopyga siparaja* 313
 Myanmar Shrike 778
 Myanmar Tit 98
 Mynah
 Bell 615
 Southern Black-backed 616
mysorensis, *Leptocoma sericea* 268
mysorensis, *Zosterops* 439, 458
mystacalis, *Aethopyga* 314
mystacalis, *Rhabdornis* 189, 191, 193, 194
Myza 631
 Myza
 Celebes 631
 Dark-eared 631
 Lesser Sulawesi 631
 Sarasin's 632
 White-eared 632
Myzomela 637
 Myzomela
 Admiralty 650
 Adolphina's 650
 Amboina 637
 Ambon 637
 Ashy 638
 Banda 641, 649
 Banded 660
 Bismarck 638, 650
 Bismarck Black 650
 Black 639, 650
 Black-and-red 653
 Black-bellied 646
 Black-breasted 653
 Black-headed 651
 Blackish 639
 Bougainville 651
 Carbon 639
 Cardinal 645
 Celebes 641
 Crimson-fronted 640
 Crimson-hooded 649
 Crimson-rumped 651
 Drab 637
 Dusky 535, 638
 Ebony 650
 Eichhorn's 651
 Elfin 650
 Grey 638
 Guadalcanal 651
 Islet 650, 651
 Kühn's 649
 Kulambangara 651
 Kulambangra 651
 Lifou Cardinal 645
 Malaita 652
 Mangrove Red-headed 648
 Micronesian 576, 644
 Midget 650
 Moluccan 638
 Mountain 649
 Mountain Red-headed 650
 New Britain 646
 New Caledonian 642
 New Ireland 640
 Olive-yellow 640
 Orange-breasted 575, 652
 Papuan Black 639
 Red 639
 Red-bellied 652
 Red-brown 638
 Red-caped 653
 Red-capped 651
 Red-chinned 637
 Red-collared 511, 653
 Red-headed 648

Red-naped 651
 Red-rumped 653
 Red-spot 637
 Red-spotted 637
 Red-throated 637
 Red-tinted 639
 Red-vested 652
 Rosenberg's 653
 Rotuma 640
 Ruby-throated 637
 Samoan Cardinal 645
 Sanguineous 642
 Santa Ana 652
 Scarlet 536, 560, 569, 642
 Scarlet-bibbed 650
 Scarlet-naped 574, 651
 Scarlet-throated 650
 Selater's 638, 650
 Seram 637
 Small Bougainville 651
 Sooty 652
 Splendid 646
 Sulawesi 641
 Sulphur-breasted 652
 Sumba 649
 Sunda 653
 Timor 653
 Tristram's 652
 Umboi 638
 Wakolo 641
 Wetar 649
 White-chinned 637
 White-sided 639
 White-throated 637
 Yellow-vented 651

N

Naga Nuthatch 128
nagaensis, *Sitta* 112, 128
 Naked-faced Spiderhunter 318
 Namaqua Sunbird 295
namwera, *Cinnyris manoensis* 274
 Nandi Double-collared Sunbird 278
nargianus, *Lanius vittatus* 780
narmadae, *Lichmera lombokia* 660
nasutus, *Lanius schach* 781
 Natal Long-tailed Sugarbird 497
 Natal Sugarbird 497
natalis, *Zosterops* 440, 462
natunae, *Aethopyga siparaja* 313
natunense, *Hypogramma hypogrammicum* 257
natunensis, *Prionochilus maculatus* 369
nea, *Meliphaga lewinii* 589
Nectarinia 271
 NECTARINIIDAE 196, 245
nectarinoides, *Cinnyris* 284
 Neergaard's Sunbird 277
neergaardi, *Cinnyris* 277
neglecta, *Cyanomitra olivacea* 260
neglecta, *Sitta* 130
 Neglected Nuthatch 130
neglectum, *Dicaeum maugei* 385
neglectus, *Anthreptes* 251
neglectus, *Philemon buceroides* 680
neglectus, *Remiz macronyx* 69
neglectus, *Zosterops montanus* 450
 Nehrkorn's Flowerpecker 383
nehrkorni, *Dicaeum* 383
nehrkorni, *Zosterops* 456
nelsoni, *Lanius ludovicianus* 785
nelsoni, *Sitta carolinensis* 140
 Nendo White-eye 465
 Nepal Treecreeper 185
 Nepal Yellow-backed Sunbird 309
nepalensis, *Tichodroma muraria* 164
nesiae, *Anthreptes malacensis* 247
nesophilus, *Anthreptes malacensis* 247
nesophilus, *Cinnyris notatus* 302
neumanni, *Anthreptes orientalis* 251
neumayeri, *Sitta* 107, 108, 114, 118, 141
 Neumayer's Nuthatch 141
nevadensis, *Lanius ludovicianus* 785
 New Britain Friarbird 681
 New Britain Friarbird 681
 New Britain Honeyeater 611, 646
 New Britain Leatherhead 681
 New Britain Myzomela 646
 New Britain Red-headed Honeyeater 646
 New Caledonian Friarbird 578, 683
 New Caledonian Honeyeater 631, 642
 New Caledonian Myzomela 642
 New Caledonian White-eye 467
 New Georgia Honeyeater 651
 New Guinea Berrypecker 348
 New Guinea Black-fronted White-eye 457
 New Guinea Brown Honeyeater 583
 New Guinea Friarbird 680
 New Guinea Honeyeater 583
 New Guinea Longbill 338
 New Guinea Mountain White-eye 461
 New Guinea Oriole 716
 New Guinea White-eye 461
 New Hebrides Honeyeater 631
 New Holland Honeyeater 513, 667
 New Ireland Flowerpecker 384
 New Ireland Friarbird 577, 681
 New Ireland Honeyeater 640
 New Ireland Myzomela 640
 New Norcia Honeyeater 602
 New Zealand Bell 587
 New Zealand Bellbird 530, 587
 Newton's Fiscal 792
 Newton's Sunbird 257
 Newton's Yellow-breasted Sunbird 257
newtoni, *Lanius* 792
newtonii, *Anabathmis* 257
niasense, *Dicaeum cruentatum* 389
niasensis, *Aethopyga siparaja* 313
niasensis, *Arachnothera longirostra* 317
niassae, *Cinnyris venustus* 292
niassae, *Cyanomitra verticalis* 258
 Nicobar Black-naped Oriole 724
nicobarica, *Aethopyga siparaja* 313
nicobaricus, *Zosterops palpebrosus* 446
nigellicauda, *Oriolus trailii* 730
niger, *Phylidonyris* 668
nigeriae, *Anthodiaeta collaris* 253
nigeriae, *Cinnyris superbus* 290
nigerrima, *Myzomela pammelaena* 650
nigra, *Melanocharis* 323, 329, 335
nigrescens, *Certhia americana* 182
nigrescens, *Chalcomitra fuliginosa* 263
nigrescens, *Zosterops lateralis* 467
nigricans, *Remiz macronyx* 69
nigricapillus, *Lanius collurioides* 778
nigriceps, *Lanius schach* 781
nigrilore, *Dicaeum* 359, 374
nigritum, *Dicaeum cruentatum* 389
nigripennis, *Oriolus* 729
nigriscapularis, *Leptocoma sericea* 268
nigrita, *Myzomela* 639
nigriventer, *Sitta azurea* 144
nigriventris, *Myzomela cardinalis* 646
nigrorum, *Zosterops* 404, 450
nigrostriatus, *Oriolus steerii* 721
nigrum, *Sugomel* 565, 636
 Nile Valley Sunbird 254
 Nilgiri Flowerpecker 380
nilgiriensis, *Zosterops palpebrosus* 446
niloticus, *Lanius senator* 793
nipalensis, *Aethopyga* 208, 309
nipalensis, *Certhia* 170, 185
 Nissan White-eye 462
nitidum, *Dicaeum* 364, 384
niveogularis, *Aegithalos* 97
niveus, *Eurocephalus anguitimens* 795
nobilis, *Moho* 499
 Noisy Friarbird 519, 541, 562, 682
 Noisy Miner 527, 545, 616
 Nondescript Honeyeater 583
 Norfolk Island White-eye 468
 Norfolk White-eye 468
normantoniensis, *Melithreptus gularis* 672
 North Siberian Shrike 786
 Northern Double-collared Sunbird 205, 278
 Northern Figbird 715
 Northern Long-tailed Tit 78, 83, 84, 86, 89, 90, 93, 95
 Northern Orange-tufted Sunbird 289
 Northern Oriole 717
 Northern Pardalote 401
 Northern Pygmy Sunbird 254
 Northern Shrike 786
 Northern Treecreeper 181
 Northern White-crowned Shrike 741, 742, 746, 796
notabilis, *Glycyfobia* 631
notabilis, *Lichmera* 663
notata, *Meliphaga* 544, 589
notatus, *Cinnyris* 302
notatus, *Oriolus auratus* 723
 Noted Sunbird 302
 Nouhuys's Melidectes 611
nouhuysi, *Melidectes* 611
novaeguineae, *Philemon buceroides* 680
novaeguineae, *Toxorhamphus* 327, 338

novaeguineae, *Zosterops* 461
novaehollandiae, *Phylidonyris* 513, 667
novaenorcaiae, *Lichenostomus leucotis* 602
novaeseelandiae, *Prosthodroma* 500, 537, 587
 Nubian Shrike 794
nubicus, *Lanius* 762, 794
nuchale, *Hypogramma hypogrammicum* 257
nuchalis, *Melidectes torquatus* 614
nupta, *Lichmera indistincta* 661
 Nuthatch 102, 127
 Algerian 134
 Azure 144
 Beautiful 125, 145
 Black-headed 135
 Black-masked 136
 Blue 111, 144
 Brooks's 129
 Brown-headed 109, 132
 Burmese 130
 Californian 131
 Carolina 139
 Chestnut-bellied 129
 Chestnut-vented 112, 128
 Chinese 127, 135
 Cinnamon-bellied 129
 Common 127, 139
 Corsican 122, 133
 Eastern Rock 104, 121, 141
 Eurasian 105, 106, 107, 110, 113, 115, 116, 117, 119, 120, 127
 European 127
 Florida 139
 Giant 111, 124, 144
 Great 141
 Great Rock 141
 Greater 141
 Greater Rock 141
 Himalayan 130
 Hondo 127
 Indian 129
 Inyo 139
 Kabylian 134
 Kabylie 134
 Kamtschatkan 127
 Kashmir 122, 129
 Krüper's 119, 134
 Lesser Rock 141
 Lilac 143
 Mountain 128
 Naga 128
 Neglected 130
 Neumayer's 141
 Oriental 127
 Persian 141
 Przewalski's 102, 139
 Pygmy 108, 131
 Red-bellied 136
 Red-breasted 110, 136
 Rock 141
 Rocky Mountain 139
 Snowy-browed 135
 Southern 127
 Sulphur-billed 143
 Syrian Rock 141
 Velvet-fronted 103, 109, 112, 142
 Velvet-fronted Blue 142
 Victoria 131
 Western Rock 107, 108, 114, 118, 141
 White-breasted 106, 116, 121, 139
 White-breasted American 139
 White-breasted Black-capped 139
 White-browed 125, 131
 White-cheeked 139
 White-tailed 130
 Wood 127
 Yellow-billed 123, 143
 Yesso 127
 Yunnan 123, 136
nyassae, *Anthreptes longuemarej* 251
nyikensis, *Nectarinia johnstoni* 273
nymani, *Myzomela eques* 637

O

O'o

Bishop's 499
 Hawaii 499
 Kauai 499
 Oahu 499
 Oahu O'o 499
oberholseri, *Sitta carolinensis* 140
oblitus, *Prionochilus maculatus* 369
oblitus, *Zosterops rendovae* 464

- obscura*, *Anthornis melanura* 587
obscura, *Cyanomitra* 261
obscura, *Manorina flavigula* 618
obscura, *Myzomela* 535, 638
obscura, *Sitta tephronota* 141
obscuratus, *Aegithalos bonvaloti* 98
Obscure Berrypecker 335
Obscure Honeyeater 596
obscurifrons, *Dicaeum geelvinkianum* 384
obscurior, *Cinnyris jugularis* 297
obscurum, *Dicaeum hypoleucum* 379
obscurus, *Leptopoeile sophiae* 101
obscurus, *Lichenostomus* 596
obsoletum, *Dicaeum agile* 371
obstinatus, *Zosterops montanus* 450
occidentalis, *Certhia americana* 182
occidentalis, *Lichenostomus cratitius* 605
occidentalis, *Melidectes fuscus* 611
occidentalis, *Philemon citreogularis* 684
occidentalis, *Ptiloprora meekiana* 657
occidentis, *Paramythia montium* 348
occidentis, *Zosterops palpebrosus* 446
ochra, *Aethopyga saturata* 310
Ochre-winged Honeyeater 633
ochrochrous, *Zosterops lateralis* 467
ochromelas, *Melidectes* 612
ochropyrrha, *Aethopyga siparaja* 313
octaviae, *Cyanomitra cyanolaema* 259
ocularis, *Lichmera indistincta* 661
Oculocincta 483
Oedistoma 337
oenochlamys, *Sitta* 143
oenopa, *Leptocoma sperata* 267
Oenositta 142, 143
ogilviegranti, *Cinnyris chloropygius* 273
ognewi, *Tichodroma muraria* 164
oleagineus, *Zosterops* 429, 477
olivacea, *Cyanomitra* 235, 260
olivacea, *Lichmera alboauricularis* 662
olivacea, *Paramythia montium* 348
Olivaceous Berrypecker 348
Olivaceous Flowerpecker 380
olivaceum, *Dicaeum concolor* 380
olivaceus, *Cephalopyrus flammiceps* 74
olivaceus, *Prionochilus* 369
olivaceus, *Zosterops* 476
olivacina, *Cyanomitra olivacea* 260
olivascens, *Oedistoma pygmaeum* 337
Olive Black-eye 483
Olive Honeyeater 660
Olive Straight-billed Honeyeater 629
Olive Straightbill 629
Olive Sunbird 260, 261
Olive White-eye 476
Olive-backed Flowerpecker 369
Olive-backed Oriole 698, 705, 710, 717
Olive-backed Sunbird 226, 232, 234, 258, 296
Olive-bellied Sunbird 222, 273
Olive-brown Honeyeater 583
Olive-brown Oriole 712, 717
Olive-capped Flowerpecker 359, 374
Olive-coloured Sunbird 260
Olive-coloured White-eye 477
Olive-crowned Flowerpecker 383
Olive-lored Oriole 721
Olive-streaked Honeyeater 657
Olive-yellow Honeyeater 640
Olive-yellow Myzomela 640
olivei, *Cinnyris jugularis* 297
olympia, *Leptocoma sericea* 268
omoensis, *Zosterops abyssinicus* 469
oneho, *Anthornis melanura* 587
opistatus, *Prionochilus maculatus* 369
Orange River White-eye 470
Orange-backed Flowerpecker 375
Orange-bellied Flowerpecker 353, 360, 379
Orange-bellied Sunbird 292
Orange-bellied Variable Sunbird 292
Orange-breasted Flowerpecker 379
Orange-breasted Honeyeater 652
Orange-breasted Myzomela 575, 652
Orange-breasted Sunbird 200, 258
Orange-cheeked Honeyeater 588
Orange-tipped Pardalote 401
Orange-tufted Sunbird 289
Orange-wattled Bird-of-paradise 633
Oreocharis 348
oreophilus, *Zosterops novaeguineae* 461
Oreornis 588
Oriental Black-headed Oriole 729
Oriental Mountain White-eye 450
Oriental Nuthatch 127
Oriental White-eye 411, 415, 427, 446
orientalis, *Anthreptes* 251
orientalis, *Certhia familiaris* 181
orientalis, *Melanocharis longicauda* 335
orientalis, *Meliphaga* 590
origenes, *Zosterops montanus* 450
oriochares, *Zosterops montanus* 450
Oriole 692, 715
Abyssinian 728
African 723
African Black-headed 728
African Golden 703, 723
Andaman Black-naped 724
Asian Black-headed 729
Australian 717
Australian Yellow 718
Black 730
Black-and-crimson 730
Black-eared 712, 716
Black-faced 716
Black-headed 721, 729
Black-headed Forest 728
Black-hooded 729
Black-naped 699, 711, 724
Black-tailed 728
Black-throated 721
Black-winged 729
Brown 694, 716
Buru 716
Ceram 716
Ceylon Black-headed 729
Crimson-breasted 730
Dark 717
Dark-eared 716
Dark-headed 728
Dark-throated 713, 721
Dusky 716
Dusky-brown 712, 716
East African Black-headed 728
Eastern Black-headed 700, 701, 703, 704, 706, 728
Eastern Black-naped 724
Ethiopian Black-headed 693, 728
Eurasian Golden 695, 698, 707, 709, 722
European Golden 722
Forest 728
Forsten's 716
Golden 722
Gray's 716
Green 704, 717, 718
Green-backed 717
Green-headed 727
Green-lored 721
Greenish-backed 727
Grey-collared 716
Grey-necked 716
Grey-throated 721
Halmahera 716
Indian Black-headed 729
Indian Golden 701, 722
Isabela 721
Isabella 721
Malaysian 721
Maroon 694, 696, 702, 730
Mell's 731
Mell's Maroon 731
Moluccan 716
Montane 728
Mountain 728
New Guinea 716
Nicobar Black-naped 724
Northern 717
Olive-backed 698, 705, 710, 717
Olive-brown 712, 717
Olive-lored 721
Oriental Black-headed 729
Percival's 728
Philippine 711, 721
Ruddy 716
Sao Tome 713, 727
Seram 716
Silver 731
Slender-billed 723
Slender-billed Black-naped 723
Stresemann's 731
Striated 716
Sunda 717
Tanimbar 716
Timor 717
West African Black-headed 727
Western Black-headed 727
White-bellied 717
White-lored 721
Yellow 718
Yellow-bellied 718
ORIOLIDAE 692, 715
Oriolus 716
oriolus, *Oriolus* 695, 698, 707, 709, 722
oritis, *Cyanomitra* 236, 259
Ornamental Melidectes 614
Ornate Honeyeater 614
Ornate Melidectes 614
ornatus, *Auriparus flaviceps* 74
ornatus, *Cinnyris jugularis* 297
ornatus, *Lichenostomus* 606
ornatus, *Pardalotus striatus* 401
orphogaster, *Cinnyris chloropygius* 273
oscillans, *Oriolus chinensis* 724
osea, *Cinnyris* 222, 289
osiris, *Cinnyris mariquensis* 283
ottomeyeri, *Zosterops griseotinctus* 462
Oustalet's Sunbird 291
Oustalet's White-bellied Sunbird 291
oustaleti, *Cinnyris* 291
ovamboensis, *Cinnyris mariquensis* 283
owstoni, *Aethopyga siparaja* 313
owstoni, *Zosterops semperi* 448
P
pagense, *Dicaeum trigonostigma* 379
pagodarum, *Arachnothera magna* 319
Painted Berrypecker 340, 348
Painted Honeyeater 578, 691
Palau Greater White-eye 484
Palau White-eye 484
palauensis, *Megazosterops* 408, 484
Palawan Flowerpecker 365, 369, 380
Palawan Sunbird 306
Palawan Yellow-rumped Flowerpecker 369
palawana, *Sitta frontalis* 142
palawanensis, *Oriolus chinensis* 724
palawanorum, *Dicaeum pygmaeum* 381
palawanus, *Oriolus xanthonotus* 721
Pale Red-browed Pardalote 401
Pale White-eye 453, 454, 470
Pale-bellied Sunbird 254
Pale-bellied White-eye 454
Pale-billed Flowerpecker 360, 380
Pale-brown Shrike 777
Pale-eyed Honeyeater 654
Pale-yellow Honeyeater 608
Palestine Sunbird 222, 289
pallascens, *Anthoscopus caroli* 72
pallascens, *Dicaeum agile* 371
Pallid Honeyeater 608
Pallid Pardalote 401
Pallid White-eye 470
pallida, *Arachnothera longirostra* 317
pallida, *Chalcaparia singalensis* 245
pallida, *Glycichaera fallax* 654
pallida, *Manorina flavigula* 618
pallida, *Melanocharis nigra* 335
pallidiceps, *Melithreptes brevirostris* 673
pallidiceps, *Philemon buceroides* 680
pallidifrons, *Lanius collurio* 776
pallidigaster, *Anthodiaeta* 243, 254
pallidigula, *Hypocryptadius cinnamomeus* 485
pallidior, *Myzomela albigula* 637
pallidipes, *Zosterops griseotinctus* 462
pallidirostris, *Lanius meridionalis* 787
pallidius, *Dicaeum trigonostigma* 379
pallidogularis, *Zosterops minor* 457
pallidumbo, *Aegithalos caudatus* 95
pallidus, *Zosterops* 424, 428, 470
palpebrosus, *Zosterops* 411, 415, 427, 446
pammelaena, *Myzomela* 650
panopsis, *Chalcaparia singalensis* 245
papuae, *Meliphaga analoga* 591
Papuan Black Honeyeater 639
Papuan Black Myzomela 639
Papuan Black-fronted White-eye 457
Papuan Flowerpecker 383, 384
Papuan Mountain White-eye 457
papuensis, *Philemon citreogularis* 684
paradoxa, *Anthochaera* 573, 624
paradoxus, *Zosterops kulambangrae* 464
paraguae, *Anthreptes malacensis* 247
Paramythia 348
PARAMYTHIIDAE 340, 348
Pardalote 390, 400
Black-headed 401
Cape Red-browed 401
Eastern 401
Eastern Striated 401
Forty-spotted 399, 400
Many-spotted 400
Northern 401
Orange-tipped 401
Pale Red-browed 401
Pallid 401
Red-browed 392, 394, 401
Red-lored 401
Red-tipped 401
Spotted 391, 392, 397, 398, 400
Striated 393, 394, 395, 396, 401
Tasmanian 400
Yellow-rumped 400
Yellow-tipped 401
PARDALOTIDAE 390, 400
Pardalotus 400
parkeri, *Acanthagenys rufogularis* 618
parkesi, *Zosterops montanus* 450
parryi, *Pardalotus rubricatus* 401
pars, *Arachnothera affinis* 319
parsonsi, *Prionochilus olivaceus* 369
parus, *Melithreptes gularis* 672
parvirostris, *Cinnyris reichenowi* 278
parvirostris, *Myza celebensis* 631
parvulus, *Anthoscopus* 71
passekii, *Aegithalos caudatus* 95
PASSERIFORMES 51
pataisi, *Lichmera argentauris* 660
patersonae, *Anthodiaeta collaris* 253
Pearl-bellied White-eye 454
Pectoral Flowerpecker 383
pectorale, *Dicaeum* 383
pectoralis, *Cinnyris jugularis* 297
pectoralis, *Cissomela* 526, 659
pectoralis, *Zosterops montanus* 450
pelloptilus, *Anthreptes malacensis* 247
Pemba Purple-banded Sunbird 286
Pemba Sunbird 286
Pemba Violet-breasted Sunbird 286
Pemba White-eye 471
pembae, *Cinnyris* 286
pembae, *Cyanomitra obscura* 261
Penduline Tit 69
Penduline-tit 52, 69
African 72, 73
Black-headed 69, 70
Buff-bellied 72
Cape 57, 60, 73
Chinese 52, 59, 70
Common 69
Crowned 70
Eurasian 53, 56, 63, 67, 69
European 69
Forest 73
Grey 65, 72
Masked 69
Mouse-coloured 54, 72
Rungwe 72
Sennar 71
Southern 73
Sudan 71
Western 69
White-crowned 64, 70
Yellow 71
Yellow-fronted 73
Zambezi 72
pendulinus, *Remiz* 53, 56, 63, 67, 69
penicillatus, *Lichenostomus* 520, 547, 608
Peninsular White-eye 454
Percival's Oriole 728
percivali, *Oriolus* 728
percussus, *Prionochilus* 355, 369
periplectus, *Zosterops chloris* 453
permistus, *Oriolus monacha* 728
pernigra, *Certhia americana* 182
perplexus, *Zosterops flavifrons* 465
perretti, *Aethopyga temminckii* 314
Persian Nuthatch 141
persica, *Certhia familiaris* 181
persica, *Sitta europaea* 127
persimilis, *Remiz pendulinus* 69
personatus, *Psaltiriparus minimus* 99
perstriata, *Ptiloprora* 658
persuasus, *Oriolus xanthonotus* 721
petersi, *Aethopyga saturata* 310
phaeochromus, *Oriolus* 712, 716
phaeopygium, *Dicaeum eximium* 384
phayrei, *Leptocoma sperata* 267
Philemon 679
philemon, *Xanthotis flaviventer* 689
Philippine Flowerpecker 375
Philippine Oriole 711, 721
Philippine Shrike 777, 782
Philippine Spiderhunter 318
Philippine Sunbird 267
Philippine White-eye 446, 450
Philippine Yellow White-eye 450
philippinensis, *Arachnothera clarae* 318

phillipsi, *Anthodiaeta collaris* 253
phillipsi, *Certhia americana* 182
phoenicotis, *Chalcoparia singalensis* 245
phoenicuroides, *Lanius isabellinus* 777
Pholidornis 75
pholidota, *Myza sarasinorum* 632
photina, *Aethopyga siparaja* 313
phrygia, *Anthochaera* 581, 622
Phylidonyris 666
phyllicus, *Zosterops senegalensis* 470
picta, *Grantiella* 578, 691
pictus, *Cinnyris jugularis* 296
Pied Honeyeater 531, 585
Pinaia White-eye 481
pinaiae, *Lophozosterops* 481
pinarochrous, *Zosterops lateralis* 467
Pinto's Double-collared Sunbird 274
pinto, *Cinnyris manensis* 274
piperata, *Rhamphocharis crassirostris* 337
Plain Bushiti 99
Plain Flowerpecker 352, 380
Plain Friarbird 684
Plain Honeyeater 583
Plain Olive Honeyeater 660
Plain Sunbird 198, 246
Plain White-eye 448
Plain-backed Little Sunbird 246
Plain-backed Sunbird 241, 246
Plain-coloured Flowerpecker 380
Plain-coloured Sunbird 246
Plain-headed Creeper 195
Plain-throated Sunbird 247
planasi, *Lichenostomus plumulus* 606
Platen's Yellow-rumped Flowerpecker 369
plateni, *Cinnyris jugularis* 297
plateni, *Prionochilus* 365, 369
platura, *Anthodiaeta* 199, 254
Plectorhyncha 690
pleoxantha, *Arachnothera chrysogenys* 318
plesseni, *Philemon buceroides* 680
Plum-coloured Sunbird 251
plumbea, *Ptiloprora* 657
plumbea, *Sitta neumayer* 141
Plumbeous Bushiti 99
plumbeus, *Psaltriparus minimus* 99
Plumed Honeyeater 606
Plumed Longbill 337
plumigenis, *Philemon* 679
plumulus, *Lichenostomus* 502, 606
pluto, *Myzomela nigrita* 639
Poecilositta 144
poensis, *Cyanomitra oritis* 260
poensis, *Zosterops senegalensis* 470
Pohnpei White-eye 469, 479
poikilosternus, *Xanthotis polygrammus* 688
poliocephala, *Glycichaera fallax* 654
poliogastus, *Zosterops* 412, 432, 473
poliopterus, *Toxorhamphus* 328, 331, 338
poliots: *Lichmera incana* 662
pollostus, *Anthreptes malacensis* 247
polyclystus, *Cinnyris jugularis* 297
polygrammus, *Xanthotis* 688
polyphomus, *Melidectes torquatus* 614
Ponapé Greater White-eye 479
Ponapé White-eye 479
ponapensis, *Zosterops cinereus* 469
pontifex, *Dicaeum hypoleucum* 379
porphyrolaema, *Leptocoma sericea* 268
praedicta, *Ptiloprora perstriata* 658
prasina, *Melanocharis striativentris* 336
prateri, *Sitta castanea* 129
predator, *Lanius collaris* 792
Preuss's Double-collared Sunbird 278
preussi, *Cinnyris reichenowi* 278
Prigogine's Double-collared Sunbird 277
Prigogine's Sunbird 277
prigoginei, *Cinnyris* 277
prillwitzii, *Arachnothera longirostra* 317
primigenia, *Aethopyga* 305
primitiva, *Myzomela eques* 637
Prince's Island Speirops 484
princeps, *Melidectes* 579, 612
Principe Island Speirops 484
Principe Speirops 484
Principe Sunbird 257
Principe White-eye 474
Prionochilus 369
procerior, *Foulehaio carunculatus* 669
PROMEROPIDAE 486, 496
Promerops 496
proprium, *Dicaeum* 371
proselius, *Cinnyris jugularis* 297
proserpina, *Leptocoma sericea* 268
Prosthamera 587

proteus, *Chalcomitra senegalensis* 264
Provocator Honeyeater 690
provocator, *Xanthotis* 516, 690
proximus, *Pycnopygius ixoides* 583
Pryer's Flowerpecker 389
pryeri, *Dicaeum cruentatum* 389
Przewalski's Nuthatch 102, 139
przewalskii, *Sitta* 102, 139
Psaltria 100
Psaltriparus 99
Ptiloprora 657
Ptilotis 480, 690
Puff-backed Honeyeater 590, 654
Puff-backed Meliphaga 590
Puget Sound Bushtit 99
puguensis, *Cyanomitra olivacea* 260
pujoli, *Anthreptes rectirostris* 252
pulchella, *Myzomela* 640
pulchellum, *Dicaeum ignipectus* 387
pulchellus, *Aegithalos concinnus* 97
pulchellus, *Cinnyris* 217, 283
pulcherrima, *Aethopyga* 306
pulcherrima, *Myzomela cardinalis* 646
pulchra, *Macgregoria* 510, 633
pulchrum, *Dicaeum geelvinkianum* 383
punctatus, *Pardalotus* 391, 392, 397, 398, 400
punctifrons, *Anthoscopus* 71
Purnella 609
Purple Sunbird 226, 296
Purple-banded Sunbird 285
Purple-breasted Sunbird 271
Purple-gaped Honeyeater 605
Purple-naped Sunbird 199, 257
Purple-rumped Sunbird 227, 267
Purple-throated Sunbird 212, 216, 267
purpureiventris, *Nectarinia* 271
pusilla, *Sitta* 109, 132
Pycnopygius 583
pygmaea, *Dicaeum* 380
pygmaea, *Sitta* 108, 131
pygmaeum, *Dicaeum* 380
pygmaeum, *Oedistoma* 337
pygmaea, *Dicaeum* 380
Pygmy Bushiti 100
Pygmy Flowerpecker 380
Pygmy Grey White-eye 483
Pygmy Honeyeater 337
Pygmy Long-tailed Sunbird 254
Pygmy Longbill 337
Pygmy Nuthatch 108, 131
Pygmy Sunbird 199, 254
Pygmy Tit 79, 100
Pygmy White-eye 483
pyrrhopterus, *Phylidonyris* 666
pyrrhostictus, *Lanius collaris* 792

Q
quadragintus, *Pardalotus* 399, 400
quadricolor, *Dicaeum* 375
quanae, *Zosterops senegalensis* 471
queenslandica, *Conopophila rufogularis* 628

R
rabori, *Rhabdornis inornatus* 195
ragazzii, *Cyanomitra obscura* 261
Rainbow Bird 271
rajputanae, *Salpornis spilonotus* 186
ramsayi, *Myzomela pammelaena* 650
ramsayi, *Zosterops lateralis* 467
Ramsayornis 627
randi, *Arachnothera longirostra* 317
rankinei, *Anthoscopus caroli* 72
Ranongga White-eye 463
rara, *Meliphaga mimikae* 592
rectirostris, *Anthreptes* 252
Red Honeyeater 639
Red Myzomela 639
Red Wattlebird 524, 546, 548, 623
Red-and-blue Sunbird 246
Red-backed Honeyeater 658
Red-backed Shrike 756, 761, 767, 776, 781
Red-banded Flowerpecker 384
Red-bellied Honeyeater 652
Red-bellied Myzomela 652
Red-bellied Nuthatch 136
Red-bibbed Honeyeater 650
Red-breasted Honeyeater 628
Red-breasted Nuthatch 110, 136
Red-breasted Sunbird 278

Red-browed Diamond-bird 401
Red-browed Pardalote 392, 394, 401
Red-brown Honeyeater 638
Red-brown Myzomela 638
Red-caped Honeyeater 653
Red-caped Myzomela 653
Red-capped Flowerpecker 383
Red-capped Myzomela 651
Red-chested Flowerpecker 354, 385
Red-chested Sunbird 213, 284
Red-chinned Myzomela 637
Red-collared Flowerpecker 375
Red-collared Honeyeater 653
Red-collared Myzomela 511, 653
Red-collared Sunbird 274
Red-crowned Honeyeater 651
Red-eye 715
Red-faced Honeyeater 671
Red-flanked White-eye 445
Red-headed Flowerpecker 383
Red-headed Honeyeater 648
Red-headed Long-tailed Tit 96
Red-headed Mountain Honeyeater 650
Red-headed Myzomela 648
Red-headed Tit 96
Red-keeled Flowerpecker 375
Red-lored Pardalote 401
Red-naped Honeyeater 651
Red-naped Myzomela 651
Red-rumped Honeyeater 653
Red-rumped Myzomela 653
Red-shouldered Sunbird 248
Red-sided Honeyeater 657
Red-sided Streaked Honeyeater 657
Red-spot Honeyeater 637
Red-spot Myzomela 637
Red-spotted Myzomela 637
Red-striped Flowerpecker 375
Red-tailed Shrike 777
Red-throated Honeyeater 628, 637
Red-throated Myzomela 637
Red-throated Sunbird 242, 248
Red-tinted Honeyeater 639
Red-tinted Myzomela 639
Red-tipped Pardalote 401
Red-tufted Malachite Sunbird 272
Red-tufted Sunbird 218, 272
Red-vested Myzomela 652
Red-winged Wallcreeper 164
Regal Sunbird 238, 279
Regent Honeyeater 581, 622
Regent-bird
 Mock 622
regius, *Acanthorhynchus tenuirostris* 582
regius, *Cinnyris* 238, 279
regulus, *Prionochilus percussus* 369
Reichenbach's Sunbird 200, 257
reichenbachii, *Anabathmis* 200, 257
Reichenow's Melidectes 613
Reichenow's Wattlebird 613
reichenowi, *Anthreptes* 241, 246
reichenowi, *Cinnyris* 205, 278
reichenowi, *Drepanorhynchus* 202, 273
reichenowi, *Oriolus larvatus* 728
reichenowi, *Zosterops senegalensis* 470
Remiz 69
REMIZIDAE 52, 69
remota, *Arachnothera magna* 319
remotum, *Dicaeum agile* 371
Rentova White-eye 464
rendovae, *Zosterops* 464
Rennell White-eye 463, 479
rennellianus, *Zosterops* 463
restrictus, *Pardalotus striatus* 401
reticulata, *Meliphaga* 595
Reticulated Honeyeater 595
retrocinctum, *Dicaeum* 375
reubeni, *Oriolus xanthornus* 729
Reunion Grey White-eye 473
Reunion Olive White-eye 476
rex, *Pardalotus quadragintus* 400
rex, *Phylidonyris pyrrhopterus* 666
Rhabdornis 188, 194
 Grand 194
 Long-billed 194
 Stripe-breasted 190, 195
 Stripe-headed 189, 191, 193, 194
 Stripe-sided 194
Rhabdornis 194
RHABDORNITHIDAE 188, 194
Rhamphocharis 336
rhizophorae, *Cinnyris jugularis* 297
rhodesiae, *Anthoscopus caroli* 72
rhodesiae, *Cinnyris oustaleti* 291

rhodolaemus, *Anthreptes* 242, 248
rhodopygale, *Dicaeum sanguinolentum* 388
richmondi, *Oriolus chinensis* 724
richmondi, *Zosterops nigrorum* 450
ripleyi, *Aethopyga nipalensis* 309
rippioni, *Certhia himalayana* 184
River Honeyeater 601
robertsi, *Anthoscopus caroli* 72
robinsoni, *Oriolus traillii* 730
Robust White-eye 404
robusta, *Arachnothera* 228, 318
robustirostris, *Cinnyris jugularis* 297
robustus, *Philemon inornatus* 684
roccatii, *Anthoscopus caroli* 72
Rock Nuthatch 141
Rockefeller's Sunbird 279
rockefelleri, *Cinnyris* 279
Rocky Mountain Nuthatch 139
rolleti, *Oriolus larvatus* 728
romae, *Dicaeum maugei* 385
rooki, *Myzomela cineracea* 638
rosaceus, *Aegithalos caudatus* 95
roseilia, *Sitta europaea* 127
Rosenberg's Honeyeater 653
Rosenberg's Myzomela 653
rosenbergii, *Myzomela* 511, 653
rosseli, *Dicaeum nitidum* 384
rossica, *Certhia familiaris* 181
rossocaucasica, *Certhia brachydactyla* 183
Rota White-eye 447
rotensis, *Zosterops* 447
rothschildi, *Anthoscopus caroli* 72
rothschildi, *Arachnothera longirostra* 317
rothschildi, *Zosterops minor* 457
Rotuma Honeyeater 640
Rotuma Myzomela 640
rubescens, *Chalcomitra* 263
rubensis, *Xanthotis flaviventer* 689
rubiginosa, *Sitta europaea* 127
rubiginensis, *Chalcoparia singalensis* 245
rubrata, *Myzomela* 576, 644
rubricatus, *Pardalotus* 392, 394, 401
rubrigena, *Anthreptes malacensis* 247
rubrigulare, *Dicaeum geelvinkianum* 384
rubrinota, *Aethopyga bella* 307
rubritorques, *Anthreptes* 253
rubrobrunnea, *Myzomela obscura* 638
rubrocoronatum, *Dicaeum geelvinkianum* 384
rubropygium, *Dicaeum trigonostigma* 379
rubrotincta, *Myzomela obscura* 638
Ruby-checked Sunbird 197, 236, 245
Ruby-throated Honeyeater 637
Ruby-throated Myzomela 637
Rubycheek 245
Ruddy Oriole 716
Rufescent Dark-eye 480
Rufescent White-eye 480
ruficollis, *Madanga* 443, 481
rufipennis, *Cinnyris* 291
rufocrissalis, *Melidectes* 504, 613
rufogularis, *Acanthagenys* 549, 568, 618
rufogularis, *Conopophila* 628
Rufous-backed Honeyeater 556, 658
Rufous-backed Shrike 781
Rufous-banded Honeyeater 563, 628
Rufous-breasted Honeyeater 628, 689
Rufous-collared White-eye 481
Rufous-eye
 Cinnamon 485
Rufous-fronted Bushiti 97
Rufous-fronted Tit 97
Rufous-rumped Shrike 781
Rufous-sided Honeyeater 657
Rufous-sided Streaked Honeyeater 657
Rufous-tailed Shrike 777
Rufous-throated Dark-eye 481
Rufous-throated Honeyeater 628
Rufous-throated Sunbird 248
Rufous-throated White-eye 443, 481
Rufous-winged Sunbird 291
ruki, *Rukia* 479
Rukia 479
Rukia
 Yap 477
Rungwe Penduline-tit 72
rupicola, *Sitta neumayer* 141
ruppelli, *Eurocephalus* 741, 742, 746, 796
rushiae, *Pholidornis* 56, 62, 75
Rusty Flowerpecker 385
Rusty-flanked Treecreeper 170, 185
ruthae, *Anthoscopus flavifrons* 73
rutilans, *Lanius senator* 793
Rwenzori Blue-headed Sunbird 260
Rwenzori Double-collared Sunbird 277

S

- saani*, *Oriolus chinensis* 724
 Sacramento Bushit 99
 Safford's Cardinal Honeyeater 644
saffordi, *Myzomela rubratra* 644
sagittatus, *Oriolus* 698, 705, 710, 717
 Saipan Bridled White-eye 447
sakhalinensis, *Sitta europaea* 127
saleyerensis, *Cinnyris jugularis* 297
saliens, *Cinnyris afer* 278
salimalii, *Zosterops palpebrosus* 446
salomonseni, *Dicaeum pygmaeum* 380
Salpornis 186
salvadori, *Salpornis spilonotus* 186
salvadorii, *Dicaeum maugei* 385
salvadorii, *Leptocoma sericea* 268
salvadorii, *Lichenostomus subfrenatus* 595
salvadorii, *Lichmera squamata* 662
salvadorii, *Nectarinia johnstoni* 272
salvadorii, *Sphecotheres vieilloti* 715
salvadorii, *Zosterops* 449
samarensis, *Oriolus steerii* 721
samarensis, *Prionochilus olivaceus* 369
 Samoan Cardinal Myzomela 645
 Samoan Wattled Honeyeater 669
 Samoan White-eye 465
samoensis, *Gymnomyza* 579, 670
samoensis, *Zosterops* 465
samueli, *Lichenostomus chrysops* 597
 San Cristobal Flowerpecker 385
 San Cristobal Honeyeater 615
 San Cristobal Melidectes 615
 San Cristobal Midget Flowerpecker 385
sanctaerucius, *Myzomela cardinalis* 646
sanctaerucius, *Zosterops* 465
 Sandstone Friarbird 680
 Sanford's White-eye 479
sanfordi, *Myzomela cardinalis* 646
sanfordi, *Rukia* 479
Sanfordia 479
 Sanghir Sunbird 306
 Sanghir Yellow-backed Sunbird 306
sanghiranus, *Anthreptes malacensis* 247
sanghirense, *Dicaeum celebicum* 387
 Sangihe Sunbird 306
 Sangihe White-eye 456
sangirensis, *Leptocoma sericea* 268
sangirensis, *Oriolus chinensis* 724
 Sanguineous Honeyeater 642
 Sanguineous Myzomela 642
sanguinipectus, *Aethopyga saturata* 310
sanguinolenta, *Myzomela* 536, 560, 569, 642
sanguinolentum, *Dicaeum* 388
 Santa Ana Honeyeater 652
 Santa Ana Myzomela 652
 Santa Cruz White-eye 465
 São Tomé Fiscal 792
 São Tomé Giant Sunbird 258
 Sao Tome Oriole 713, 727
 Sao Tome Speirops 485
 Sao Tome Sunbird 257, 258
 Sao Tome White-eye 474
 Sarasin's Myza 632
sarasinorum, *Myza* 632
sarasinorum, *Zosterops montanus* 450
saturata, *Aethopyga* 235, 310
saturator, *Chalcomitra senegalensis* 264
saturator, *Sitta frontalis* 142
saturator, *Xanthotis flaviventer* 689
saturatus, *Cephalopyrus flammiceps* 74
saturatus, *Psaltiriparus minimus* 99
 Savaii White-eye 465
 Savau White-eye 465
saypani, *Zosterops conspicillatus* 448
 Scaled Honeyeater 662
 Scaly Honeyeater 662
 Scaly-breasted Honeyeater 662
 Scaly-crowned Honeyeater 660
 Scaly-crowned White-eye 481
 Scaly-headed White-eye 481
 Scaly-throated Honeyeater 601
 Scarlet Honeyeater 642
 Scarlet Myzomela 536, 560, 569, 642
 Scarlet Sunbird 314
 Scarlet-backed Flowerpecker 359, 388
 Scarlet-bibbed Honeyeater 650
 Scarlet-bibbed Myzomela 650
 Scarlet-breasted Flowerpecker 366, 370, 387
 Scarlet-breasted Sunbird 264, 313
 Scarlet-chested Sunbird 264
 Scarlet-collared Flowerpecker 375
 Scarlet-headed Flowerpecker 389
 Scarlet-naped Honeyeater 651
 Scarlet-naped Myzomela 574, 651
 Scarlet-throated Honeyeater 650
 Scarlet-throated Myzomela 650
 Scarlet-throated Sunbird 264, 313
 Scarlet-tufted Malachite Sunbird 272
 Scarlet-tufted Sunbird 245, 272
 Schach Shrike 781
schach, *Lanius* 739, 744, 745, 781
schistaceiceps, *Dicaeum erythrothorax* 383
schoddei, *Melithreptus albogularis* 674
schradereensis, *Melidectes belfordi* 613
schubotzi, *Cinnyris stuhlmanni* 277
 Sclater's Honeyeater 650
 Sclater's Myzomela 638, 650
sclateri, *Cyanomitra obscura* 261
sclateri, *Meliarchus* 615
sclateri, *Myzomela* 650
 Scrub Honeyeater 591
 Scrub Mountain-honeyeater 591
 Scrub Mountain-meliphaga 591
 Scrub White-eared Honeyeater 591
 Scrub White-eared Meliphaga 591
 Scrub White-eyed Honeyeater 591
 Scrub White-marked Honeyeater 591
 Scrub White-marked Meliphaga 591
scurrula, *Aegithalos fuliginosus* 99
seheriae, *Aethopyga siparaja* 313
 Seimund's Little Green Sunbird 252
seimundi, *Anthreptes* 252
semiflavus, *Zosterops* 409
semperi, *Zosterops* 448
senator, *Lanius* 765, 793
senegalensis, *Anthoscopus parvulus* 71
senegalensis, *Chalcomitra* 264
senegalensis, *Zosterops* 426, 433, 434, 470
 Sennar Penduline-tit 71
senogalliensis, *Sitta* 104
seorsa, *Sitta europaea* 127
separabile, *Dicaeum agile* 371
sepik, *Meliphaga montana* 593
septentrionalis, *Cinnyris cupreus* 295
septentrionalis, *Prionochilus maculatus* 369
septentrionalis, *Toxorhamphus poliopterus* 338
septentrionalis, *Xanthotis polygrammus* 688
 Seram Friarbird 679
 Seram Honeyeater 663
 Seram Myzomela 637
 Seram Oriole 716
 Seram White-eye 456, 481
seranensis, *Zosterops montanus* 450
sericea, *Leptocoma* 202, 268
setekwa, *Dicaeum geelvinkianum* 384
setekwa, *Meliphaga albonotata* 591
 Severtsov's Tit-warbler 101
 Seychelles Blue-headed Sunbird 302
 Seychelles Brown White-eye 475
 Seychelles Grey White-eye 443, 475
 Seychelles Sunbird 240, 302
 Seychelles White-eye 475
 Seychelles Yellow White-eye 409
shanensis, *Certhia manipurensis* 186
sharpai, *Aegithalos* 98
sharpai, *Anthoscopus caroli* 72
sharpai, *Meliphaga aruensis* 590
 Shelley's Double-collared Sunbird 284
 Shelley's Sunbird 248, 284, 306, 307
shelleyi, *Aethopyga* 306
shelleyi, *Cinnyris* 284
shellyae, *Drepanorhynchus reichenowi* 273
 Shining Flowerpecker 383
 Shining Sunbird 289
 Short-bearded Honeyeater 611
 Short-bearded Melidectes 611
 Short-billed Honeyeater 673
 Short-billed Sunbird 285
 Short-toed Treecreeper 169, 171, 173, 176, 177, 183
 Shrike 732, 775
 Altai 786
 Bay-backed 748, 780
 Black-capped 781
 Black-headed 781
 Brown 759, 777
 Bull-headed 760, 775
 Burmese 778
 Central Asian 777
 Chestnut-backed 778
 Chestnut-rumped 778
 Chinese Great Grey 788
 Chinese Grey 754, 788
 Common Fiscal 792
 Daurian 777
 Dusky 781
 Eastern Long-tailed 795
 Eastern Woodchat 793
 Emin's 772, 779
 Emin's Red-backed 779
 Fiscal 792
 Great Grey 735, 749, 755, 786
 Grey 786
 Grey-backed 738, 770, 782
 Grey-capped 782
 Highland 775
 Indian Grey 787
 Isabelline 733, 751, 777
 Japanese 777
 Large Chinese 788
 Large-nosed 781
 Lesser Grey 785
 Loggerhead 750, 758, 785
 Long-tailed 739, 744, 745, 781, 794, 795
 Long-tailed Grey 788
 Long-tailed Pied 792
 Mackinnon's 791
 Mackinnon's Grey 791
 Magpie 740, 745, 763, 768, 795
 Masked 762, 794
 Migrant 785
 Mountain 773, 782
 Myanmar 778
 North Siberian 786
 Northern 786
 Northern White-crowned 741, 742, 746, 796
 Nubian 794
 Pale-brown 777
 Philippine 777, 782
 Red-backed 756, 761, 767, 776, 781
 Red-tailed 777
 Rufous-backed 781
 Rufous-rumped 781
 Rufous-tailed 777
 Schach 781
 Smith's White-crowned 795
 Southern Grey 757, 769, 787
 Southern Rufous-rumped 781
 Southern White-crowned 766, 795
 Souza's 771, 779
 Steppe 786
 Steppe Grey 787
 Strong-billed 782
 Taita Fiscal 791
 Thick-billed 775
 Tibetan 782
 Tiger 737, 775
 Turkistan 777
 Turkistan Red-tailed 777
 Uhehe 793
 Wedge-tailed 788
 Western Long-tailed 794
 White-crowned 795
 White-rumped 796
 Woodchat 765, 793
 Yellow-billed 740, 752, 794
siamense, *Dicaeum cruentatum* 389
siamensis, *Zosterops palpebrosus* 446
 Siamese White-eye 446
siberu, *Aethopyga siparaja* 313
sibiricus, *Aegithalos caudatus* 95
sibiricus, *Lanius excubitor* 786
sibiricus, *Oriolus oriolus* 722
sibutuense, *Dicaeum trigonostigma* 379
sibuyanicum, *Dicaeum trigonostigma* 379
sicarius, *Lanius bucephalus* 775
siccata, *Chalcomitra hunteri* 265
 Sichuan Treecreeper 175, 179, 185
siculus, *Aegithalos caudatus* 95
sierramadrensis, *Zosterops nigrorum* 450
 Sikkim Treecreeper 167, 185
silvanus, *Zosterops polioastrus* 473
 Silver Honeyeater 660
 Silver Oriole 731
 Silver-crowned Friarbird 515, 682
 Silver-eared Honeyeater 662
 Silver-faced Tit 99
 Silver-spangled Honeyeater 660
 Silver-throated Bushit 96
 Silver-throated Tit 96
 Silvereye 414, 417, 419, 423, 425, 431, 435, 454, 462, 467
 Australian 454
 Capricorn 467
 Grey-backed 467
 Grey-breasted 467
 Western 467
 Yellow 462
simalurensis, *Dicaeum cruentatum* 389
simillima, *Arachnothera flavigaster* 318
simillimum, *Dicaeum geelvinkianum* 383
 Simla Yellow-backed Sunbird 309
simplex, *Anthreptes* 198, 246
simplex, *Myzomela obscura* 638
simplex, *Pycnopygius ixoides* 583
simplex, *Zosterops japonicus* 445
simplicior, *Anthreptes simplex* 246
sinaloae, *Auriparus flaviceps* 74
sindorensis, *Zosterops montanus* 450
sinense, *Dicaeum concolor* 380
sinensis, *Sitta europaea* 127
singalensis, *Chalcoparia* 197, 236, 245
 Singing Honeyeater 598
siparaja, *Aethopyga* 208, 313
sipora, *Oriolus chinensis* 724
siquijorensis, *Zosterops everetti* 449
Sitta 127
 SITTIDAE 102, 127
 Slaty-chinned Longbill 328, 331, 338
 Slender-billed Black-naped Oriole 723
 Slender-billed Honeyeater 582, 592
 Slender-billed Meliphaga 592
 Slender-billed Oriole 723
 Slender-billed White-eye 468
 Small Black-fronted White-eye 457
 Small Bougainville Honeyeater 651
 Small Bougainville Myzomela 651
 Small Flowerpecker 380
 Small Lifou White-eye 467
 Small Mountain Honeyeater 588
 Small Spot-breasted Honeyeater 590
 Small Spot-breasted Meliphaga 590
 Small Spotted Honeyeater 590
 Small Sunbird 267
 Small White-eye 446, 457
 Smaller Black-bellied Sunbird 284
 Smaller Double-collared Sunbird 274
 Smith's White-crowned Shrike 795
smithii, *Lanius collaris* 792
 Smoky Bare-eyed Honeyeater 632
 Smoky Honeyeater 632
 Snowy-browed Nuthatch 135
 Socotra Island Sunbird 265
 Socotra Sunbird 240, 265
socotramus, *Zosterops abyssinicus* 469
 Soepiori White-eye 458
sokolovi, *Aethopyga christinae* 310
sola, *Leptocoma zeylonica* 267
solangiae, *Sitta* 123, 143
solaris, *Cinnyris* 298
sollicitans, *Dicaeum concolor* 380
solombensis, *Zosterops chloris* 453
 Solomon Flowerpecker 384
 Solomon Grey-throated White-eye 464
 Solomon Islands Flowerpecker 384
 Solomon White-eye 464
 Solomon Yellow-throated White-eye 461
somadikartai, *Zosterops* 456
 Somali Fiscal 791
 Somali Sunbird 292
somalicus, *Lanius* 791
 Sombre Miner 618
someri, *Anthodiaeta collaris* 253
sonoriensis, *Lanius ludovicianus* 785
sonoroides, *Lichenostomus versicolor* 601
sonorus, *Lichenostomus virescens* 598
 Sooty Honeyeater 611, 652
 Sooty Long-tailed Tit 99
 Sooty Melidectes 611
 Sooty Myzomela 652
 Sooty Tit 85, 93, 98
sophiae, *Leptopoecile* 81, 91, 101
sordida, *Arachnothera longirostra* 317
sordidum, *Dicaeum everetti* 371
sordidus, *Philemon citreogularis* 684
sororia, *Cyanomitra* 259
sorsogonensis, *Oriolus chinensis* 724
 Souimanga Sunbird 219, 301
souimanga, *Cinnyris* 301
 South Pare White-eye 473
 South-west African Fiscal 792
 Southern Bifasciated Sunbird 283
 Southern Black-backed Minah 616
 Southern Black-backed Mynah 616
 Southern Double-collared Sunbird 207, 274
 Southern Figbird 715
 Southern Grey Shrike 757, 769, 787
 Southern Honeyeater 591
 Southern Kapok 73
 Southern Nuthatch 127
 Southern Orange-tufted Sunbird 289
 Southern Penduline-tit 73
 Southern Pygmy Sunbird 254
 Southern Rufous-rumped Shrike 781

Southern White-bellied Sunbird / Sunbird

- Southern White-bellied Sunbird 291
 Southern White-crowned Shrike 766, 795
 Southern White-eared Honeyeater 591
 Southern White-eared Meliphaga 591
 Souza's Shrike 771, 779
souzae, *Lanius* 771, 779
sovimanga, *Cinnyris* 219, 301
 Spangle-crowned Honeyeater 584
 Spangled Honeyeater 509, 632
 Spectacled Honeyeater 604, 663
 Spectacled Spiderhunter 232, 318
 Spectacled White-eye 447
speculifer, *Oriolus chlorocephalus* 727
speculigerus, *Lanius isabellinus* 777
Speirops 484
Speirops
 Bioko 484
 Black-capped 409, 485
 Cameroon 485
 Fernando Po 484
 Mount Cameroon 441, 485
 Prince's Island 484
 Principe 484
 Principe Island 484
 Sao Tome 485
sperata, *Leptocoma* 212, 216, 267
Sphecotheres 715
sphenocercus, *Lanius* 754, 788
 Spiderhunter
 Bare-faced 318
 Bornean 319
 Everett's 319
 Greater Yellow-eared 318
 Grey-breasted 224, 225, 319
 Kinabalu 319
 Large 318
 Lesser Yellow-eared 318
 Little 209, 317
 Long-billed 228, 318
 Naked-faced 318
 Philippine 318
 Spectacled 232, 318
 Streaked 210, 224, 319
 Streaky-breasted 319
 Thick-billed 317
 Whitehead's 320
 Yellow-eared 213, 318
spilogaster, *Xanthotis flaviventer* 689
spilonotus, *Salpormis* 169, 172, 178, 186
 Spine-billed Honeyeater 582
 Spinebill 582, 583
 Eastern 532, 559, 582
 Victorian 582
 Western 498, 583
 White-browed 583
 Spinebill Honeyeater 582
 Spiny-cheeked Honeyeater 549, 568, 618
 Spiny-cheeked Wattlebird 618
 Splendid Myzomela 646
 Splendid Sunbird 290
 Splendid White-eye 463
splendidum, *Dicaeum maugei* 385
splendius, *Zosterops* 463
 Spot-bellied Honeyeater 632
 Spot-breasted Dark-eye 483
 Spot-breasted Honeyeater 592
 Spot-breasted Meliphaga 592
 Spot-breasted White-eye 483
 Spot-headed Honeyeater 632
 Spot-headed Honeyeater 632
 Spotted Berrypecker 326, 336
 Spotted Creeper 169, 172, 178, 186
 Spotted Grey Creeper 186
 Spotted Honeyeater 688
 Spotted Pardalote 391, 392, 397, 398, 400
 Spotted Treecreeper 186
 Spotted Xanthotis 688
 Spring-cheeked Honeyeater 618
squamata, *Lichmera* 662
squamiceps, *Lophozosterops* 481
squamifrons, *Oculocincta* 483
 Sri Lanka Hill White-eye 447
 Sri Lanka White-eye 416, 446, 447
ssaposhnikowi, *Remiz macronyx* 69
stachyrinus, *Lophozosterops squamiceps* 482
 Stalker's White-eye 480
stalkerii, *Tephrozosterops* 480
stalkerii, *Zosterops* 456
stangerii, *Chalcomitra rubescens* 263
steerii, *Oriolus* 711, 721
steini, *Meliphaga montana* 593
steini, *Myzomela nigrata* 639
steini, *Zosterops montanus* 450
stejnegeri, *Zosterops japonicus* 445
stellae, *Chalcoparia singalensis* 245
stenocricotus, *Zosterops senegalensis* 470
 Steppe Grey Shrike 787
 Steppe Shrike 786
 Stevens's Honeyeater 592
stevensi, *Meliphaga analoga* 591
stevensi, *Meliphaga cinereifrons* 592
stewarti, *Certhia americana* 182
stictocephalus, *Pycnopygius* 584
stictoptera, *Oreocharis* 348
stierlingi, *Cinnyris venustus* 292
stierlingi, *Zosterops senegalensis* 470
 Stoliczka's Tit-warbler 101
 Stoliczka's Treecreeper 185
stoliczkae, *Leptopoeile sophiae* 101
stoliczkae, *Remiz coronatus* 70
 Straight-billed Green Sunbird 252
 Straightbill
 Green-backed 654
 Grey-throated 629
 Lowland 629
 Mountain 629
 Olive 629
 Tawny 507, 629
 Streak-breasted Honeyeater 595
 Streak-breasted Meliphaga 595
 Streak-breasted White-eye 483
 Streak-capped Honeyeater 584
 Streak-headed Darkeye 481
 Streak-headed Honeyeater 584
 Streak-headed White-eye 481
 Streak-naped Honeyeater 689
 Streaked Berrypecker 324, 336
 Streaked Honeyeater 689
 Streaked Spiderhunter 210, 224, 319
 Streaky-breasted Flowerpecker 370
 Streaky-breasted Spiderhunter 319
 Streaky-headed Darkeye 481
 Streaky-headed White-eye 481
strenuus, *Zosterops* 404, 468
 Stresemann's Oriole 731
stresemanni, *Certhia brachydactyla* 183
stresemanni, *Dicaeum trochileum* 389
stresemanni, *Lanius schach* 781
stresemanni, *Lophozosterops squamiceps* 481
stresemanni, *Melidectes belfordi* 613
stresemanni, *Melilestes megarhynchus* 630
stresemanni, *Oriolus chinensis* 724
stresemanni, *Zosterops* 464
Stresemannia 630
 Striated Berrypecker 336
 Striated Diamond-bird 401
 Striated Friarbird 685
 Striated Oriole 716
 Striated Pardalote 393, 394, 395, 396, 401
striaticeps, *Lophozosterops squamiceps* 481
striatissimum, *Dicaeum agile* 371
striativentris, *Melanocharis* 324, 336
striatus, *Pardalotus* 393, 394, 395, 396, 401
 Stripe-breasted Creeper 195
 Stripe-breasted Rhabdornis 190, 195
 Stripe-headed Creeper 194
 Stripe-headed Rhabdornis 189, 191, 193, 194
 Stripe-headed White-eye 483
 Stripe-sided Rhabdornis 194
 Striped Flowerpecker 370
 Striped Honeyeater 517, 690
 Strong-billed Honeyeater 673
 Strong-billed Shrike 782
strophium, *Cinnyris bifasciatus* 285
 Stuhlmann's Double-collared Sunbird 215, 238, 277
stuhlmanni, *Cinnyris* 215, 238, 277
stuhlmanni, *Zosterops senegalensis* 470
suahelicus, *Cinnyris mariquensis* 283
subalaris, *Cinnyris chalybeus* 275
subalibogularis, *Melithreptus albogularis* 674
subatrifrons, *Zosterops atrifrons* 456
 Sub-bridled Honeyeater 595
subcollaris, *Anthodiaeta collaris* 253
subcorniculatus, *Philemon* 679
subcoronatus, *Lanius collaris* 792
 Subcrested Honeyeater 604
subcrissatus, *Lophozosterops dohertyi* 482
subfamosa, *Nectarinia famosa* 272
subflavum, *Dicaeum concolor* 380
subfrenatus, *Lichenostomus* 595
subgermanus, *Lichenostomus fuscus* 607
substriatus, *Pardalotus striatus* 401
subtuberosus, *Philemon buceroides* 680
 Sudan Penduline-tit 71
 Sudest Honeyeater 591
 Sudest Meliphaga 591
 Sugarbird 486, 496
 Cape 487, 491, 493, 494, 495, 496
 Cape Long-tailed 496
 Chestnut-headed 497
 Green 272
 Gurney's 489, 492, 497
 Long-tailed 496
 Natal 497
 Natal Long-tailed 497
Sugomel 636
sukensis, *Cinnyris venustus* 292
sulaense, *Dicaeum celebicum* 387
sulaensis, *Zosterops atrifrons* 456
 Sulawesi Flowerpecker 373
 Sulawesi Honeyeater 641
 Sulawesi Myzomela 641
 Sulawesi White-eye 454
 Sulphur-billed Nuthatch 143
 Sulphur-breasted Myzomela 652
 Sulu Flowerpecker 379
suluensis, *Lanius schach* 781
suluensis, *Oriolus chinensis* 724
 Sumatran Flowerpecker 387
sumatrana, *Chalcoparia singalensis* 245
sumatranum, *Dicaeum cruentatum* 389
 Sumba Honeyeater 649
 Sumba Island Sunbird 297
 Sumba Myzomela 649
 Sumba Sunbird 297
sumbanus, *Philemon buceroides* 680
sumbavense, *Dicaeum annae* 370
sumbavensis, *Zosterops chloris* 453
 Sunbird 196, 245
 Abyssinian 289
 African Violet-backed 251
 Amani 243, 254
 Amethyst 214, 264
 Amethyst-throated 264
 Anchieta's 246
 Angola 291
 Angola White-bellied 291
 Anjouan 301
 Apo 242, 305
 Apricot-breasted 239, 297
 Banded 252, 253, 257
 Banded Green 252, 253
 Bannerman's 259
 Bannerman's Blue-headed 259
 Bates's 295
 Bates's Olive 295
 Beautiful 217, 283
 Beautiful Long-tailed 283
 Bifasciated 285
 Black 202, 264, 268
 Black-bellied 284
 Black-breasted 296, 310
 Black-throated 235, 296, 310
 Blue 251
 Blue-headed 259, 260
 Blue-headed Brown 259
 Blue-naped 257
 Blue-throated 246, 259, 309
 Blue-throated Brown 259
 Blue-throated Little 246
 Bocage's 271
 Bocage's Montane Double-collared 277
 Bouvier's 289
 Bouvier's Orange-tufted 289
 Bronze 233, 272
 Bronzed Pygmy 254
 Bronzy 272
 Brown 245, 248
 Brown-throated 198, 247
 Buff-breasted 292
 Buff-chested 292
 Buff-throated 263
 Caconda White-bellied 291
 Cameroon 236, 259
 Cameroon Blue-headed 260
 Carmelite 263
 Chad Orange-tufted 289
 Coguno Double-collared 277
 Collared 225, 231, 253
 Common Malachite 272
 Common Purple-banded 234, 285
 Congo 284
 Congo Black-bellied 284
 Copper 295
 Copper-coloured 295
 Copper-throated 269
 Coppery 295
 Crimson 208, 313
 Crimson-backed 239, 267
 Double-collared 274
 Dusky 204, 295
 Dusky São Tomé 258
 Duyvenbode's 306
 Eastern Crimson 313
 Eastern Double-collared 205, 279
 Eastern Olive 235, 260
 Eastern Pygmy 254
 Eastern Violet-backed 251
 Elegant 306
 Fernando Po 295
 Fernando Po Mouse-coloured 295
 Fire-tailed 314
 Flame-breasted 298
 Flaming 305
 Forest Double-collared 279
 Fork-tailed 221, 310
 Fraser's 245
 Gadow's 272
 Giant 258
 Golden-winged 202, 273
 Gould's 309
 Goulpourah 313
 Greater Double-collared 205, 278
 Green 252
 Green-backed 252
 Green-headed 211, 258
 Green-headed Olive 258
 Green-headed Sunbird 211, 258
 Green-tailed 208, 309
 Green-throated 263, 309
 Grey 261
 Grey-bellied Double-collared 274
 Grey-chinned 252
 Grey-headed 245, 305
 Grey-hooded 305
 Grey-throated 247
 Guinea Olive 261
 Guinean Olive 261
 Gunning's 246
 Hachisuka's 305
 Handsome 307
 Hartlaub's 257
 Hasselt's 267
 van Hasselt's 267
 Henke's 267
 Hodgson's 310
 Hofmann's 284
 Humboldt's 301
 Hunter's 201, 265
 Indian Purple-rumped 267
 Javan 314
 Johanna's 290
 Kenya 246, 251
 Kenya Violet-backed 251
 Kenya Violet-breasted 285
 Kuhl's 309
 Large Double-collared 278
 Lesser Double-collared 274
 Lesser Sunda 247
 Lina's 243, 305
 Little Bifasciated 285
 Little Green 252
 Little Olive 252
 Little Purple-banded 285
 Long-billed 303
 Long-billed Green 302
 Long-tailed 272
 Long-tailed Congo 284
 Long-tailed Emerald 272
 Longuemare's 251
 Loten's 229, 303
 Lovely 306, 307
 Loveridge's 280
 Ludwig's Double-collared 277
 Luzon 267
 Macklot's 269
 Madagascan 301
 Madagascar 302
 Madagascar Green 302
 Madame Verreaux's 290
 Malachite 230, 233, 272
 Mangrove 248
 Marico 283
 Mariqua 203, 223, 283
 Maroon-breasted 303
 Marungu 277
 Mayotte 241, 302
 Mayotte Buff-breasted 302
 Metallic 254
 Metallic-winged 306
 Mindanao 267
 Miombo 274
 Miombo Double-collared 205, 274
 Montane Double-collared 277
 Moreau's 280

- Mount Apo 305
 Mountain 306
 Mouse-brown 248
 Mouse-coloured 201, 248, 261
 Namaqua 295
 Nandi Double-collared 278
 Neergaard's 277
 Nepal Yellow-backed 309
 Newton's 257
 Newton's Yellow-breasted 257
 Nile Valley 254
 Northern Double-collared 205, 278
 Northern Orange-tufted 289
 Northern Pygmy 254
 Noted 302
 Olive 260, 261
 Olive-backed 226, 232, 234, 258, 296
 Olive-bellied 222, 273
 Olive-coloured 260
 Orange-bellied 292
 Orange-bellied Variable 292
 Orange-breasted 200, 258
 Orange-tufted 289
 Oustalet's 291
 Oustalet's White-bellied 291
 Palawan 306
 Pale-bellied 254
 Palestine 222, 289
 Pemba 286
 Pemba Purple-banded 286
 Pemba Violet-breasted 286
 Philippine 267
 Pinto's Double-collared 274
 Plain 198, 246
 Plain-backed 241, 246
 Plain-backed Little 246
 Plain-coloured 246
 Plain-throated 247
 Plum-coloured 251
 Preuss's Double-collared 278
 Prigogine's 277
 Prigogine's Double-collared 277
 Principe 257
 Purple 226, 296
 Purple-banded 285
 Purple-breasted 271
 Purple-naped 199, 257
 Purple-rumped 227, 267
 Purple-throated 212, 216, 267
 Pygmy 199, 254
 Pygmy Long-tailed 254
 Red-and-blue 246
 Red-breasted 278
 Red-chested 213, 284
 Red-collared 274
 Red-shouldered 248
 Red-throated 242, 248
 Red-tufted 218, 272
 Red-tufted Malachite 272
 Regal 238, 279
 Reichenbach's 200, 257
 Rockefeller's 279
 Ruby-cheeked 197, 236, 245
 Rufous-throated 248
 Rufous-winged 291
 Rwenzori Blue-headed 260
 Rwenzori Double-collared 277
 Sanghir 306
 Sanghir Yellow-backed 306
 Sangihe 306
 Sao Tome 257, 258
 São Tomé Giant 258
 Scarlet 314
 Scarlet-breasted 264, 313
 Scarlet-chested 264
 Scarlet-throated 264, 313
 Scarlet-tufted 245, 272
 Scarlet-tufted Malachite 272
 Seimund's Little Green 252
 Seychelles 240, 302
 Seychelles Blue-headed 302
 Shelley's 248, 284, 306, 307
 Shelley's Double-collared 284
 Shining 289
 Short-billed 285
 Simla Yellow-backed 309
 Small 267
 Smaller Black-bellied 284
 Smaller Double-collared 274
 Socotra 240, 265
 Socotra Island 265
 Somali 292
 Souimanga 219, 301
 Southern Bifasciated 283
 Southern Double-collared 207, 274
 Southern Orange-tufted 289
 Southern Pygmy 254
 Southern White-bellied 291
 Splendid 290
 Straight-billed Green 252
 Stuhlmann's Double-collared 215, 238, 277
 Sumba 297
 Sumba Island 297
 Sunda 298
 Superb 290
 Swahili 283
 Tacazze 203, 271
 Temminck's 237, 314
 Timor 298
 Tiny 274
 Tsavo Purple-banded 285
 Uganda Violet-backed 251
 Uluguru 251
 Uluguru Violet-backed 251
 Ursula's 295
 Ursula's Mouse-coloured 295
 Usambara Double-collared 279
 Usambara Grey-chinned 253
 Variable 206, 292
 Verreaux's 261
 Vigors's 313
 Vigors's Yellow-backed 313
 Violet-backed 251
 Violet-breasted 285, 302
 Violet-green 302
 Violet-headed 258
 Violet-tailed 252, 314
 Wedge-tailed 258
 Western Bifasciated 283
 Western Crimson 313
 Western Green 252
 Western Olive 261
 Western Pygmy 254
 Western Violet-backed 228, 251
 White-bellied 291, 292
 White-bellied Variable 292
 White-breasted 214, 220, 291
 White-flanked 309
 White-vented 295
 Yellow-backed 309, 313
 Yellow-bellied 292, 296
 Yellow-breasted 257, 292, 296
 Yellow-chinned 252
 Yellow-tufted Malachite 272
 Zambesi Blue-headed 246
 Zambesi Valley 284
 Zambesi Valley Double-collared 284
 Zambian 291
 Sunda Flowerpecker 370
 Sunda Honeyeater 653, 660
 Sunda Myzomela 653
 Sunda Oriole 717
 Sunda Sunbird 298
 Sunda White-eye 483
sundevalli, *Zosterops pallidus* 470
 Superb Sunbird 290
superbus, *Cinnyris* 290
superciliaris, *Glycifolia notabilis* 631
superciliaris, *Lophozosterops* 482
superciliosa, *Woodfordia* 479
supercilosus, *Acanthorhynchus* 498, 583
supercilosus, *Lanius cristatus* 777
surdus, *Zosterops atrifrons* 456
 Swahili Sunbird 283
 Swallow
 Australian Flower 388
 sylviella, *Anthoscopus caroli* 72
 syriaca, *Sitta neumayer* 141
 Syrian Rock Nuthatch 141
 szalayi, *Oriolus* 694, 716
 Tacazze Sunbird 203, 271
tacazze, *Nectarinia* 203, 271
tacitus, *Lanius souzae* 779
taeniura, *Certhia himalayana* 184
 Tagula Black-fronted White-eye 457
 Tagula Honeyeater 591
 Tagula Meliphaga 591
 Tagula White-eye 457
tagulatus, *Philemon buceroides* 680
tahanensis, *Zosterops everetti* 449
 Taita Fiscal 791
 Taita Fiscal Shrike 791
 Taita White-eye 473
taiti, *Aegithalos caudatus* 95
taiwanensis, *Aegithalos concinnus* 97
takatsukasai, *Sitta europaea* 127
takatsukasai, *Zosterops semperi* 448
talatala, *Cinnyris* 214, 220, 291
talautense, *Dicaeum celebicum* 387
talautensis, *Leptocoma sericea* 268
talifuensis, *Aegithalos concinnus* 97
tamdaoensis, *Cinnyris jugularis* 297
tanakae, *Oriolus xanthornus* 729
tanamassae, *Dicaeum trigonostigma* 379
tanganjicae, *Cyanomitra alinae* 260
tanganyicae, *Cinnyris bouvieri* 289
 Tanimbar Friarbird 679
 Tanimbar Honeyeater 662
 Tanimbar Oriole 716
tararae, *Xanthotis flaviventer* 689
tarihoae, *Aegithalos caudatus* 95
taruensis, *Anthoscopus caroli* 72
 Tasmanian Diamond-bird 400
 Tasmanian Honeyeater 582, 666
 Tasmanian Pardalote 400
 Tasmanian Wattlebird 624
tasmanica, *Anthochaera chrysoptera* 620
tauricus, *Aegithalos caudatus* 95
taviunensis, *Foulehaio carunculatus* 669
 Tawny Straight-billed Honeyeater 629
 Tawny Straightbill 507, 629
 Tawny-breasted Honeyeater 564, 689
 Tawny-breasted Xanthotis 689
 Tawny-crowned Honeyeater 659
 Teardrop White-eye 479
 Teita Fiscal 791
 Teita White-eye 473
 Temminck's Honeyeater 595
 Temminck's Sunbird 237, 314
temmincki, *Arachnothera crassirostris* 317
temminckii, *Aethopyga* 237, 314
tenuifrons, *Zosterops minor* 457
tenuirostris, *Acanthorhynchus* 532, 559, 582
tenuirostris, *Oriolus* 723
tenuirostris, *Zosterops* 468
tenuis, *Myzomela cardinalis* 646
tenuissima, *Sitta carolinensis* 139
tephrolaemus, *Anthreptes rectirostris* 252
tephronota, *Sitta* 104, 121, 141
tephronotus, *Aegithalos caudatus* 95
tephronotus, *Lanius* 738, 770, 782
tephroleurus, *Zosterops lateralis* 467
Tephrozosterops 480
terglanei, *Aethopyga siparaja* 313
ternatanus, *Zosterops montanus* 450
tertius, *Lanius validirostris* 782
teiparius, *Zosterops kulambangrae* 464
teysmanni, *Cinnyris jugularis* 297
thaicacus, *Oriolus xanthornus* 729
theresae, *Lanius meridionalis* 787
theresae, *Leptocoma sperata* 267
theresia, *Leptocoma sericea* 268
 Thick-billed Berrypecker 336
 Thick-billed Flowerpecker 370
 Thick-billed Shrike 775
 Thick-billed Spiderhunter 317
 Thick-billed White-eye 407, 483
thomasi, *Lichenostomus leucotis* 602
thomasi, *Melidectes rufocrissalis* 613
thomensis, *Deptes* 258
thoracicus, *Prionochilus* 366, 370
 Three Kings Bellbird 587
 Thrush
 Green 717
tianquanensis, *Certhia* 175, 179, 185
tianschanica, *Certhia familiaris* 181
 Tibetan Shrike 782
tibicen, *Oriolus larvatus* 728
tibolii, *Aethopyga boltoni* 305
Tichodroma 164
 TICHODROMIDAE 146, 164
 Tickell's Flowerpecker 380
 Tiger Shrike 737, 775
tigrinus, *Lanius* 737, 775
Timeliopsis 629
 Timor Figbird 692, 715
 Timor Flowerpecker 385
 Timor Friarbird 680, 684
 Timor Helmeted Friarbird 680
 Timor Honeyeater 595, 653, 663
 Timor Meliphaga 595
 Timor Myzomela 653
 Timor Oriole 717
 Timor Sunbird 298
 Timor White-eye 483
timorlaensis, *Philemon plumigenis* 680
tinctum, *Dicaeum agile* 371
tinoptila, *Aethopyga siparaja* 313
 Tiny Sunbird 274
 Tiny Tit-warbler 75
 Tiny Tit-weaver 75
 Tit
 Alpine 95
 Black-browed 76, 98
 Black-headed 97, 98
 Black-throated 77, 82, 88, 92, 96
 Blyth's 97
 Blyth's Long-tailed 97
 Bonvalot's 98
 Burmese 98
 Cappoc 71
 Eurasian Long-tailed 95
 Fire-capped 55, 74
 Himalayan 97
 Kapot 71
 Kashmir 96
 Least Penduline 71
 Long-tailed 76, 95
 Mouse-coloured 72
 Myanmar 98
 Northern Long-tailed 78, 83, 84, 86, 89, 90, 93, 95
 Penduline 69
 Pygmy 79, 100
 Red-headed 96
 Red-headed Long-tailed 96
 Rufous-fronted 97
 Silver-faced 99
 Silver-throated 96
 Sooty 85, 93, 98
 Sooty Long-tailed 99
 West African Penduline 71
 White-cheeked 96
 White-cheeked Long-tailed 96
 White-necklaced 99
 White-throated 97
 White-throated Long-tailed 97
 Tit Berrypecker 343, 348
 Tit-hyllia 56, 62, 75
 Tit-warbler
 Crested 80, 85, 100
 Fire-capped 74
 Severtsov's 101
 Stoliczka's 101
 Tiny 75
 White-browed 81, 91, 101
 Tit-weaver 75
 Tiny 75
titioti, *Manorina melanocephala* 616
tiwi, *Oriolus flavocinctus* 718
 Togan White-eye 456
togoensis, *Corvinella corvina* 794
tongensis, *Zosterops senegalensis* 471
tonkeana, *Leptocoma sericea* 268
tonkinensis, *Aethopyga siparaja* 313
tonkinensis, *Sitta cinnamoventris* 130
tormenti, *Dicaeum hirundinaceum* 388
toroensis, *Zosterops senegalensis* 470
torquatus, *Melidectes* 614
Toxorhamphus 338
traillii, *Oriolus* 694, 696, 702, 730
transgensis, *Aethopyga siparaja* 313
traylori, *Nectarinia seimundi* 252
 Treecreeper 166, 181
 American 171, 175, 182
 Bar-tailed 167, 184
 Brown-throated 185, 186
 Common 181
 Eurasian 168, 170, 174, 178, 181
 European 181
 Himalayan 184
 Hodgson's 182
 Manipur 186
 Nepal 185
 Northern 181
 Rusty-flanked 170, 185
 Short-toed 169, 171, 173, 176, 177, 183
 Sichuan 175, 179, 185
 Sikkim 167, 185
 Spotted 186
 Stoliczka's 185
Trichodere 669
tricolor, *Lanius schach* 781
trigonostigma, *Dicaeum* 353, 360, 379
trinidae, *Chlorocharis emiliae* 483
 Tristram's Flowerpecker 385
 Tristram's Honeyeater 652
 Tristram's Myzomela 652
tristrami, *Dicaeum* 385
tristrami, *Myzomela* 652
trivialis, *Philemon buceroides* 680
trivirgatus, *Aegithalos caudatus* 95

trochileum / White-eye

trochileum, *Dicaeum* 389
trochiloidea, *Aethopyga gouldiae* 309
trochiloides, *Acanthorhynchus tenuirostris* 582
trochilus, *Leptocoma sperata* 267
tropicus, *Zosterops lateralis* 467
Truk Greater White-eye 479
Truk White-eye 479
tsaidamensis, *Lanius isabellinus* 777
Tsavo Purple-banded Sunbird 285
tsavoensis, *Cinnyris* 285
tschitscherini, *Sitta neumayer* 141
tucopiae, *Myzomela cardinalis* 646
tudjuensis, *Zosterops chloris* 453
Tufted-eye
 Grey-throated 482
Tui 500, 537, 587
 Chatham Island 587
turanicus, *Lanius minor* 785
turkanae, *Cinnyris habessinicus* 289
Turkistan Red-tailed Shrike 777
Turkistan Shrike 777
turkestanica, *Oriolus kundoo* 722

U

uchidai, *Dicaeum concolor* 380
uellensis, *Cinnyris chloropygius* 273
Uganda Violet-backed Sunbird 251
ugandae, *Anthodiaeta collaris* 253
ugiensis, *Zosterops* 464
Uhehe Fiscal 793
Uhehe Shrike 793
ultimus, *Zosterops hypoxanthus* 457
Uluguru Sunbird 251
Uluguru Violet-backed Sunbird 251
Umboi Myzomela 638
umboi, *Philemon cockerelli* 681
umbratile, *Dicaeum ignipectus* 387
umbrosa, *Melanocharis longicauda* 335
umbrosa, *Ptiloprora guisei* 658
umbrosa, *Sitta carolinensis* 139
Unadorned Honeyeater 627
uncinatus, *Lanius meridionalis* 787
undulata, *Glycyfobia* 508, 631
unicolor, *Dicaeum concolor* 380
unicolor, *Lichenostomus* 533, 601
unicolor, *Melanocharis nigra* 335
unicus, *Pycnopygius ixoides* 583
unicus, *Zosterops palpebrosus* 446
Uniform-coloured Honeyeater 601
Urodepanis 309, 310
Urolestes 795
uropygialis, *Arachnothera robusta* 318
uropygialis, *Pardalotus striatus* 401
uropygialis, *Zosterops* 455
Ursula's Mouse-coloured Sunbird 295
Ursula's Sunbird 295
ursulae, *Cinnyris* 295
Usambara Double-collared Sunbird 279
Usambara Grey-chinned Sunbird 253
usambaricus, *Cinnyris mediocris* 279
ussheri, *Pholidornis rufiae* 75
utakwensis, *Lichenostomus subfrenatus* 595

V

vagans, *Melilestes mearnsianus* 630
valia, *Cinnyris jugularis* 297
validirostris, *Lanius* 773, 782
validirostris, *Melithreptus* 673
valuensis, *Zosterops lateralis* 467
vanheysti, *Dicaeum ignipectus* 387
vantyniei, *Arachnothera longirostris* 317
Vanuatu Honeyeater 631
Vanuatu Mountain Honeyeater 631
Vanuatu White-eye 465
Variable Sunbird 206, 292
Variable White-eye 464
Varied Honeyeater 550, 601
variegatus, *Certhionyx* 531, 585
vatensis, *Zosterops lateralis* 467
vaughani, *Zosterops* 471
vaughanjonae, *Cinnyris cupreus* 295
vegetus, *Zosterops lateralis* 467
velata, *Sitta frontalis* 142
vellalavella White-eye 463
vellalavella, *Zosterops* 463
Velvet-fronted Blue Nuthatch 142
Velvet-fronted Nuthatch 103, 109, 112, 142
venustus, *Cinnyris* 206, 292
Verdin 54, 58, 61, 64, 66, 74
veronica, *Leptocoma sericea* 268

veroxii, *Cyanomitra* 201, 261
Verreaux's Sunbird 261
versicolor, *Lichenostomus* 550, 601
Verster's Berrypecker 336
versteri, *Melanocharis* 325, 330, 332, 333, 336
verticalis, *Cyanomitra* 211, 258
vicina, *Leptocoma sericea* 268
vicina, *Meliphaga* 591
Victoria Nuthatch 131
victoriae, *Aethopyga nipalensis* 309
victoriae, *Sitta* 125, 131
Victorian Spinebill 582
Victorian Wattle-cheeked Honeyeater 605
vieilloti, *Sphecotheres* 693, 697, 699, 707, 708, 715
vigilans, *Lanius collaris* 792
Vigors's Sunbird 313
Vigors's Yellow-backed Sunbird 313
vigorii, *Aethopyga* 313
villosa, *Sitta* 135
vinacea, *Myzomela cruentata* 639
vinaceus, *Aegithalos glaucogularis* 96
vincens, *Dicaeum* 366, 373
vincenti, *Cyanomitra obscura* 261
violacea, *Anthobaphes* 200, 258
violaceum, *Dicaeum geelvinkianum* 384
Violet-backed Sunbird 251
Violet-breasted Sunbird 285, 302
Violet-green Sunbird 302
Violet-headed Sunbird 258
Violet-tailed Sunbird 252, 314
virago, *Melanocharis versteri* 336
virens, *Zosterops pallidus* 470
virescens, *Dicaeum concolor* 380
virescens, *Lichenostomus* 598
virescens, *Ptilotis* 660
viridescens, *Rhamphocharis crassirostris* 337
viridicatus, *Zosterops atricapilla* 449
viridicauda, *Aethopyga siparaja* 313
viridifrons, *Lichenostomus obscurus* 596
viridifuscus, *Oriolus* 717
viridis, *Gymnomyza* 670
viridis, *Sphecotheres* 692, 715
viridisplendens, *Cyanomitra verticalis* 259
viridissimum, *Dicaeum bicolor* 374
Visayan Flowerpecker 375
visi, *Xanthotis flaviventer* 689
vittatus, *Lanius* 748, 780
Vitu Levu Wattle Honeyeater 669
voeltzkowi, *Cinnyris notatus* 302
voeltzkowi, *Zosterops maderaspatanus* 474
Vogelkop Honeyeater 612
Vogelkop Melidectes 612
Vogelkop Wattle Honeyeater 612
Von Rosenberg's Honeyeater 653
Vose's Melidectes 611
Vosea 611, 630
vulcani, *Zosterops montanus* 450
vulcanorum, *Cyanomitra alinae* 260
vulgaris, *Lichenostomus versicolor* 601
vulnerata, *Myzomela* 653
vulneratum, *Dicaeum* 383
vulneratus, *Oriolus cruentus* 730

W

wahgiensis, *Myzomela rosenbergii* 653
wahgiensis, *Zosterops novaeguineae* 461
waigeuense, *Oedistoma pygmaeum* 337
Wakolo Honeyeater 641
Wakolo Myzomela 641
wakoloensis, *Myzomela* 641
waldronae, *Anthoscopus flavifrons* 73
Wallace's White-eye 453
Wallacean Flowerpecker 388
Wallacean Honeyeater 641
wallacei, *Zosterops* 437, 453
Wallcreeper 147, 149, 151, 153, 155, 157, 159, 161, 163, 146, 164
 Red-winged 164
Warbling Honeyeater 661
Warty-faced Honeyeater 622
Wattle-cheeked Honeyeater 605
Wattlebird 623
 Brush 620, 621
 Cinnamon-breasted 614
 Common 623
 Little 522, 553, 620
 Long 624
 Lunulated 621
 Mock 620, 621
 Red 524, 546, 548, 623
 Reichenow's 613
 Spiny-cheeked 618
 Tasmanian 624
 Western 505, 621
 Yellow 573, 624
Wattled Honeyeater 539, 623, 669
Wattled Smoky Honeyeater 509, 633
wayensis, *Manorina flavigula* 618
Wedge-tailed Shrike 788
Wedge-tailed Sunbird 258
West African Black-headed Oriole 727
West African Penduline Tit 71
Western Bifasciated Sunbird 283
Western Black-headed Oriole 727
Western Crimson Sunbird 313
Western Green Sunbird 252
Western Long-tailed Shrike 794
Western Lunulated Honeyeater 675
Western Melipotes 632
Western Mountain White-eye 458
Western Olive Sunbird 261
Western Penduline-tit 69
Western Pied Honeyeater 585
Western Pygmy Sunbird 254
Western Rock Nuthatch 107, 108, 114, 118, 141
Western Silvereye 467
Western Smoky Honeyeater 632
Western Spinebill 498, 583
Western Spinebilled Honeyeater 583
Western Violet-backed Sunbird 228, 251
Western Wattlebird 505, 621
Western White-eye 467
Western White-naped Honeyeater 675
westernensis, *Zosterops lateralis* 467
westwoodia, *Lichenostomus virescens* 598
Wetar Figbird 715
Wetar Honeyeater 649, 664
Wetar Myzomela 649
wetmorei, *Zosterops everetti* 449
Whiskered Flowerpecker 371
whistleri, *Leptocoma zeylonica* 267
White gaped Honeyeater 601
White's Honeyeater 629
White-bearded Honeyeater 667
White-bellied Flowerpecker 379
White-bellied Honeyeater 631, 664
White-bellied Oriole 717
White-bellied Sunbird 291, 292
White-bellied Variable Sunbird 292
White-bellied White-eye 454
White-breasted American Nuthatch 139
White-breasted Black-capped Nuthatch 139
White-breasted Honeyeater 627, 631
White-breasted Nuthatch 106, 116, 121, 139
White-breasted Sunbird 214, 220, 291
White-breasted White-eye 469
White-browed Nuthatch 125, 131
White-browed Spinebill 583
White-browed Tit-warbler 81, 91, 101
White-browed White-eye 482
White-capped Honeyeater 612
White-cheeked Bushtit 96
White-cheeked Honeyeater 668
White-cheeked Long-tailed Tit 96
White-cheeked Nuthatch 139
White-cheeked Tit 96
White-chested White-eye 468
White-chinned Honeyeater 637, 674
White-chinned Myzomela 637
White-crowned Penduline-tit 64, 70
White-crowned Shrike 795
White-eared Honeyeater 545, 591, 593, 602, 632, 662
White-eared Meliphaga 591, 593
White-eared Mountain Honeyeater 593
White-eared Mountain Meliphaga 593
White-eared Myza 632
White-eye 402, 445
 Abyssinian 405, 469
 Abyssinian Yellow 469
 African Montane 412, 432, 473
 African Mountain 473
 African Pale 470
 African Yellow 426, 433, 434, 470
 Alor 454
 Amboina 461
 Ambon 461
 Ambon Yellow 461
 Annobon 474
 Apo 481
 Arfak 457
 Arfak Black-fronted 457
 Arfak Yellow-throated 457
 Ashy-bellied 454
 Australian Pale 454

Australian Yellow 413, 462
Bacan Black-fronted 455
Banda 453
Banded 463
Bare-eyed 479
Batjan Black-fronted 455
Biak 439, 458
Bicoloured 480
Bismarck 457
Bismarck Black-fronted 457
Bismarck Yellow-bellied 457
Black 458
Black-capped 418, 449
Black-crowned 455
Black-fronted 455, 456, 457
Black-headed 457
Black-masked 438, 481
Black-ringed 404, 455
Bonin 442, 480
Bourbon 473
Bridled 447
Broad-ringed 473
Brown-breasted 481
Bukida 461
Buru 458
Buru Island 458
Buru Mountain 481
Buru Yellow 458
Cameroon 485
Cape 424, 428, 470
Cape-and-Green 470
Capped 458
Caroline 448, 469
Caroline Islands 448
Celebes 454, 455
Celebes Grey-throated 481
Celebes Mountain 481
Central Solomons 464
Ceram 480
Ceylon 446, 447
Ceylon Hill 446, 447
Ceylon Small 446
Chestnut-flanked 403, 445, 475
Chestnut-sided 422, 475
Chinese 445
Christmas 440, 462
Christmas Island 462
Chuuk 479
Cinnamon 485
Citrine 448
Comoro 476
Creamy-throated 417, 455
Crested 439, 482
Crookshank's 458
Dark Green 445
Dark-crowned 482
Doherty's 482
Dull-colored 462
Dusky 430, 469
Enggano 449
Everett's 449
Eye-browed 482
Eyebrowed 479
Faichuk 479
Fiji 465
Finsch's 469
Flores 483
Ganongga 463
Giant 408, 484
Gizo 463
Golden 462, 480
Golden-bellied 455
Golden-green 404, 450
Golden-yellow 450
Goodfellow's 481
Grand Comoro 476
Great Chuuk 479
Great Kai 454
Great Kei 454
Green 470
Green-backed 420, 467
Green-throated 455
Grey 469, 473
Grey-backed 467
Grey-breasted 467
Grey-brown 469
Grey-hooded 481
Grey-throated 464, 482
Halmahera 455
Halmahera Black-fronted 455
Hartert's 463
Hermit 464
Highland 473
Hova 474

- Hova Grey-backed 474
Hume's 446
Indian 446
Island 462
Islet 462
Jackson's 470
Japanese 412, 421, 445
Javan 453, 482
Javan Grey-throated 406, 482
Kai 454, 455
Karopi 480
Kei 454, 455
Kenya 469
Kenya Yellow 469
Kikuyu 473
Kirk's 474
Kolombangara Mountain 464
Kosrae 469
Kühn's 461
Kulal 473
Kulumbangra 464
Laoumera 454
Large Bridled 453
Large Chuuk 479
Large Lifou 469
Large Palau 484
Large Ponapé 479
Large Sri Lanka 447
Large Yap 477
Layard's 465
Lemon-bellied 453
Lemon-throated 455
Lesser Sunda Lowland 483
Lesser Sunda Mountain 482
Little Kai 455
Little Kei 455
Long-billed 479
Lord Howe 467
Lord Howe Island 467
Louisiane 436, 462
Louisiane Black-fronted 457
Lowland 446
Luzon 446
Madagascar 474
Madanga 481
Makassar 455
Malagasy 433, 474
Malaita 464
Mangrove 453, 462
Marianas Bridled 447
Mascarene 437, 473
Mascarene Grey 473
Mascarene Olive 476
Mauritius Grey 473
Mauritius Olive 476
Mayotte 475
Mbulu 473
Metcalf's 461
Mindanao 481
Moluccan 453, 455
Moluccan Black-fronted 455
Mount Karthala 476
Mountain 450, 457, 461, 473
Mukojima 480
Murphy's 464
Nendo 465
New Caledonian 467
New Guinea 461
New Guinea Black-fronted 457
New Guinea Mountain 461
Nissan 462
Norfolk 468
Norfolk Island 468
Olive 476
Olive-coloured 477
Orange River 470
Oriental 411, 415, 427, 446
Oriental Mountain 450
Palau 484
Palau Greater 484
Pale 453, 454, 470
Pale-bellied 454
Pallid 470
Papuan Black-fronted 457
Papuan Mountain 457
Pearl-bellied 454
Pemba 471
Peninsular 454
Philippine 446, 450
Philippine Yellow 450
Pinaia 481
Plain 448
Pohnpei 469, 479
Ponapé 479
Ponapé Greater 479
Principe 474
Pygmy 483
Pygmy Grey 483
Ranongga 463
Red-flanked 445
Rendova 464
Rennell 463, 479
Reunion Grey 473
Reunion Olive 476
Robust 404
Rota 447
Rufescent 480
Rufous-collared 481
Rufous-throated 443, 481
Saipan Bridled 447
Samoan 465
Sanford's 479
Sangihe 456
Santa Cruz 465
Sao Tome 474
Savaii 465
Savau 465
Scaly-crowned 481
Scaly-headed 481
Seram 456, 481
Seychelles 475
Seychelles Brown 475
Seychelles Grey 443, 475
Seychelles Yellow 409
Siamese 446
Slender-billed 468
Small 446, 457
Small Black-fronted 457
Small Lifou 467
Soepiori 458
Solomon 464
Solomon Grey-throated 464
Solomon Yellow-throated 461
South Pare 473
Spectacled 447
Splendid 463
Spot-breasted 483
Sri Lanka 416, 446, 447
Sri Lanka Hill 447
Stalker's 480
Streak-breasted 483
Streak-headed 481
Streaky-headed 481
Stripe-headed 483
Sulawesi 454
Sunda 483
Tagula 457
Tagula Black-fronted 457
Taita 473
Teardrop 479
Teita 473
Thick-billed 407, 483
Timor 483
Togian 456
Truk 479
Truk Greater 479
Vanuatu 465
Variable 464
Vellalavella 463
Wallace's 453
Western 467
Western Mountain 458
White-bellied 454
White-breasted 469
White-browed 482
White-chested 468
White-throated 457, 468
Woodford's 479
Yap 477
Yap Greater 477
Yap Olive 429, 477
Yellow 450, 453, 462, 465, 469, 470
Yellow-bellied 446, 453, 458
Yellow-bellied Mountain 458
Yellow-browed 482
Yellow-fronted 465
Yellow-spectacled 437, 453
Yellow-throated 461
Yellowish 450
White-eyed Honeyeater 480, 654, 667
White-flanked Sunbird 309
White-fronted Honeyeater 503, 609, 612
White-fronted Melidectes 612
White-gaped Honeyeater 533, 601
White-lined Honeyeater 594
White-lored Oriole 721
White-marked Honeyeater 591
White-marked Meliphaga 591
White-marked Scrub Honeyeater 593
White-naped Friarbird 682
White-naped Honeyeater 514, 675
White-necklaced Tit 99
White-plumed Honeyeater 520, 547, 608
White-quilled Honeyeater 676
White-rumped Miner 618
White-rumped Shrike 796
White-sided Myzomela 639
White-spangled Honeyeater 662
White-streaked Friarbird 685
White-streaked Honeyeater 669, 685
White-striped Honeyeater 594, 595
White-tailed Nuthatch 130
White-throated Bushtit 97
White-throated Flowerpecker 366, 373, 383
White-throated Honeyeater 567, 628, 637, 674
White-throated Long-tailed Tit 97
White-throated Myzomela 637
White-throated Tit 97
White-throated White-eye 457, 468
White-tufted Honeyeater 662
White-vented Sunbird 295
Whitehead's Spiderhunter 320
whiteheadi, *Dicaeum haemastictum* 375
whiteheadi, *Leptocoma sperata* 267
whiteheadi, *Sitta* 122, 133
whiteheadi, *Zosterops montanus* 450
whitei, *Conopophila* 506, 629
Whiteman Melidectes 611
Whiteman Mountain Melidectes 611
whitemanensis, *Melidectes* 611
whyte, *Cinnyris ludovicensis* 278
wiglesworthi, *Antheptes malacensis* 247
wilhelminae, *Dicaeum sanguinolentum* 388
williamsoni, *Zosterops palpebrosus* 446
winifredae, *Zosterops poliogaster* 473
winterbottomi, *Anthoscopus caroli* 72
wombeyi, *Melithreptus brevirostris* 673
Wood Nuthatch 127
Woodchat 793
Woodchat Shrike 765, 793
Woodford's White-eye 479
Woodfordia 479
woodi, *Cinnyris jugularis* 297
woodwardi, *Anthochaera carunculata* 623
wrayi, *Aethopyga saturata* 310
wuroi, *Zosterops novaeguineae* 461
- X**
xanthochlora, *Antheptes simplex* 246
xanthochroa, *Zosterops* 420, 467
Xanthomyza 622
Xanthonotus 721
xanthonotus, *Oriolus* 713, 721
xanthopyge, *Pardalotus punctatus* 400
xanthopygium, *Dicaeum trigonostigma* 379
xanthopygius, *Prionochilus* 350, 370
xanthornus, *Oriolus* 729
Xanthotis 688
Xanthotis
Brown 689
Spotted 688
Tawny-breasted 689
Yellow-faced 690
xerophilus, *Zosterops borbonicus* 473
xylodromus, *Salpornis spilonotus* 186
- Y**
yamamurae, *Oriolus chinensis* 724
Yap Greater White-eye 477
Yap Olive White-eye 429, 477
Yap Rukia 477
Yap White-eye 477
yarkandensis, *Oriolus kundoo* 722
Yellow Figbird 715
Yellow Honeyeater 602
Yellow Miner 618
Yellow Oriole 718
Yellow Penduline-tit 71
Yellow Silvereye 462
Yellow Wattlebird 573, 624
Yellow White-eye 450, 453, 462, 465, 469, 470
Yellow-backed Sunbird 309, 313
Yellow-bellied Berrypecker 335
Yellow-bellied Flowerpecker 352, 373
Yellow-bellied Longbill 327, 338
Yellow-bellied Mountain White-eye 458
Yellow-bellied Oriole 718
Yellow-bellied Sunbird 292, 296
Yellow-bellied White-eye 446, 453, 458
Yellow-billed Nuthatch 123, 143
Yellow-billed Shrike 740, 752, 794
Yellow-breasted Flowerpecker 357, 361, 369
Yellow-breasted Sunbird 257, 292, 296
Yellow-browed Darkeye 482
Yellow-browed Honeyeater 504, 613
Yellow-browed Melidectes 613
Yellow-browed White-eye 482
Yellow-chinned Sunbird 252
Yellow-crowned Flowerpecker 374
Yellow-eared Honeyeater 577, 589, 663
Yellow-eared Spiderhunter 213, 318
Yellow-faced Honeyeater 558, 597, 632, 690
Yellow-faced Xanthotis 690
Yellow-fronted Honeyeater 606
Yellow-fronted Penduline-tit 73
Yellow-fronted White-eye 465
Yellow-gaped Honeyeater 593, 597
Yellow-gaped Meliphaga 593
Yellow-plumed Honeyeater 606
Yellow-rumped Flowerpecker 350, 370
Yellow-rumped Pardalote 400
Yellow-sided Flowerpecker 373
Yellow-spectacled White-eye 437, 453
Yellow-spotted Honeyeater 544, 589, 591
Yellow-spotted Meliphaga 589, 591
Yellow-streaked Honeyeater 601, 689
Yellow-throated Flowerpecker 369
Yellow-throated Friarbird 684
Yellow-throated Honeyeater 603, 604
Yellow-throated Miner 518, 525, 617
Yellow-throated White-eye 461
Yellow-tinted Honeyeater 534, 554, 608
Yellow-tipped Pardalote 401
Yellow-tufted Honeyeater 572, 604
Yellow-tufted Malachite Sunbird 272
Yellow-vented Flowerpecker 356, 373
Yellow-vented Honeyeater 651
Yellow-vented Myzomela 651
Yellow-winged Honeyeater 667
Yellowish Honeyeater 608, 657
Yellowish White-eye 450
Yellowish-streaked Honeyeater 657
yeniseensis, *Remiz coronatus* 70
yesoensis, *Zosterops japonicus* 445
Yesso Nuthatch 127
yokakuni, *Zosterops japonicus* 445
yokanae, *Antheptes reichenowi* 246
yorki, *Dicaeum hirundinaceum* 388
yorki, *Pardalotus rubricatus* 401
yorki, *Philemon buceroides* 680
Yunnan Nuthatch 123, 136
yunnanensis, *Certhia himalayana* 184
yunnanensis, *Sitta* 123, 136
- Z**
zachlora, *Zosterops chloris* 453
Zambesi Blue-headed Sunbird 246
Zambesi Valley Double-collared Sunbird 284
Zambesi Valley Sunbird 284
zambesiana, *Anthodiaeta collaris* 253
Zambezi Penduline-tit 72
Zambian Sunbird 291
zamboanga, *Rhabdornis inornatus* 195
zamboanga, *Sitta oenochlamys* 143
zanda, *Lichenostomus flavescens* 608
Zanthomiza 622
zanzibarica, *Cyanomitra veronii* 261
zaepagus, *Cinnyris jugularis* 297
zarinna, *Arachnothera longirostris* 317
zarudnyi, *Sitta neumayer* 141
zelotes, *Certhia americana* 182
zenkerianus, *Lanius mackinnoni* 791
zenobius, *Cinnyris jugularis* 297
zeylonica, *Leptocoma* 227, 267
zeylonicum, *Dicaeum agile* 371
zita, *Dicaeum monticulum* 387
zonarius, *Cinnyris manoensis* 274
ZOSTEROPIDAE 402, 445
Zosterops 445
zuluensis, *Anthodiaeta collaris* 253

SUMMARY OF VOLUME 13

REMIZIDAE (Penduline-tits)
AEGITHALIDAE (Long-tailed Tits)
SITTIDAE (Nuthatches)
TICHODROMIDAE (Wallcreeper)
CERTHIIDAE (Treecreepers)
RHABDORNITHIDAE (Rhabdornis)
NECTARINIIDAE (Sunbirds)
MELANOCHARITIDAE (Berrypeckers and Longbills)
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DICAEDIDAE (Flowerpeckers)
PARDALOTIDAE (Pardalotes)
ZOSTEROPIDAE (White-eyes)
PROMEROPIDAE (Sugarbirds)
MELIPHAGIDAE (Honeyeaters)
ORIOOLIDAE (Orioles)
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